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Agricultural input subsidies in sub-Saharan Africa
– the case of Tanzania

Tamahi Kato

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UNIVERSITY OF SUSSEX

TAMAHI KATO

DOCTOR OF PHILOSOPHY IN DEVELOPMENT STUDIES

AGRICULTURAL INPUT SUBSIDIES IN SUB-SAHARAN AFRICA

- THE CASE OF TANZANIA

SUMMARY

This thesis investigates the design, implementation and impacts of the market-smart input subsidy (NAIVS) in Tanzania's Ruvuma Region.

The research uses a mixed-methods approach, where quantitative data analysis is complemented by qualitative research. Using four waves of household panel data, I found that voucher receipt had no statistically significant impact on maize yields, income poverty or the household assets owned by recipient households. The qualitative research finds that this was due to flaws in NAIVS's design and in its implementation. Weak institutional capacity was found in voucher management, especially at the lower level of government: a substantial number of vouchers went missing; inputs and vouchers were delivered late most years; and vouchers were resold by farmers.

Due to an increase in real input prices, the 'top-up' payment required for voucher use was increased, which made it difficult for poor farmers to access the subsidy. In practice, the input vouchers were obtained by elites: households with elected positions in the villages; wealthier households; and those households who were already using improved inputs prior to NAIVS. It contributed to national food security; however, because of the spill-over effects which brought a higher increase ratio in input use among non-recipient than recipient households, the observed impact on maize yields cannot be attributed to NAIVS. Because of the leakage to wealthier farmers and fraud, it did not ensure household food security for poor farmers.

The thesis reveals that studies of input subsidy programmes require not only economic analysis but also social and political analysis. Such studies would require the use of a new theory of change, which uses economic analysis but places social and political analysis at the forefront, and in which a mixed-methods approach must be used.

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List of Abbreviations

ASR	Agricultural Sector Review
CAN	Calcium Ammonium Nitrate
CCM	<i>Chama Cha Mapunduzi</i> (Tanzania Conservative Party)
C.I.F.	Cost, Insurance and Freight
CNFA	Citizen Network for Foreign Affairs
CPI	Consumer Price Index
DAP	Diammonium Phosphate
DC	District Council
DID	Difference-in-Differences
DED	District Executive Director
DID	Difference-in-Differences
DVC	District Voucher Committee
ESRF	Economic and Social Research Foundation
FAC	Future Agriculture Consortium
FAO	Food and Agriculture Organisation of the United Nations
FAOSTAT	FAO Statistics
FEWS Net	Famine Early Warning Systems Network
FISP	Farm Input Subsidy Programme
F.O.B.	Free on Board
GBP	United Kingdom Pound
GDP	Gross Domestic Product
HH	Household
HIPC	Highly-indebted Poor Countries
IV	Instrumental Variable
MAFAP	Monitoring and Analyzing Food and Agricultural Policies of FAO
MAFC	Ministry of Agriculture, Food Security and Co-operatives
MCM	Ministry of Cooperatives and Marketing
MDGs	Millennium Development Goals
MFEA	Ministry of Finance and Economic Affairs
MIT	Ministry of Industry and Trade
MKUKUTA	Mkakati Kukuza Uchumi na Kupunguza Umaskini (Swahili for National Strategy for Growth and Reduction of Poverty)
MPEE	Ministry of Planning and Economic Empowerment
MRP	Minjingu Rock Phosphate
MWLD	Ministry of Water and Livestock Development

NAIVS	National Agricultural Input Voucher Scheme
NBS	National Bureau of Statistics
NFRA	National Food Reserve Agency
NMC	National Milling Corporation
NGO	Non-Governmental Organisation
NMB	National Microfinance Bank
NVC	National Voucher Committee
OCGS	Office of Chief Government Statistician
OLS	Ordinary Least Squares
PER	Public Expenditure Review
PMO-RALG	Prime Minister's Office, Regional Administration and Local Government
PSM	Propensity Score Matching
RS	Regional Secretariat
RVC	Regional Voucher Committee
SACCOs	Savings and Credit Cooperatives
SAP	Structural Adjustment Programme
SGR	Strategic Grain Reserve
SODECO	Songea Development Cooperation
SSA	Sub-Saharan Africa
URT	United Republic of Tanzania
USD	United States Dollar
TFC	Tanzania Fertiliser Company
TMA	Tanzania Meteorological Agency
TZS	Tanzania Shilling
VAEO	Village Agricultural Extension Officer
VC	Voucher Committee
VEO	Village Executive Officer
VVC	Village Voucher Committee
WAEO	Ward Agricultural Extension Officer
WVC	Ward Voucher Committee

List of Swahili words

Bei-elekezi	Suggested price
Katibu talafa	Commissioner at the level between district and ward
Kitongozi	Hamlet
Maisha	Life
Ngumu	Difficult
Ni	is / am / are
Vitongozi	Hamlet (plural)
Piki-piki	Motor bike
Ujamaa	Communal village production units in the Tanzanian socialist era

Chapter 1 Introduction

1-1. Introduction

Input subsidies have played a crucial role in development policies in sub-Saharan Africa (SSA). During the period of nationalistic policies in the 1960s and 70s, many SSA countries provided universal input subsidies to all farming households with the aim of earning foreign exchange for industrialisation through agricultural intensification. Opponents suggest that they tended to benefit wealthier farmers most, rather than poor farmers; to bring about market failure; to suffer from ineffectiveness and inefficiency due to weak management capacities and frauds, and to incur huge costs. Proponents suggest that they educate farmers on input use and, if used properly, will develop the private sector which will give farmers better access to inputs. However, due to frequent droughts, adverse economic circumstances and dubious policy decisions, the growth rate of agricultural GDP per capita for the region was negative or close to zero from the 1970s to the early 1990s (World Bank, 2007).

Because of the economic crisis and financial sustainability concerns, Structural Adjustment Programmes (SAPs) in the 1980s and 90s liberalised markets and removed input subsidies. With a positive growth rate of agricultural GDP per capita since then, the earlier trend has been reversed by improvements in agricultural performance, better macroeconomic policies and higher commodity prices. However, food production, especially cereal yields, has been stagnant in the region because of the large budget cut in the agricultural sector after the SAP. The stagnant crop yields have long been regarded as a challenge in SSA.

The main reasons for this low productivity are low levels of input (access to irrigation, fertiliser and improved seeds) use, soil degradation, low population density, an underdeveloped road network, a diverse agro-ecological system and policy distortion against agriculture. Input use in SSA, in particular, has been very low compared to that in other regions of the world, partly due to the removal of input subsidies in the 1980s (Morris et al., 2007). The low use of inputs is mainly caused by high prices and an under-developed market, due to the low volume of demand and high transport costs caused by lack of access to good roads.

After the SAP, these input subsidy programmes were continued in Zambia, justified on the basis of the threat of food insecurity, drought and a stagnant economy. Since the early 2000s, other SSA countries have also gradually reintroduced input subsidy programmes using resources generated through debt cancellation under the Highly-Indebted Poor Countries (HIPC) initiative and General Budget Support.

The reintroduction of input subsidies often caused considerable tension between government and donors. The main opponents cited a history of inefficiencies due to mismanagement and fraud. However, the donors' positions varied over time and were not

consistent even within the same institutions (Potter, 2005; Chirwa and Dorward, 2013) due either to differing ideologies or to the lack of evidence available as to the effects and efficiency of the subsidies.

In 2003, when I was working with the poverty monitoring sector in Tanzania, the government reintroduced an input transport subsidy programme with the objective of improving poor farmers' ability to access inputs. However, this raised major concerns in civil society and among donors, partly because of the subsidy's history of high leakage and inefficiency. Since it was difficult to judge at the time whether the government policy was right or not, and considering the history of input subsidies under the country's socialist regime, 'there was concern among African politicians, NGOs, and some policy analysts about the apparent failures of liberalized policies in supporting ... sustainable intensification of staple food crop production' (Chirwa and Dorward, 2013: 21-22). These factors brought about my own concern in the country's input subsidies and motivated me to undertake this doctoral research.

The reported success of the Malawi Farm Input Subsidy Programme (FISP) in the mid-2000s has brought about a recent surge of interest in the new type of 'market-smart' subsidy, which uses coupons or vouchers to deliver subsidy directly to small-scale farmers, to avoid fraud and illicit behaviour. It also promotes the development of the private sector by involving it in input procurement and delivery. Market-smart subsidies aim to overcome the problems of market failure and ineffectiveness and inefficiencies experienced by the previous universal input subsidies by targeting small-scale poor farmers and aiming for poverty reduction and economic growth through an increased use of inputs.

At least eight African countries (Kenya, Malawi, Rwanda, the United Republic of Tanzania, Zambia, Mozambique, Nigeria and Ghana) have introduced 'market-smart' input subsidies since the late 1990s (Banful, 2011). African Union member states gathered for the African Fertilizer Summit in 2006 and declared their unanimous commitment to increase fertiliser use from the then current low level of 8 kg per hectare to an average of 50 kg per hectare. They also declared that they would provide funding for financing mechanisms for fertiliser operation and smart subsidies, and eliminate all taxes and tariffs on fertilisers and their raw materials (African Union, 2006).

One of the 17 Sustainable Development Goals agreed in 2015 was 'to end hunger, achieve food security, improve nutrition and promote sustainable agriculture' (United Nations General Assembly, 2015), while increasing the agricultural productivity and incomes of small-scale farmers was listed as one of the measures towards this objective. Recognising the crucial role that 'market-smart' input subsidies could play in attaining this goal, this thesis aims to analyse the effects and impacts of these subsidies in SSA on poverty reduction and farmers' livelihoods, focusing on the effects of the programme design and implementation which, so far, have been subject to little detailed study. It aims to analyse the challenges of these programmes and thus provide lessons for future 'market-smart' subsidies in SSA.

1-2. Food security in sub-Saharan Africa

The food security situation in SSA has worsened since the world food crisis of 1972/74. Not only has crop yield stagnated, but the lack of institutional capacity to ensure wide access to delivered foods has meant that malnutrition is prevalent in SSA. However, because of positive agricultural growth and better institutional management between 2000 and 2013, the prevalence of undernourishment in SSA has improved by 30 per cent (World Bank, 2015b).

The World Summit on Food Security (WFS) (2009) adhered to the definition of food security declared by the same Summit in 1996 as being ‘when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life’. However, it added to this the statement that ‘(t)he four pillars of food security are availability, access, utilization and stability. Nutritional dimension is integral to the concept of food security.’

Since 2008, food and input prices have been on the increase and are projected to remain high in the coming years, which has made food security an emerging concern. In 2014, African states adopted the Malabo declaration on accelerated agricultural growth and transformation for shared prosperity and improved livelihoods (African Union, 2014), an implementation strategy and a roadmap to turn the goals into concrete results.

In SSA, the progress toward improving food insecurity in general has been slow but has varied among countries. Food availability in SSA has increased by nearly 12 per cent over the past 20 years. Of the 40 countries in SSA, seven have achieved both the Millennium Development Goals (to halve the absolute number of people suffering from hunger) and the WFS (to halve the absolute number of undernourished) targets; 11 have met the MDGs targets and made progress on WFS, and 12 have made progress towards meeting MDGs and/or WFS targets. Meanwhile, the number of stunted children has stagnated while the number of underweight children has declined (FAO, 2015a).

In order to achieve food security, a multi-sectoral approach is required, as well as agricultural growth. The State of Food and Agriculture 2015 (FAO, 2015b) suggests that ‘social protection programmes are effective in reducing poverty and hunger’ (p. xiii), and need coordination with agricultural interventions to improve livelihoods sustainably. One agricultural intervention is input subsidy programmes, which can reach more of the poorest by adapting the input package to their particular needs, and by linking with social cash transfer programmes which enable the poorest to pay the ‘unsubsidised’ part of the inputs.

1-3. Food security policies and input subsidies in Tanzania

From the late 1960s until the early 1990s, the Tanzanian government used to monopolise input importation and marketing with the provision of significant subsidies using various mechanisms

areas'¹ (Figure 1). For the food security purposes this NFRA route might be different from the commercial route to Dar es Salaam (Wilson and Lewis, 2015), which, however, might be much smaller than the one from Iringa and Mbeya in the amount. The amount distributed to specific regions is decided by the Prime Minister's office, which takes into consideration food shortages caused by drought, poor rainfall, hunger and natural disasters in these regions².

The above-mentioned input subsidy re-introduced in 2003/04 was that provided to input supplier companies for transport costs, in order for them to deliver an agreed quantity of fertilisers to farmers at fixed prices (World Bank, 2009a). However, with no proper monitoring mechanism the expected amounts of inputs were not delivered to the smallholders or sold to other farmers at the market prices.

In 2008, when food and input prices started to rise, the government of Tanzania asked donors for emergency support for food security programmes. The World Bank responded to this with the launch of the Tanzania Accelerated Food Security Project, which aimed to achieve national and household food security by providing input subsidy (the National Agricultural Input Voucher Scheme (NAIVS)) to small-scale farmers (World Bank, 2009a). Learning from Malawi's experience, the project introduced a 'market-smart' subsidy by promoting private sector development in the input market. The NAIVS project document states that 'vouchers have proven more effective and less apt to distort the market than methods used commonly in the past, such as direct subsidies and centralized control of fertilizer procurement and distribution' (World Bank, 2009a: 71). The subsidy targeted maize and rice production in areas with a potentially high response to input use, i.e., the Southern Highlands, and northern and central-western areas. The project aimed to achieve poverty reduction and economic growth through increased crop production, targeting 2.5 million small-scale farm households in the country. The 'benefits' of a 'smart' subsidy include 'increased farmer output, stronger private input markets, and increased adoption of new technologies by poor farmers' (ibid: 71). Various studies acknowledge that 'these benefits depend greatly on how the subsidy programme is designed and implemented', which is the focus of this thesis (World Bank, 2009; Druilhe and Barreiro-Hurle, 2012; Jayne and Rashid, 2013).

1-4. Key features of the input subsidy programmes

In order for input subsidy programmes to be effective and efficient, many complex elements must be considered. In this section the key features of the subsidy programmes are summarised.

¹ Interview in December 2012.

² Interview with the MAFC Director of National Food Security (October, 2012)

1-4-1. Programme aims, design and implementation

Input subsidy programmes tend to have dual objectives: 1) to increase national food security and accelerate economic growth through increased maize/rice production; and 2) to reduce poverty amongst small-scale farmers by improving household food security through increased production from the increased use of inputs (Chirwa and Dorward, 2013; Ricker-Gilbert et al., 2013a). However, these cannot be attained by targeting one group. In order to achieve national economic growth, it would be better to target large farmer households who have complementary inputs to enhance productivity. For the purpose of poverty reduction, small-scale farmers who could also achieve high marginal productivity³ should be targeted. As regards the implementation of NAIVS, it was difficult to achieve the two objectives at the same time because of the late delivery or resale of vouchers; difficulties in paying the ‘unsubsidised part’ of inputs; the embezzlement of vouchers and subsidised inputs by politicians, government officers and elites; and the diverting of vouchers to elites or wealthier farmers, as will be discussed at length in Chapter 4. This thesis analyses whether the programme aim, design and implementation flawed well, as design and implementation are key for any effective ‘market-smart’ subsidy programme.

1-4-2. Targeting

Knowing that previous input subsidy programmes incurred heavy costs, targeting small-scale farmers accurately was important for the efficiency (without leakage to wealthier farmers) and effectiveness (higher marginal productivity⁴) of the programme. Normally, input subsidy programmes combine various types of targeting: geographical targeting (high-potential areas); categorical targeting (landholders); proxy-means tests (local definition of poor and vulnerable); and/or community selection. The efficiency and cost-effectiveness of these methods of targeting vary from case to case. Studies suggest that ‘market-smart’ subsidies are not exempt from targeting errors and the politicisation of targeting (Banful, 2011; Mason and Jayne, 2013). Pan and Christiaensen (2012) mention elite capture in input voucher distribution during the pilot year in Kilimanjaro Region in Tanzania, where 60 per cent of vouchers were obtained by village elites.

1-4-3. Input / Voucher delivery

Due to the vouchers being printed in the UK and late ordering by the Tanzanian government causing late delivery of the vouchers to the project site and the lack of administrative and technical capacities, subsidised inputs and vouchers tend to be delivered late

^{3, 4} There are no scale economies in fertiliser use; nevertheless, an alternative argument is that larger farmers might be better-educated or more experienced in fertiliser use and achieve higher marginal productivity. The evidence either way is not wholly conclusive but the evidence on lower per hectare use by smaller farmers and the normal assumption of declining returns suggest the marginal productivity argument supports the small farm case.

(Chirwa and Dorward, 2013; Jayne and Rashid, 2013). This lateness affects the effectiveness of the subsidy, as either farmers delay planting and grow fewer crops, or they choose not to delay and plant traditional seeds without using planting fertiliser and resell their vouchers (Chirwa et al., 2011a).

Since most of the inputs are imports in SSA, they are susceptible to price changes in the international market. Therefore, although there is a suggested subsidy ratio in the programme, the farmers' payment for 'unsubsidised' parts of inputs fluctuates and the face values of vouchers did not change, with poor farmers sometimes unable to obtain the subsidised inputs if the prices become higher.

Studies suggest that patron-client relationships or rent-seeking behaviours exist in the government hierarchies of SSA countries, for the former where more junior officials give resources (in this case inputs or vouchers) to senior officials in return for favours from them (Fjeldstad et al., 2003; Cooksey, 2012). The incentive structure for government officials to implement government-run social transfer programmes is very weak, for example, especially at the lower levels where remunerations are low. When opportunities exist, therefore, 'siphoning off' is a frequent practice (Ellis et al., 2009: 65). Maliro (2011) suggests that 'there are openly reported instances of fraudulent behavior that nonetheless fail to provoke official outrage or censure or punishment, in effect allowing such behavior to become institutionalized over time' (p. 146). As regards the input voucher programme in Tanzania, Cooksey notes that there were many missing vouchers, probably taken by government officials and politicians before they reached the villages (Cooksey, 2012). Frauds and illicit behaviour commonly occur in input subsidy programmes (Cooksey, 2012; Chirwa and Dorward, 2013; Jayne and Rashid, 2013). Ellis et al. (2009) suggest that the new technologies such as mobile phones merit future consideration for effective delivery.

1-4-4. Impact of input subsidies on maize yields and poverty

Several studies suggest the 'market-smart' subsidy programmes increased maize production among beneficiaries in Malawi and Zambia (SOAS et al., 2008; Chirwa et al., 2011a; Ricker-Gilbert and Jayne, 2011; Lunduka et al., 2013; Mason et al., 2013); raised national maize production in Malawi (Dorward and Chirwa, 2011; Lunduka et al., 2013) although the official data for maize production in Malawi seem to be overstated (Chirwa and Dorward, 2013), and could raise maize or rice production, in their estimation, in Nigeria (Liverpool-Tasie and Takeshima, 2013).

However, these increases in production are found to be concentrated in wealthier households, with the programme making almost no impact on poverty reduction in Malawi and Zambia (Marenja and Barrett, 2009; Lunduka et al., 2013; Mason and Jayne, 2013; Ricker-Gilbert et al., 2013b), while a seed voucher programme which provided rice seeds to randomly-selected farm households was reported to have a significant impact on income poverty in Nigeria

(Awotide et al., 2013).

1-4-5. Gender impacts

Since the programmes target vulnerable households, including female-headed households, they should have gender impacts on farmers' households and in the communities. However, in patriarchal societies such as those in SSA, it was not easy to target women in many cases because of their powerless positions. The study by SOAS et al. (2008) found that in Malawi, male-headed households were more likely to receive coupons than female-headed households. Chirwa et al. (2011a) found that in 2008/09 women-controlled plots were less likely to apply fertilisers than men-controlled plots; however, within male-headed households the application of 'subsidised fertilisers' did not have much difference between men-controlled and women-controlled plots, and the access to commercial fertilisers were favourable to women-controlled plots. This suggests that the programme could reduce gender difference in intra-household decision-making power.

1-4-6. Market effects

Input subsidies affect the market in inputs, by increasing supply and demand and thus lowering their prices. 'Market-smart' subsidies aim to promote the development of the private sector by using it in input procurement and delivery. In some cases, such as that of the FISP, the role of the private sector was nonetheless limited.

Leakage to wealthier farmers means that commercial purchases can be displaced by subsidised inputs, making the net increase in input purchase less than the subsidised input volume. Studies on FISP find that an increase in maize production lowers maize prices, and that increased labour demand due to an increase in production brings about higher labour wages (Chirwa and Dorward, 2013; Dorward and Chirwa, 2013). Meanwhile, some farmers sell vouchers at less than their value as they prefer to raise money rather than buy inputs. Other wealthier farmers buy these vouchers as they are at below market price (Ellis et al., 2009).

1-4-7. Cost effectiveness

Input subsidy programmes are very costly, and it is therefore important to analyse their cost-effectiveness. The analysis should compare all the procurement and delivery costs per unit of each type of input with the value of the inputs at local market prices. However, due to information constraints it is difficult to implement any adequate analysis of cost-effectiveness. The most-studied input subsidy programme is FISP in Malawi. Ellis et al. (2009) suggest that universal coverage, i.e., less targeting, might be more cost-effective because of the tendency towards elite capture.

The right benefit-cost ratio (BCR) was keenly debated in the case of Malawi (Jayne et al.,

2013; Dorward and Chirwa, 2015; Jayne et al., 2015); Dorward and Chirwa debated how to treat the diversion cost and indirect effects of the input subsidy programme in particular. Jayne et al. (2015) suggest that the BCRs of input subsidy programmes are negative and that investment in traditional public goods such as agricultural R&D and extension, or on road, rural electrification or other productivity-enhancing investments, should therefore be priorities instead of continuous investment in unproductive subsidy programmes (Fan et al., 2007).

1-5. Research questions

In order to analyse the key issues of the input subsidy programmes, this thesis aims to address the following research question:

Research question: *How did NAIVS impact on poverty reduction and the livelihoods of farmers in Ruvuma Region in Tanzania?*

To date, several studies have been conducted concerning the implementation and impact of NAIVS. The baseline survey for the impact study of NAIVS, conducted by the Tanzanian government, found that beneficiaries were better-off and better-‘connected’ to village leaders than non-beneficiaries (Patel, 2011). The impact study found that beneficiaries made greater maize/rice yield gains than non-recipients; however, the profitability of input use for the average farmer not in receipt of subsidy was low, as it depended on input use efficiency and output prices (URT, 2014e). NAIVS had a positive effect on farmers’ learning about the inputs, and a significant number of programme graduates continued to buy the commercial inputs. As input subsidies have been a crucial but contentious tool for development policies in SSA but so far very few studies have been conducted on the impact, design and implementation of the programmes, this thesis aims to address the current concern as to whether ‘market-smart’ subsidies could be effective and efficient in improving the household food security, and reducing the poverty, of small-scale farmers, overcoming the deficiencies of past input subsidies such as market failures, leakage to wealthier farmers, mismanagement and fraud. As Jayne et al. (2013) suggest, ‘(g)reater attention to program design and implementation details to reduce problems of crowding out and diversion can substantially raise the returns to such programs’ (p.687). By revealing in detail the design and implementation of the current programmes in SSA, the thesis is a unique study which highlights the challenges for these programmes and could offer lessons for future subsidy programmes in SSA.

I focus on Ruvuma Region, for the panel data which I obtained from World Bank focused on Kilimanjaro and Ruvuma Regions, and NAIVS voucher distribution was focused on the Southern Highlands (URT, 2014e), ‘the grain supplier’ in the country, which Ruvuma was a part, and Ruvuma was one of the poorest regions in the country (URT, 2005), thus the study on Ruvuma is better in order to measure the impact on poverty.

To address the research question, this thesis addresses the following six research sub-questions:

Research sub-question 1: Who received NAIVS vouchers?

NAIVS aimed to target initially small-scale poor, vulnerable households, with the land criteria of no more than 1 ha. of maize or rice cultivation, with priority given to vulnerable households such as female-headed households (World Bank, 2009a). Other studies of market-smart input subsidies (Chirwa and Dorward, 2013; Jayne et al., 2013; Jayne and Rashid, 2013) similarly suggest elite capture and diversion and fraud in Malawi, Zambia, Kenya and Tanzania. These studies also suggest that targeting was an issue; there were inclusion errors and exclusion errors. In that context the question of who obtained vouchers is pertinent in the case of NAIVS in Tanzania. This thesis looks in detail at how the targeting and voucher management were designed and implemented, and who ultimately received vouchers.

Research sub-question 2: Did NAIVS increase the maize yields of recipient households?

This thesis analyses whether NAIVS increased the maize yields of recipient farmers through the increased use of inputs. NAIVS was designed to target poor, small-scale farmers in the highly promising area of input use. It aimed to achieve poverty reduction as well as economic growth through increased maize or rice production, by using improved inputs. Using subsidised inputs, small-scale farmers who had not used improved inputs in the previous five years could obtain a higher marginal productivity (World Bank, 2009a). NAIVS provided subsidised inputs for three consecutive years so that poor, small-scale recipient farmers could accumulate enough income to purchase commercial inputs after the subsidy; i.e., they could ‘exit’ the programme. NAIVS was designed so that the receipt of one voucher package for three consecutive years would more than double a farmer’s maize productivity, from 1,120 kg per acre to 2,450–3,200 kg per acre. Rice yield was expected to rise by 60 ~ 90%, from 1,735 kg per acre to 2,800–3,300 kg per acre (World Bank, 2009a: 22). This thesis analyses whether NAIVS achieved the expected outcome of increased maize yields, and if not, why.

Research sub-question 3: Did NAIVS reduce poverty and increase the food security and the assets of recipient households?

Through increased maize production, the small-scale recipient farmers are expected to increase their income, in such a way that the net maize-buyers reduced their purchases and/or net maize-sellers could increase their sales, thus they could increase available income. If they increase their income, they can accumulate assets. Dorward and Chirwa (2013) suggest that in Malawi, FISP reduced income poverty from 2005/06 to 2007/08 by a limited amount, although there might be a data limitation in their study. Other studies suggest that in Malawi and Nigeria, the subsidy

programme reduced income poverty (Xu et al., 2009b; Awotide et al., 2013). This thesis uses panel data to control other conditions in order to look at whether NAIVS reduced poverty and increased the food security and the assets of recipient households with the analysis of change in livelihoods. If these outcomes were not achieved, the thesis analyses the reasons. This thesis also looks at the livelihood strategies of poor small-scale farmers in relation to the voucher programme, e.g., reselling vouchers or sharing them with other farmers.

Research sub-question 4: Did receipt of NAIVS input vouchers have any gender impacts?

‘Market-smart’ subsidies target vulnerable households, prioritizing female-headed households. If targeting was successful, therefore, and with all other conditions equal, female-headed recipient households could increase their maize production and their poverty in comparison with male-headed non-recipient households. However, studies find that despite these aims, female-headed households were less likely to receive subsidies in Malawi (Ricker-Gilbert et al., 2011; Chibwana et al., 2014), and FISP did not reduce the gap between male-headed and female-headed households in the adoption of modern seeds and fertilisers (Fisher and Kandiwa, 2014). There was, however, a smaller gender gap between male-controlled and female-controlled plots in the use of fertilisers (Chirwa et al., 2011a). This thesis looks at whether NAIVS did prioritise female-headed households in the distribution of vouchers, and how these households’ livelihoods changed accordingly.

Research sub-question 5: Did NAIVS lower maize producer prices and increase agricultural wages?

With subsidised inputs occupying a relatively large proportion of total input demand in the region, total maize production and labour demand should both have increased, reducing the real price of maize and increasing agricultural wages. This should have benefited maize-deficit, labour-surplus poor farmers and maize-surplus labour-deficit farmers should have suffered. Chirwa and Dorward (2013) suggest that these were such indirect impacts of FISP. This thesis looks at these aspects of NAIVS in Ruvuma Region as these are the key elements for poverty reduction of poor farmers.

Research sub-question 6: Did NAIVS promote the private sector?

Subsidised inputs are intended to increase input availability, which will in turn reduce input prices and promote demand. ‘Market-smart’ subsidies aim to overcome the deficiencies of the conventional government-supplied input subsidy programme - which brought about market distortion - by using the input private sector for input procurement and delivery. Depending on countries, the involvement of the private sector varied. This thesis looks at how NAIVS promoted the private sector and how private agents acted in the programme; what the challenges were; and

whether the agents were willing to stay in the input business in future years. Given that most of the subsidised inputs in Tanzania are imported, this thesis also looks at the trend of input prices and how this affected voucher receipt by farmers.

1-6. Thesis structure

This thesis aims to contribute to the discussion of the effectiveness and efficiency of the ‘market-smart’ input subsidy programme in SSA, by a detailed analysis of its design and implementation. The strengths of this thesis are that it employs a wide range of data taken from the five countries’ programmes and a detailed case study in Tanzania, using secondary literature and data review, and primary mixed-methods research in Tanzania; and that it considers the impact of input subsidies through an analysis of design and implementation issues. It concludes with an overview of the challenges posed by these programmes which may or will be faced by other SSA countries. So far, few detailed studies have been conducted on the design and implementation of programmes. The thesis looks at the case study of NAIVS in Tanzania with mixed-methods, using empirical qualitative and quantitative data in Ruvuma Region, one of the ‘grain suppliers’ in the country. A mixed-methods approach is appropriate to measure the impact on farmers’ livelihoods as well as to look closely at how the programme was implemented. The quantitative data is primarily based on the panel data, which captured the agricultural situation just before the pilot year and again in the programme’s third year. The qualitative information was collected through key informant interviews, farmer group discussions in the region and, to a lesser extent, at national level in the third year of the programme. This thesis analyses the impact of NAIVS on poverty reduction and change to farmers’ livelihoods by looking at how the programme was designed and implemented; how design and implementation impacted on maize production and productivities, poverty, food security and livelihoods of the recipient farmer households, as well as their indirect effects on non-recipients, villages and the wider economy; and how social and power relations affected the programme, conversely, how the programme affected these relationships.

The structure of this thesis is as follows. The next chapter looks at the input subsidy programmes in SSA countries, and their successes and challenges. The third chapter presents the analytical framework and the research methodology of the thesis. The fourth chapter provides a detailed analysis of the programme’s aim, design and implementation. The fifth chapter analyses the characteristics of voucher recipients. The sixth chapter looks into the impact of NAIVS on maize yields. The seventh chapter analyses the impact of NAIVS on poverty, farmers’ livelihoods and gender aspects in Ruvuma. The eighth chapter presents an analysis of the indirect impact of NAIVS on the wider economy, by looking at changes in input prices, maize prices and agricultural wages. The ninth chapter discusses the findings based on the research questions. The tenth chapter concludes with an analysis of future challenges to ‘market-smart’ subsidies in SSA.

Chapter 2. Review of input subsidies in sub-Saharan Africa⁵

2-1. Introduction

Since their independence in the years before the mid-1970s, a number of sub-Saharan African (SSA) countries have developed food security programmes by providing subsidies, credits, other inputs, extension services and marketing facilities to small-scale farmers as well as by controlling markets and food crop prices (Ellis, 1982; Maxwell, 2001). At first many of these countries provided universal input subsidies that were accessible to all farming households. Due to fiscal unsustainability and the inefficiency of these state-controlled policies due to market distortion, structural adjustment programmes introduced in the 1980s and 1990s created liberalised input and output markets with the abolition of pan-territorial prices, the privatisation of state-owned enterprises and the removal of input subsidies in many countries. Among them the removal of input subsidies was a critical development due to the fiscal and budgetary orthodoxy. Although a positive growth rate of agricultural GDP per capita has been reported in the region since then, the food crop yields have been stagnant in the region. One of the reasons for this low productivity has been the low level of input use (World Bank, 2007).

However, due to the threat of food insecurity, especially from drought and a stagnant economy, subsidy programmes have continued in Zambia. Other SSA countries have also gradually reintroduced input subsidy programmes, as their governments have received debt cancellation under the Highly-Indebted Poor Countries (HIPC) initiative and General Budget Support since around the early 2000s, enabling them to put money into agricultural input subsidies. Such subsidy programmes have been popular among politicians since they can show direct support for citizens, and ‘compensate for the lack of long-term investment for infrastructure and short-cut the need for more complex effort for market development’ (Poulton et al., 2009: 1416).

After attempting with initiatives such as the Starter Pack and Targeted Input Programmes, Malawi launched the Farm Input Subsidy Programme (FISP) across much of the country in 2005/06. This subsidy aimed to overcome the problems of previous input subsidies of market distortion and leakage to non-intended beneficiaries: by targeting small-scale farmers and achieved wide coverage through the use of vouchers (sometimes known as ‘coupons’); and by using the private sector for the procurement and delivery of inputs in order not to distort the input market. This is called a ‘market-smart’ subsidy (Minot and Benson, 2009). The innovative

⁵ A part of this chapter was used for the forthcoming article, ‘Input subsidies in sub-Saharan Africa’ co-authored with Martin Greeley (Kato, T. and Greeley, M. (2016) ‘Agricultural input subsidies in sub-Saharan Africa’, *IDS Bulletin*, Vol. 47 (2) pp. 33-48.)

approach and the report of success in increasing maize production and yields from 2005/06 to 2007/08 brought subsidy lobby and impetus to the unanimous commitment of the African Union states to increasing input use through ‘market-smart’ subsidies to promote food crop yields, mainly of maize (African Union, 2006). Since the food and input price spikes in 2008, even donors that advocated for agricultural liberalisation, such as the World Bank, have been supporting these programmes (Benin et al., 2013).

Since the late 1990s, 11 countries have introduced input subsidies in SSA (Crawford et al., 2006; Druilhe and Barreiro-Hurle, 2012). These input subsidies have evolved from demonstration packs to large subsidy programmes, but have mainly shifted to targeting small-scale farmers, as in Kenya, Malawi, Rwanda, the United Republic of Tanzania, Zambia, Mozambique, Nigeria and Ghana, while those in Burkina Faso, Senegal, and Mali were universally distributed (Druilhe and Barreiro-Hurle, 2012; Liverpool-Tasie, 2012b). We focus here on the ‘market-smart’ subsidies, targeting small-scale farmers and promoting private sector development. Evidence shows that these subsidies have increased fertiliser use, average food crop yields and food crop production, but that their success depends on the context, and their design and implementation (Dorward and Kydd, 2005; Druilhe and Barreiro-Hurle, 2012; Chirwa and Dorward, 2013).

In this chapter I aim to analyse the design and implementation features of input subsidy programmes and how these affected the outcomes. I will first review five most prominent ‘market-smart’ input subsidy programmes in SSA (Malawi, Zambia, Ghana, Nigeria and Tanzania) on their historical developments, on their features of design and implementation and their outcomes. In the case of Tanzania, I will review the input subsidies prior to the current programme which will be the focus of my thesis and is explained in detail from the next chapter. Lastly, I will conclude with an overview of the challenges these programmes pose.

2-2. Overview of five ‘market-smart’ subsidy programmes in sub-Saharan Africa

2-2-1. Design and implementation of ‘market-smart’ input subsidies

In aiming to overcome the past deficiencies of input subsidies, ‘market-smart’ input subsidies generally have the following characteristics: 1) targeting small-scale, vulnerable farmers, who did not use inputs before but in theory would find it profitable to do so; 2) promoting private sector development, where the private sector procures and distributes inputs by using vouchers, providing matching grants and loan guarantees, etc.; 3) having an ‘exit’ strategy, because of their huge financial burden on governments and possible market distortion (Morris et al., 2007; Chirwa and Dorward, 2013; Jayne and Rashid, 2013). The use of vouchers emerged as a mechanism for simultaneously targeting subsidies and promoting the private sector, as well as tightening the relationship between input agro-dealers and the financial sector (Gregory, 2006). An overview of

several features of these programmes in five SSA countries under study is given in Table 1. As regards exit strategy, however, among the subsidy programmes studied, only that in Tanzania explicitly mentioned one, while other programmes did not and that in Ghana was implemented as a single-year programme.

As mentioned in the section 1-4-1, current subsidy programmes target eligible farmers, in most cases small-scale, but also those who achieve high marginal productivity. Such households do not necessarily constitute a homogenous group. Targeting small-scale, vulnerable farmers would increase the effectiveness of the programme by increasing input use, given that these farmers did not use inputs before the programme. However, as complementary inputs are not readily available, small-scale farmers would not have increased their productivity as much as if they had access to complementary inputs whereas wealthier ones would do better when they received inputs. Because of these different effects, the programme's targeted group becomes unclear.

Most of these programmes used decentralised targeting, through traditional authorities, local key stakeholders, voucher committees, or farmer cooperatives, etc. Use of local stakeholders' knowledge reduces administrative cost, and is common in various anti-poverty programmes (Grosh et al., 2008). In the case of Tanzania, voucher committees were established from national to village levels (World Bank, 2009a). This multi-sectoral arrangement encompassed the government, private sector and farmers' groups. Beneficiaries were selected at village level. The process was designed in such a way that the beneficiary candidates were selected at hamlet level, and the names were suggested to the village voucher committees, which were then compiled into lists and reported to the village assembly for discussion and approval.

Though targeting methods varied, all the programmes under study targeted small-scale farmers by either decentralised targeting or community targeting. However, studies suggest that leakage to wealthier farmers, elite capture and illicit behaviour were found in most of the countries (Chirwa and Dorward, 2013; Jayne and Rashid, 2013). In our case study in Tanzania, explained in detail in Chapter 4, and in other programmes, decentralised targeting using vouchers based on eligibility criteria – albeit ostensibly more cost-effective and a better way of targeting those in need – has often been subject to elite capture and fraud, and therefore does not work efficiently (Pan and Christiaensen, 2012). Liverpool-Tasie (2012a) suggests that social capital and intragroup dynamics were important in voucher allocation in analysing how the programme in Nigeria targeted farmer groups which would later distribute inputs among smallholder farmers. Female-headed households were prioritised in several countries, such as Malawi, Zambia and Tanzania. However, because of power relations in communities, the evidence in Malawi and the qualitative information in our study in Tanzania show that female-headed households had difficulty obtaining subsidised inputs (Chirwa et al., 2011a). An e-voucher system was piloted in Zambia and has been implemented in Nigeria in order to curb these problems.

The degree of the ‘market-smartness’ varied by contexts, that is, the nature of the relationship between public and private sectors, the geographical coverage of the private sector, and the policy orientation toward private sector development of the countries. The programme in Malawi used parastatal agencies for input distribution and retailing, with limited participation by private agents in order for mutual trust to be developed (Chirwa and Dorward, 2013). In Tanzania these activities were undertaken by the private sector, which promoted the development of a private input sector through the increased input demand created by subsidies (URT, 2014e). In Nigeria, after the inefficient history of the previous input subsidy programmes where the government controlled input procurement and delivery, the new programme left fertiliser procurement and delivery to the private sector (Liverpool-Tasie and Takeshima, 2013).

2-2-2. Effects and challenges of the ‘market-smart’ input subsidies

Studies suggest that most of the programmes brought about increased maize production and maize yields, when climatic and economic conditions were favourable. The studies reported that the programmes in Malawi, Nigeria, Tanzania and Zambia found increased maize productivity and output, and the first two also increased household income and reduced poverty (Xu et al., 2009b; Yawson et al., 2010; Awotide et al., 2013; URT, 2014e). Examining the field results of rice-producing farms in Ghana, Wiredu et al. (2015) suggest that the programme did increase land productivity, while reducing labour productivity, as increased labour, mostly from family, was demanded due to increased production.

Meanwhile, most of the programmes were found to be ineffective and inefficient, due to leakage to wealthier farmers and elite capture, late delivery of vouchers and inputs, and displacement of commercial input purchase. A study on political economy of the subsidy programme in Malawi suggests that ‘the threat of the political capture of the programme for short-term goals....is always imminent. ... The debates about FISP among technocrats are stymied by the preponderance of the political considerations about the programme’ (Chinsinga, 2012b: 2). The subsidy in Ghana suffered political influence in voucher distribution, whereby areas where the government leadership had political interest benefited preferentially (Banful, 2011). On displacement, using nationally representative panel data in Zambia, Xu et al. (2009a) suggest that the less developed the private sector, the more subsidies tend not to be displacing, as they create fertiliser demand. One solution for displacement could be e-vouchers, by which Nigeria is reported to have tripled fertiliser use per hectare from 2011 to 2013 (from 6.6 to 17.8 kg) (World Bank, 2015b), a performance that merits detailed study.

Studies suggest that input subsidies have had a wider impact on the economy through increased food crop production: a reduction in consumer food prices, which would benefit poor food consumers; an increase in rural agricultural wages; the expansion of input access; and the promotion of private sector development in rural areas (Druilhe and Barreiro-Hurle, 2012; Chirwa

and Dorward, 2013; Dorward and Chirwa, 2013). However, the benefit has varied with the nature of the subsidies and their context in the markets, as well as with the weather. Chirwa and Dorward (2013) suggest that the large scale of the programme in Malawi brought about a reduction in real maize prices, and that it promoted private sector development and agricultural growth. An informational spill-over effect was also observed in Tanzania (URT, 2014e).

The benefit-cost ratio in the overall economy was debated in the case of Malawi (Jayne et al., 2013; Dorward and Chirwa, 2015; Jayne et al., 2015) and the Zambian study reported a ratio of below one (Mason et al., 2013). A synthesis of recent studies on market-smart input subsidies suggests that programme costs outweigh the benefits. The production gains have been found to be limited due to low fertiliser use efficiency, diversion from intended beneficiaries, and displacement of previously commercial input use (Jayne and Rashid, 2013).

All the programmes found similar challenges of the previous subsidy programmes; such as improvements in targeting, an increase in the transparency of voucher distribution, better monitoring and evaluation, and timely delivery of vouchers. The programme in Tanzania found that the late redemption of vouchers by the National Micro-finance Bank caused reluctance among the agro-dealers to continue in the subsidy business. In the next section I will describe each country's experience in greater detail.

Table 1: Characteristics of five recent input subsidy programmes in sub-Saharan Africa

	Malawi	Zambia	Ghana	Nigeria	Tanzania
Programme	Farm Input Subsidy Programme	Farm Input Subsidy Programme	Fertiliser Subsidy Programme	Growth Enhancement Support Scheme	National Agricultural Input Voucher Scheme
Year implemented	2005/6 ~	2009 ~	2008 ~ 2013, 2015	2012 ~	2008/09 ~
Programme objectives	Improve resource-poor smallholder farmers' access to improved inputs in order to achieve household and national food self-sufficiency and raise incomes	Improve household and national food security, incomes, and accessibility to agricultural inputs by small-scale farmers	Enhance national food production and security	Promote fertiliser demand and private input sector	Reduce poverty and household food insecurity as well as achieve economic growth and national food security
Targeted crop	Maize, legume, and other cash crops (reverting to maize and legume only since 2009/10)	Maize	Maize or rice, and legume (soya bean)	Maize or rice	Maize or rice
Targeted beneficiaries	Smallholder farmers, with female-headed households a priority	Small-scale farmers (less than 5 ha)	Smallholder food crop farmers (maize, rice, sorghum and millet)	Smallholder farmers	Small-scale farmers (less than 1 ha. although this criterion was eliminated in 2010), able to pay for and use inputs with female-headed households as a priority
Beneficiary selection mechanism	Varied with time – through traditional authorities, varied stakeholders, village development committees, open meetings for allocation led by the Ministry of Agriculture and Food Security	Cooperative boards, extension officers, and local leaders are involved in selection	Extension officers	Farmer registration	Village voucher committee

Subsidy delivery	Coupons	Farmer cooperatives (piloted e-voucher)	Coupons	E-voucher through mobile phone	Voucher
Subsidised input package	50 kg of fertiliser + 2~4 kg of seeds	200 kg of fertiliser + 10 kg of maize	No standard package (Compound fertiliser + Urea)	100 kg of fertiliser + seeds	100 kg of fertiliser + 10 kg of seeds
Subsidy amount	About 64~93 per cent of input cost	About 50~75 per cent of input cost	About 50 per cent of input cost	About 40 per cent of input cost	About 50 per cent of input cost
Exit strategy	Not explicit	Scaling-down as the years go by	No – one-year programme	No	Three-year exit plan
Monitoring and evaluation system	Yes – numerous evaluation studies implemented (SOAS et al., 2008; Dorward et al., 2010)	Yes (Mason and Jayne, 2013)	Not reported	Not reported	Yes – there was monitoring system and impact evaluation conducted (Patel, 2011; URT, 2014)
Private sector development	Yes, but limited; the private sector has been involved in parallel with parastatal distribution and retailing (Chirwa and Dorward, 2013)	Yes, but limited to a few contracted retailers. Concerns were raised that the programme discouraged private participation (Mason et al., 2013)	Yes, but limited to big input supplier companies, which reduced competition and sales by smaller retailers (Benin et al., 2013)	Yes (Lenis Saweda O. et al., 2013)	Yes. In some cases small agro-dealers could not deliver the inputs, and big retailers tended to be assigned for delivery by district government.

Source: Author

2-3. Case study countries

2-3-1. Malawi

The majority of Malawian farmers are smallholders. According to the Integrated Household Survey carried out in 2011/12, farmers in Malawi had an average of 1.4 ha. of land for cultivation, and about 70 per cent of the land was dedicated to maize. About a third of the population had very low food security (Republic of Malawi, 2012). As in other African countries, since independence credit programmes have delivered fertiliser and hybrid maize seeds to small-scale farmers. Since the 1980s, production of maize, which is the main food crop in Malawi, has rested upon subsidies for hybrid maize. As the Structural Adjustment Programme came in, the smallholder agricultural credit programme collapsed in 1994. With lack of access to inputs, farm productivity dropped as landholdings grew smaller due to population pressure, and maize became the dominant crop (Blackie and Mann, 2005). In the early 1990s, Malawian smallholder farmers faced high food insecurity and threats of drought. Furthermore, there was an influx of refugees from civil war in Mozambique. This combination of challenges was exacerbated by the lack of access to inputs due to the removal of subsidies, the collapse of credit for inputs and an increase in input prices. Liberalisation policies seemed to bring little benefit but more costs. Fearing shortages, the government's Food Security and Nutrition Unit developed a projection of maize production which indicated that there would indeed be a serious food deficit. Donors were persuaded by this projection to introduce the free distribution of hybrid seeds and fertilisers in 1994/95. Agricultural research was conducted into 1,700 farm field trials over five years to obtain the most adequate seed and fertilisers, as well as identify optimum legume rotations. Backed by political support across the government and technical assistance, the 'Starter Pack' programme came into being.

The 'Starter Pack', targeting smallholder farmers but covering the whole country, was followed by the 'Targeted Input Programme' which was smaller in scale, targeted vulnerable households and was designed as a social protection programme. After an extreme drought that seriously reduced agricultural productivity, the government of President Mutharika, in line with its election promise, launched FISP in 2004/05 by increasing the amount of subsidised inputs, and introducing voucher delivery with the participation of the private sector, the so-called 'market-smart' subsidy. The programme objective was to increase smallholder agricultural productivity and food sufficiency, and reduce vulnerability to hunger and food insecurity (Minde et al., 2008).

In its initial couple of years, specifically from 2005/06 to 2007/08, FISP had a positive impact on maize production and productivity. The School of Oriental and African Studies et al. (2008) reviewed the existing studies and concluded that increases of 12, 15, and 18 kg of maize harvest per kg used of nitrogenous fertiliser were reasonable estimates of the responses of local (traditional), open-pollinated varieties (OPV) and hybrid varieties respectively, under reasonable farmer management. Further gains of 100 kg and 200 kg per ha. for OPV and hybrid varieties were made over local varieties without applying fertiliser. Other studies suggest that the receipt

of subsidized fertiliser had a statistically significant positive impact on food consumption (Holden and Lunduka, 2010; Chirwa et al., 2011a). Holden and Lunduka (ibid.) suggest that 66 per cent of households reported improved household food security from receiving subsidies and 30 per cent of households reported that the receipt of subsidies increased maize consumption.

As regards the impact on income poverty, Dorward and Chirwa (2013) suggest on the basis of informal rural economy modelling⁶ that the receipt of subsidies increased the household income of all households in the Shire Highlands by 7 per cent, with lower gains (around 4 per cent) in the less poor Kasungu-Lilongwe Plains area. This corroborates the improvement of subjective well-being due to receipt of subsidies found by Chirwa (2011a), which suggests that by using indicators for subjective well-being, the mean value increased from 1.66 in 2004/05 to 2.34⁷ in 2011/12.

As to the wider impact on the economy, several studies using computable general equilibrium (CGE) and partial equilibrium models suggest that increased maize production due to the increased input use from FISP lowered maize prices. Dorward and Chirwa (2013) suggest that an aggregate production increase led to lower maize prices, by which median prices fell by from 8 per cent to 40 per cent in different scenarios. Increased labour demand due to the increased input use raised rural agricultural wages. The School of Oriental and African Studies (2008) report that median daily wage rates rose by 33 per cent from 2005/06 to 2006/07, which corroborates results from focus group discussions and key informant interviews. Chirwa et al. (2011a) find that nominal wages have increased since 2009. Coupled with falling maize prices, this implies that the real wage rate has increased. Ricker-Gilbert (2011) finds a large contraction in the labour supply from 2006/07 to 2008/09, from which the increase in wage rate would be expected. The reduction in maize prices and the rise in wage rates increased maize purchasing power by 47 per cent between January 2009 and January 2010 (Chirwa and Dorward, 2013: 156).

Using data from the 2011/12 Integrated Household Survey, Chirwa and Dorward (2013) suggest that there was some displacement of commercial fertiliser by subsidy recipient households from 2009/10 to 2010/11; this was also due to the substantial increase in input prices during that period. Ricker-Gilbert et al. (2011) find that the displacement rate was 22 per cent on average, with a higher rate for non-poor households (30 per cent) than for poor households (18 per cent), by allowing for changes in the price of fertiliser and maize or tobacco. Displacement of seeds was reported to be higher by Mason and Ricker-Gilbert (2011: 19), who found a 56 per cent displacement of seeds from 2006/07 to 2008/09 from nationally representative Agricultural Input Support Surveys. With this displacement, Chirwa and Dorward (2013) suggest that in the short term the subsidy had a negative effect on the input market, but due to the increased demand for

⁶ The model of household and rural economy modelling, which is developed by simulating standard household/livelihood model structures and aggregating them in the rural maize and labour markets.

⁷ Household's own valuation of the level of overall satisfaction with life ranging from 1 as the poorest, 6 as the richest.

inputs brought about by subsidies in the medium to long term they appear to have been catalytic in raising demand for inputs.

2-3-2. Zambia

Since the introduction of the Structural Adjustment Programme, various fertiliser subsidy programmes have been implemented: the Fertiliser Credit Programme starting in 1997 which targeted small-scale farmers; the Food Security Pack Programme, a 100 per cent grant to 'empower ... households to be self-sustaining'; the Fertiliser Support Programme which has had large-scale coverage of the country since 2002/03 and was enabled by donors' support for the General Budget Support, as well as the price boom in copper and other commodities; and the Farmer Input Support Programme since 2009/10, in which the content of the input pack was halved to 200 kg of fertiliser and 10 kg of hybrid maize seed (Mason et al., 2013). Existing studies suggest that 90 per cent of the subsidy budget was going to the Farmer Input Support Programme, with the rest going to the Food Security Pack Programme.

Although it operates on a smaller scale, the Food Security Pack has similar characteristics to a 'market-smart' subsidy. It provides inputs for 0.25 ha. of production of maize, cassava or sweet potato, and of legume. It is designed to optimise the natural soil balance and fulfil the food requirements of resource-poor households (Jorgensen and Loudjeva, 2005). To improve sustainability, the packs are provided free in the first year of receipt, but after the first couple of years farmers are expected to pay 50 per cent of the value in kind after harvest, with the proceeds partly stored to ensure food security and partly sold to finance public works (ibid.). Pack distribution is managed by a NGO, which selects the geographical area in which the local committee established for the programme selects the beneficiary farmers. However, targeting has been often affected by elite capture and by the widespread splitting and sharing of packs (ibid.).

The Fertiliser Support Programme started in 2002 and operated on an increasingly large scale, its beneficiaries rising from 120,000 to 500,000 farmers in 2009/10. Fertiliser support programme renamed Farmer Input Support Programme since 2009, with the contents of the programme remained the same. The subsidy value rose from 50 per cent to 75 per cent of input costs. The fertiliser was procured by contracted private suppliers and distributed through cooperatives. The objective of the programme changed over time. At first, it aimed to assist smallholders to access inputs in remote areas where the private sector does not operate. Later, private sector market and service expansion were stressed as objectives. The beneficiary criteria are having at least 1 ~ 5 ha. of land and the capacity to cultivate maize and other crops on that area. It has been claimed that these criteria exclude the poorest farmers who own less than 1 ha. (40 per cent of total farmers (Weber, 2008) cited by (Minde et al., 2008)). Minde et al. (ibid.) find that from 2003/04 to 2007/08 the programme targeted wealthier farmers. However, they find that small farmers, with 1.7–5 ha. of the land, had the biggest marginal productivity. The

displacement of previously purchased inputs was found more among large-scale farmers than smallholder farmers.

Studies find that the receipt of the subsidy had a positive significant impact on the fertiliser application rate, the maize area planted, yields and output (Xu et al., 2009b; Mason et al., 2013). However, Xu et al. (2009b) suggest that farmers in Zambia may lack incentives to purchase commercial fertilisers even when they have capacity to do so. There was a positive spill over effect on the yields and output of other crops, although the size of the impact was less than half that on maize (Mason et al., 2013: 623). The cultivation of maize was expanded into areas previously left fallow, which goes against conventional wisdom in Zambia. One kg increase in subsidized fertiliser raises maize production by 1.88 kg on average (Mason et al., 2013: 624). The relatively low response rate to input use was explained by the crowding out of previously purchased inputs, high level of soil acidity, and late delivery of vouchers.

Existing studies suggest that the benefit from receiving fertiliser does not outweigh the cost of the programme (Mason et al., 2013; Mason and Smale, 2013). The benefit-cost ratio from receiving the seed component of the programme cannot be discerned from the existing studies⁸. These studies thus raise concerns about the effectiveness of the programme.

2-3-3. Ghana

Prior to the Structural Adjustment Programme which was launched in 1983, the Ghanaian government operated several subsidy programmes, including agricultural inputs such as fertilisers and seeds. However, there were problems of late delivery, delivery of insufficient amount and inappropriate fertilisers, leakage to unintended beneficiaries, rent-seeking behaviours and political manipulation, as seen in other SSA countries.

In order to curb the negative effects from the food and input price crisis in 2008, the Ghanaian government launched a fertiliser subsidy programme. The programme adopted the 'best practice' of the market-smart subsidy (Banful, 2010): farmers received region-specific or fertiliser-specific vouchers with which they could buy fertilisers if agents accepted the vouchers. Vouchers were then redeemed by the Ministry of Food and Agriculture via a fertiliser importer. However, it was revealed that only 11 per cent of retailers had links with fertiliser importers, which limited the number of retailers participating in the programme. Only 30 per cent of the retailers participated, some of whom did not have links to the importers and therefore asked for redemption through the other retailers. Furthermore, the concentration of retailers who had links to retailers coincided with the concentration of the input supply network, which undermined

⁸ Although Mason et al. (2013) suggest that Mason and Smale (2013) find that the benefit of receiving subsidised maize seed outweighs the cost, the author cannot find the evidence to prove this assertion.

competition among input suppliers and allowed for price collusion, etc.

Banful (2010) also suggests that in 2008, an election year, voucher distribution was politically manipulated: more vouchers were distributed to the regions which had supported opposition parties in the previous election. It was implemented as a one-year programme, but has continued every year, except for 2014, being revived again in 2015. Yawson et al. (2010) find that there were challenges in the improvement of the distribution of coupons and fertilisers to ensure the higher effectiveness of fertilisers, and that price and non-price factors constrained farmers in participating in the programme, leading to few farmers actually benefitting from it.

2-3-4. Nigeria

Nigeria is the most populous country in Africa (177.5 million in 2014) and since the 1960s petroleum has accounted for a major part (75 per cent) of government revenues (World Bank, 2015b). Nigeria is one of the few countries in SSA which produces nitrogenous and phosphorous fertilisers (Mogues et al., 2008). Due to its size, Nigeria alone accounted for 23 per cent of fertiliser consumption in sub-Saharan Africa in 2008/09 (Groot, 2009). Most of the population is engaged in agriculture, whose productivity is still low. One of the reasons for this low productivity is that fertiliser use has remained limited (17.8 kg per ha.) (World Bank, 2015b). Banful et al. (2010) suggest that this low use of fertiliser was not because farmers could not afford it or lacked knowledge about its use, but because the government's village extension agents, the main input providers to the farmers, have few staff, and lack knowledge about fertilisers and improved seeds.

Nigeria started its large-scale fertiliser subsidy programme in the 1970s in order to increase agricultural productivity and improve food security. The level of subsidy was high, reaching 86 per cent of the market price for Urea in 1992 (Mogues et al., 2008); however, there were reports of a high percentage of diversion from the intended beneficiaries, late delivery and low quality (Nagy and Edun, 2002; Banful and Olayide, 2010).

The government continued to procure and distribute subsidised fertilizers up to 2011. From the 1980s to 1996, fertiliser procurement and distribution were exclusively conducted by the federal government. Pan-territorial prices were set; that is, each type of fertiliser was sold at the same price throughout the country. Following many years of poor performance and an unsustainably high fiscal cost, fertiliser markets were partially liberalised in 1996 when a few private companies entered the market and the subsidies were shared between federal and state governments (Mogues et al., 2008). However, federal government is still responsible for most of the country's fertiliser procurement and distribution and different states apply different amounts to the subsidy so that the subsidy component in their retail price varies throughout the country. During the period between 2001 and 2005, fertiliser subsidies accounted for 42 per cent of total federal capital spending on agriculture (ibid.).

A pilot programme using a paper voucher system was conducted from 2009 to 2011. A

study of two regions found that beneficiaries tended to be poorer and that there was a crowd-in effect whereby the recipient farmers bought more private inputs than before (Liverpool-Tasie (2012b). The new government launched the Agricultural Transformation Agenda in 2012. This includes the Growth-Enhancement Support Scheme, which aims to provide subsidy to a targeted 5 million farmers each year over four years by using e-vouchers through mobile phones across the whole country. Procurement and distribution were shifted to the private sector (Federal Ministry of Agriculture and Rural Development, 2015). The programme seemed to bring about a steep increase in fertiliser use per ha., and it was reported that the targeting of poor farmers had succeeded in reducing leakages during distribution (Liverpool-Tasie and Takeshima, 2013).

2-3-5. Tanzania

Tanzanian food policy has evolved around the principle that staple food was situated among 'strategic commodities' and that people recognised that the access to their own food was one of their 'natural rights' (Bryceson, 1993: 3). In 1967, Tanzania announced that it was adopting African socialism in the Arusha Declaration. Since the early 1970s, villagisation started to facilitate the distribution of productive and social service infrastructure, including providing inputs such as tractors and fertilisers to the *ujamaa* villages to which people were forced to migrate. Fertiliser importation and marketing has been monopolised by the government.

Farmers in the Southern Highlands, traditionally the 'bread-basket' region of the country, including the Ruvuma region, benefitted from fertiliser subsidies from 1973 to 1983 and the pan-territorial maize pricing of the National Maize Corporation (NMC). In 1973/74, the National Maize Production Programme started to provide free improved inputs to 13 regions using cooperatives as distribution agents. This was followed by the National Maize Project, providing the input packages, targeting suitable maize-growing areas in 10 regions in 1975 and financed by the World Bank. This programme initially offered a 50 per cent subsidy to be reduced over time. With the low repayment rate made, the programme coverage was reduced to the six most suitable regions for maize production, and loan interest was introduced. At the completion of the programme in 1982, about 50 per cent of the loans and interest provided during the period were found to be unpaid. However, a visible positive impact was seen in Ruvuma, Mbeya and Rukwa, where marketed maize more than doubled. The 'Big Four' regions (Iringa, Mbeya, Ruvuma, and Rukwa) benefitted from the programme, having received 59 per cent of countrywide distribution, and became the NMC's main supply areas.

However, because of corruption, frequent delays in delivery and fertiliser shortages the subsidy was not effective (Minot, 2009). Due to the adverse effects of drought in 1971/72, an oil price shock in 1973 and more droughts in 1974, the country faced food insecurity. Within the agriculture sector, the volume of exports decreased substantially, accompanied by deteriorating terms of trade resulting in a decline in export revenue (Wangwe, 1987). Due to the economic

crisis since 1983, liberalisation of the agricultural market began, including the liberalisation of the input market and the phase-out of fertiliser subsidies by 1994. Cooksey (2012) suggests that there was only modest effect on maize yields for there was previous low input use and inefficient use of fertilisers even during the period of subsidies.

In 2000/01, Tanzania developed its Poverty Reduction Strategy as a condition of receiving aid cancellation under the Highly-Indebted Poor Countries (HIPC) Initiative. It also started to receive General Budget Support, which enabled the government to have financial liquidity. In 2003/04, the Tanzanian government reintroduced input transport subsidies which provide subsidies to transport companies for delivering certain amount of inputs to the villages to promote the adoption of technology. The reintroduction of subsidies was met with deep concerns by donors, civil society and researchers because of the history of inefficiency and ineffectiveness. It was later found that the intended amount of subsidised inputs was not delivered to the villages, due to the misbehaviour of the contractors. The programme was therefore gradually scaled down by the year 2007.

Ex-parastatal agencies such as the Tanzania Fertilizer Company (TFC) may sometimes be given a special mandate by the government in times of crisis such as drought. For example, in early 2008 when input prices rose sharply, the government asked the TFC to buy Urea at a high price in order to meet demand. Later that year input prices declined sharply, so the TFC could not compete with other input supplier companies who purchased inputs more cheaply after the crisis ended. The TFC therefore took out a substantial loan from the banks for that year, which they were still repaying at the time of my research at the end of 2012.

In the face of the food and input price crisis, the Tanzanian government approached donors for a project to curb the risk of food insecurity, especially that of vulnerable people, to which the World Bank responded in 2009 with the introduction of a 'market-smart' subsidy, the National Agricultural Input Voucher Scheme (NAIVS). The NAIVS aims for national and household food security by targeting small-scale farmers, learning from the successful experiences in Malawi. The details of the programme design and implementation are explained and discussed from Chapter 4 to Chapter 8.

2-4. Conclusion

In this chapter, I first reviewed the history of input subsidies of SSA: how some SSA countries have reintroduced input subsidies after the Structural Adjustment Programmes and later adopted 'market-smart' subsidies. Input subsidies were first removed during the Structural Adjustment Programme because they were very inefficient: as they were expensive, suffered high leakage to wealthier farmers, caused market distortion, and were relatively ineffective, providing low increase in yields and low or even negative benefit-cost ratios. However, in the liberalised markets, farmers, especially small-scale poorer farmers, were struggling to access inputs at full market

prices. This difficulty was exacerbated by market failures, as markets tended to be thin and fragmented in rural areas. Meanwhile, in Zambia, due to the frequent severe droughts and threats to food insecurity, input subsidies continued even during the periods of structural adjustment. Also due to the food security concern and for intention to buy political support from farmers, SSA governments reintroduced the input subsidy programmes. From the reported success of Malawi's FISP many SSA countries adopted 'market-smart' subsidies, which was facilitated by the debt cancellation under HIPC initiatives and the discretionary funds made available from General Budget Support. At least eight SSA governments have adopted 'market-smart' subsidies since then, and since the food and input price crisis in 2008, donors have started to support them.

Secondly, I reviewed the features of design and implementation of these programmes, how these affected the outcomes and the challenges to improvement. These programmes were reported to be generally successful in achieving increased input use, maize production, maize yields and food security under favourable economic and weather conditions, and in promoting private rural input business. A fall in maize prices and an increase in local agricultural wages were also reported in Malawi and our study in the Ruvuma region, which would benefit labour-surplus smallholder farmer households (Chirwa and Dorward, 2013). However, studies reported that unclear programme objectives and the various implementation problems prevented the programme from being effective and efficient.

A challenge exists to make clear the programme objectives, whether these are higher national food crop production for national food security, or the increased use of inputs by poor, small-scale farmers for household-level food security. In the programmes recently implemented, these two objectives run alongside each other, but are often contradictory. Which objective would increase marginal productivity more significantly would differ from case to case. However, in order to raise its effectiveness, each programme should clearly state its primary objective and have an adequate design and implementation plan to achieve it.

Chapter 3. Analytical Framework and Research Methodology

3-1. Introduction

‘Development interventions deliver inputs or resources through a process or modality that generates outcomes leading to short- and long-term impacts, some intended, others unforeseen’ (Devereux and Roelen, 2015: 150). The National Agricultural Input Voucher (NAIVS) programme is based on a theory of change as it wants to bring expected changes to outcomes and people’s attitudes. Theory of change is ‘a comprehensive description and illustration on how and why a desired change is expected to happen in a particular context’ (Center for Theory of Change, 2015). However, the input subsidy programmes often do not work as intended, due to unforeseen causes and the socio-economic and political power relations between actors. Conversely, the programme effects changes in socio-political relations among actors. An actor-oriented approach (Long, 1990) which was adopted to analyse the social and political relations of the actors related to the development project could be applied to the analysis of the input subsidy programmes.

In this chapter, I will first present the analytical framework of NAIVS’ theory of change by using economic theories. After that, I will present the analytical framework of how NAIVS affected social relations using an actor-oriented approach, as the provision of inputs influenced the different agencies to interact with each other, and changed social relations. This change of relations also affected the impact of NAIVS on various aspects. In order to answer the research question stated in Chapter 1, I will then explain the research methodology and the reasons for using mixed methods, followed by a description of the challenges experienced in the fieldwork.

3-2. Analytical framework

3-2-1. Theory of change of NAIVS

The theory of change of NAIVS was developed by referring to the existing studies on input subsidy programmes, including those by Chirwa and Dorward (2013), Ellis et al. (2009), several studies on the impact of Malawi’s programme (Chibwana et al., 2011; Holden and Lunduka, 2011; Lunduka et al., 2013), and Devereux and Roelen (2015) (Figure 2). It is developed based on economic theories and programme processes. The hypothesis of the framework is as follows: if farmers receive and use subsidised inputs, they will increase maize / rice yields⁹ and production, which will then enable them to increase crop income and reduce income poverty. The subsidy for improved inputs (fertilisers and improved seeds) is provided as ‘inputs’ of the programme.

⁹ As the programme targets mainly maize, hereafter it refers to maize.

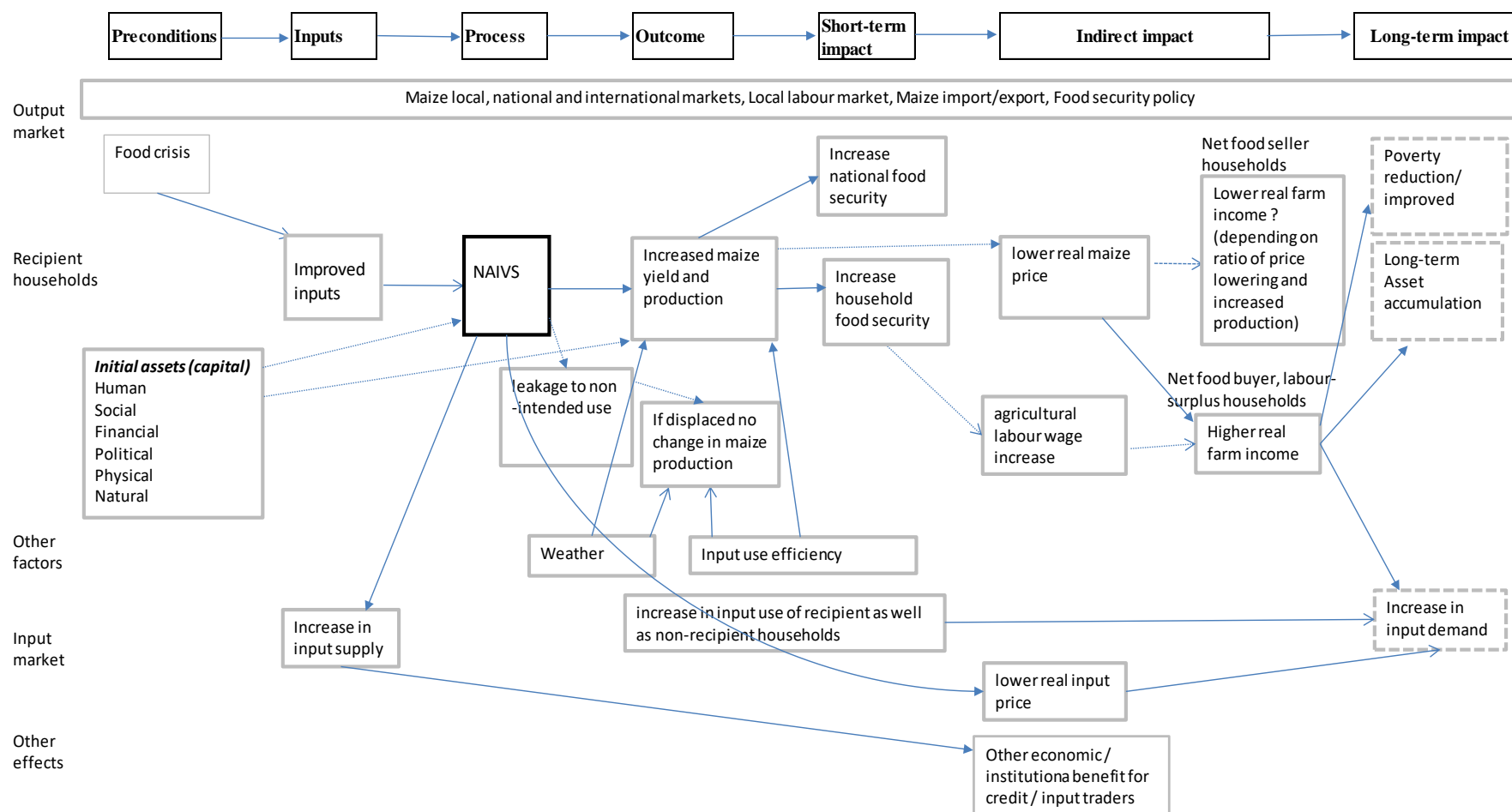


Figure 2: Theory of Change of NAIVS

Source: Author

The preconditions for the programme are based on the six capitals (human, social, financial, political, physical and natural), which are the important measurements of how the households have access to the programme and how it achieves the intended outcomes. The impact of the programme is determined by the process, that is, how it is designed and implemented. The outcome is the increase in maize yields and production. If maize yields and production are increased through the increased use of improved inputs, national and household food security are achieved as short-term impacts as long as weather and other economic conditions do not much change. As indirect impacts, the real maize producer price will become lower due to the increased maize production in the region; and agricultural wages will be higher because of the increased labour demand created by increased maize production. This makes a lower or higher real farm income for the net food-seller households, depending on the ratio of increased production and reduction of price, while it gives a higher real farm income for the net food-buyer, labour-surplus households. And net food-seller labour-surplus households will benefit from increased maize production, lower real input prices and the higher agricultural real wage. If the programme continues in the long run, assets will accumulate. All these would be affected by the weather conditions, the input/output crop markets, food security policies and programmes and maize imports/exports.

After three years of voucher receipt, recipient households may accumulate enough income to purchase commercial inputs and can then 'exit' the programme so that they continuously purchase inputs (fertilisers and improved seeds) by themselves. However, in order to achieve increased production, good agronomic practices and good weather (i.e., regular rainfall), stable input / output market prices, and sound food security policies such as trade policies and various taxes on crop marketing are required. Meanwhile, the programme might cause recipient households to focus on maize cropping, and cropping the same crop might in turn make them more vulnerable to weather shocks or soil degradation.

As regards input use, in the less developed countries where the input use is low, the provision of subsidised inputs increased the input supply in the area. Although the programme increased input demand, its demand response was slower than the increased input supply brought about by the programme. This lowered the real input prices. The lower input price will bring benefits to the non-recipients as well and promotes spill-over effect. The programme also promotes private input business in rural areas due to increased demand: given the lower real input prices and greater knowledge of the positive effect of inputs on increase in yields, the recipient households will take up subsidised / commercial inputs in the next season.

There are, however, conditions to achieve the realisation of each step of this hypothesis. As process factors, unless the subsidy recipients are initially poor and did not previously use the improved inputs, the programme may bring about a displacement of commercial input purchase

and thus increased maize yields may not be achieved. Furthermore, if some subsidies are sold/given to better-off farmers or to the agro-dealers without being used for input sales, then maize yields may not increase. Studies on input subsidies (Morris et al., 2007; Chirwa and Dorward, 2013; Jayne and Rashid, 2013) suggest that the programmes were ineffective because of displacement, fraud and elite capture in voucher distribution.

From outcomes to short-term impacts, household food security through increased maize yields and production also depends on the production of other crops, crop market prices and non-farm income. Under the liberalised open market, the price at which maize producers sell their crop may depend on international maize prices. Agricultural wages depend on weather and other economic conditions. The hypothesised long-term asset accumulation would therefore also depend on various factors, including economic and weather conditions, other crops' markets, non-farm opportunities, etc.

Measuring income poverty reflects the volatility of income/consumption; meanwhile, illiteracy, stunting, and other indicators of access to assets provide more insight into the past (Howe and McKay, 2007). I will therefore assess the change not only in household consumption, but also in household assets, which is mostly correlated to household consumption in Household Budget Survey in Tanzania, according to the Poverty Score Card for Tanzania (Shreiner, 2013). This takes into account such items as ownership of tables, radio, a bicycle/motor bike/vehicle and a modern roof. As regards household assets, as sending children to school is an important measurement for inter-generational poverty, and since I heard in the villages that there are many financial obstacles preventing poor farmers from doing so, I measure the change in their capability for sending school-age children (aged 6 – 17 years) to school.

The capitals listed above also imply the power to act and reproduce, and challenge or change the rules that govern the control, use and transformation of resources (Bebbington, 1999). The framework in the next section incorporates the analysis of the social, economic and political relationships that create poverty and wealth. With a lack of effective public and private institutions in rural areas, informal networks using their social capital are an important mechanism through which households and individuals can access resources.

3-2-2. Analytical framework for NAIVS's social relations

Figure 3 shows how NAIVS affected and was affected by social relations. The framework is based on the actor-oriented approach, where 'agencies' interact with each other. The notion of agency 'attributes to the individual actors the capacity to process social experience and to devise ways of coping with life, even under the most extreme forms of coercion' (Long, 1990: 8), and has what Giddens (1979) calls a 'transformative capability' from bottom-up. I use this approach for the analytical framework firstly because actors interact with each other and reshape social relations due to the programme implementation; and secondly because I am looking at the impact of the

programme on small-scale, normally powerless, farmers and this approach provides a social and political context to look at development programmes (Biggs and Matsaert, 2014). Devereux and Roelen (2015) suggest that the impact of development programmes in general is affected by social relations, and that, conversely, it affects social relations. This dynamic impinges on the impacts, and thus in examining the impact of the programme, an accompanying analysis of social relations is necessary.

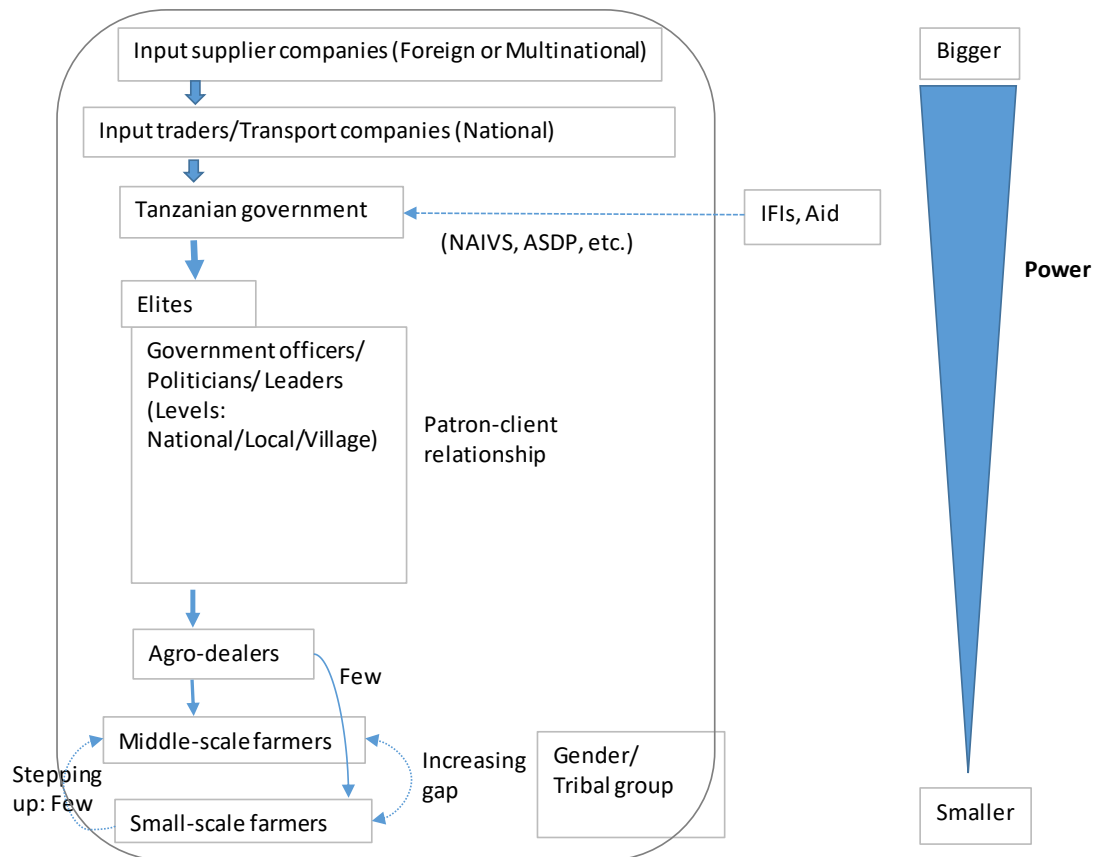


Figure 3: Analytical framework: NAIVS's impact on social relations

Note: Straight arrow: Input flow

Dotted line: Relationship

Width of arrows: Bolder the stronger the relationship

IFIs: International Financial Institutions

ASDP: Agricultural Sector Development Programme

Source: Author

The power of agency is referred to 'as a resource drawn upon by agents in the production and reproduction of interaction to the structural characteristics of society' (Giddens, 1979: 257). In the neo-liberal market regimes, relatively few foreign and multinational companies have had strong power on setting prices without enough competition, with relatively few companies engaged in producing fertilisers (Hernandez and Torero, 2011). Meanwhile, middle-scale and small-scale farmers have had the least power and been on the lowest rung of the ladder of the

political economy (Bernstein, 2010). By modelling agricultural policies Brooks et al. (2008) also found that input supplier companies have most of the benefit which does not go down to the farmers. NAIVS has impacted on the social relations of related actors as described below.

The World Bank supported the Tanzanian Government in formulating, designing and implementing NAIVS and Tanzania Social Action Fund (TASAF), other poverty-eradicating intervention, which supports vulnerable communities in such ways as constructing irrigation facilities and providing credit to poor and vulnerable households. Other aid agencies supported the government with the Agricultural Sector Development Programme (ASDP), which complements the NAIVS programme by strengthening the capacities of district governments, strengthening extension services and encouraging productivity through constructing irrigation facilities, and commercialisation. Under NAIVS, foreign, sometimes multinational input supplier companies sell inputs to national input traders, where transport companies transport them to the regions.

The NAIVS programme document suggests that fertiliser prices would rise as the economic situation revives and fuel prices rise, and due to the lagging expansion capacities for fertiliser production (World Bank, 2009a: 8, 41). In the international fertiliser market, a few countries, and a few companies within those countries, occupy a major market share and can thus raise input prices. For Urea, to give one example, the top five producing countries have 60 per cent of the market share, and the top four firms occupy more than 50 per cent in most of these countries (Hernandez and Torero, 2013). This price-setting process and rising input prices in the international market runs through the elites: government bureaucrats; politicians at national and local levels, and village elites and the agro-dealers assigned for input deliveries. Among the former there is a patron-client relationship (Fjeldstad et al., 2003; Cooksey, 2012), whereby the ex-tribal chief or higher level politicians command power over their subordinates, who promise support in return for vouchers.

Among farmers, wealthier farmers obtain most of the subsidised inputs because of affordability and their social and political power while small-scale farmers can't afford. Female farmers and those belonging to less powerful tribal groups tend to be left out of the programme's benefits. The strong power of foreign input supplier companies and the subsequent actors in the input supply chain to NAIVS was assured by the increase in the demand for inputs which the programme itself brought about, and the concentration of global input suppliers. Meanwhile, elite capture and the targeting of middle-scale farmers excluded small-scale farmers, increasing the gap between the two groups. It thus increased the inequality of socio-economic power between every rung of the ladder from foreign input suppliers to small-scale farmers (Figure 3).

The existing studies suggest an inequality of power among actors in the programme. In his study of NAIVS, Cooksey suggests that 'a concerted attempt by higher levels of the administration to curb abuses of the inputs distribution system at lower levels (...) might serve to

reduce the number of beneficiaries and increase the frustration of those left out' (Cooksey, 2012: 19). This indicates that a high ratio of vouchers is retained by the higher cadre of government, reducing the number of vouchers reaching the farmers. Having collected opinions from various parts of the country, the MKUKUTA (Swahili acronym for National Strategy for Growth and Reduction of Poverty) Monitoring System (2007) similarly reported that farmers mentioned that the least poor benefitted from the government's supply of fertilisers and seeds.

In the villages, the implementation of NAIVS also affected social relations between recipients and non-recipients, village leaders and farmers, male-heads and female-heads of households, and older-heads and younger-heads of households. NAIVS was designed to target small-scale farmers for three consecutive years. These intended recipients might then be in a position to change power relationships. However, it would provoke jealousy among poor recipient farmers, and tension between recipients and non-recipients. Furthermore, if village leaders limited the distribution of vouchers to only a few of their friends for all three years, farmers would know of this and the fraud would incite their jealousy or anger. NAIVS targeted female-headed households as a priority because they are normally poor and vulnerable. However, given that it operated in a patriarchal society where discrimination against female-headed households is so obvious that women do not even have access to land, giving subsidies to female-headed households might provoke jealousy or even anger among poor male-, or even all male-, household heads, which might prevent the female-headed households benefitting from the programme.

NAIVS targeted vulnerable households, including elderly-household heads. As seen in the salutation towards the elderly in Tanzania, which is 'shikamoo' ('Hello' to elderly in Swahili), the elderly are respected in Tanzanian culture. However, they cannot work as hard as younger people as they tend not to be healthy or mobile, and they farm in a more conservative style and tend not to be willing to take modern technology and thus tend to be poor. They tend to have more household members who support them, but when they receive subsidies as they have less physical capacity and knowledge on inputs, they might therefore give the inputs to their children, or the children might receive vouchers and return to the elderly members with a harvest. If elderly recipients give subsidised inputs to siblings they maintain power in the households but the children who actually cultivate the harvest might do all the decision-making. I will use panel survey and key-informant interviews to investigate these issues.

3-3. Reason for using mixed methods

In the last decade, the mixed-methods approach has received flourishing attention in practising social research, especially as regards poverty analysis (Kanbur, 2001; Shaffer, 2013; Roelen and Camfield, 2015). Various journals on the topic have emerged, including the *Journal of Mixed Method Research* and the *International Journal of Multiple Research Approaches*; and the *Handbook of Mixed Methods in Social and Behavioural Research* (Tashakkori and Teddlé, 2003)

have been published. ‘Triangulation’ is the widely-cited rationale for a multi-method approach (Denzin, 1989). Although combining approaches does not ensure validity, it examines different aspects of the same problem (Brannen, 2009), it can produce a fuller, more multidimensional account of social phenomena (Fielding and Fielding, 1986), and give both depth and breadth to research findings by drawing upon the different strengths of various applications (Fahmy et al., 2015).

Several studies (Chirwa and Dorward, 2013; Jayne et al., 2013; Jayne and Rashid, 2013) suggest that the subsidy programmes in SSA in general were flawed by elite capture and a lack of implementation capacity. A mixed- method investigation is required in order to see how the vouchers were distributed, which might have affected the impact of the programme. Mixed methods could provide detailed contextual information as to why and how the expected hypothesis on the theory of change was not borne out, such as why and how small-scale farmers did not get vouchers; why and how maize yields and / or input use by farmers did or did not increase; how household food security was or was not achieved, etc.

Mixed methods could also provide information on the social and political relations of actors related to the programme, which will shed light on social dynamics. These social and political relations might have been affected by the programme but they are also key in explaining the programme’s impacts (Devereux and Roelen, 2015).

3-4. Research methodology

My research uses mixed methods and is both qualitative and quantitative. Firstly, I conducted qualitative interviews, namely key-informant interviews, farmer group discussions and village meetings to explore the context of the voucher programme and its management. Secondly, I conducted a panel survey of four rounds, based on the panel data of three rounds (in 2004, 2005, and 2009), which had been developed by the World Bank¹⁰, to which I added one round (in 2013) of panel data. I revised and added to the original panel survey questionnaires developed by World Bank, especially in the input voucher section. Other quantitative data was then collected from the government and other sources. I combined the findings of all these methods, giving equal importance to each, to investigate the causal relations of the impacts of the programme, as well as to analyse changes in social and political relations.

3-4-1. Qualitative research

My qualitative data consisted of 113 semi-structured key-informant interviews, four farmer group

¹⁰ World Bank ‘Household vulnerability panel’ (Christiaensen, L. and Sarris, A. (2007a) *Household Vulnerability and Insurance Against Commodity Risk: Evidence from Rural Tanzania*, Vol. FAO Commodities and Trade Technical Paper No. 10.)

discussions, five Village Voucher Committee (VVC) member group interviews, and ten extensive village meetings, which was undertaken mainly in Songea district, Mbinga, and, to a lesser extent, in Tunduru and Namtumbo, the latter two were in charge of another supervisor in the survey who provided information on field notes and observations (Appendix 1). Key informants are MAFC officers (9 interviews), village chairman (22 interviews), farmers (15 interviews), village/ward executive officers (14 interviews), VVC members (13 interviews), village/ward agricultural extension officers (12 interviews), agro-dealers (7 interviews), private companies/agencies (6 interviews), local government agriculture officers (4 interviews), international organisation officers (3 interviews), NGOs (3 interviews), University professors (2 interviews), local government officer (1 interview), and a farmer association official (1 interview). The research topics were the participants' knowledge, experiences, evaluation and opinions of the programme, and voucher distribution and management (Appendix 2). I organised groups in three villages in three districts of recipient / non-recipient households in the pilot year with different household incomes (wealthier, middle-income, and poorer) in Round 3 data. However, I then found out that the voucher experience had changed: non-recipient households in the pilot year had mostly become later recipient households and their reported income status in Round 3 did not seem to reflect their real income at the time of the Round 4 survey. Thus the 'intended' focus group recipients / non-recipients discussion became simply group interviews with a mixed farmer group.

Extensive village meetings were conducted with village key informants, along with the panel village survey, where I asked the same questions on their experiences, opinions and evaluation of the programme, and obtained many opinions and comments. I also interviewed key stakeholders, i.e., local government agricultural officials, the Village Executive Officer (VEO), the village chairman, the chairman and other members of the VVC, and agro-dealers. During the second part of my research – the panel survey – while enumerators were conducting panel household surveys, I conducted key-informant interviews with purposive sampling, mainly with the village elites –the village chairman, the VEO, the chairman of the VVC, and Ward/Village agricultural officials, in order to obtain general contextual information in the villages. Sometimes farmers also asked me to interview them, as they wanted to talk about corruption in the village. For the protection of privacy, the village names are anonymised.

3-4-1-1. Reflexivity and limitation

When I conducted the fieldwork, especially in the qualitative research, I had to recognise my positionality and limitation in interpreting the meaning of people's behaviour and practices. I am an outsider to Tanzanian nationals, being a Japanese female researcher. Being an outsider in the society gives advantages and disadvantages in doing research: the advantage comes from being able to be objective about the norms and practices which people inside the society take for granted. Insiders tend to dismiss the nature of these norms and practices whereas an outsider can catch and

objectify them. The disadvantage comes from not being able to capture the subtleties of people's behaviour and what they truly meant in the interview and other occasions in the fieldwork, as these meanings are culturally embedded. I sometimes felt that there were some invisible barriers between the participants and myself, which limited my capacity to capture the meaning of their words and behaviours for my research. Furthermore, in a patriarchal African society like Tanzania, where men have power over women, and being an outsider researcher, a challenge is posed by male interviewees' disrespect for female researchers, or more by male researcher assistants, which sometimes hindered the smooth interviews and fieldwork. As a female, it was sometimes difficult for me to exercise control over male research assistants. Based on my positionality as outlined above, I will reflect on what I have observed. I will recognise the data limitations from being an outsider.

Swahili – a foreign language for me - also made it difficult to conduct fieldwork. In the first part of my research, I asked for a translator in the interviews. I then felt some barriers had been erected and was frustrated when I felt that the translators did not translate word by word the interviewees used, although I asked the translator to translate each word literally. These feelings on my part lessened in the second part of my research, when I was doing interviews myself with the support of a driver, who knows English to some extent and supported me by translating only when needed, as by that time I had become more conversant with Swahili and felt more familiar with the local people's culture and lives. Even then, however, I felt some barriers were still preventing me from fully understanding the meaning of people's behaviours and words. That is also the limitation of my qualitative research.

3-4-2. Quantitative research

3-4-2-1. Panel data

My quantitative data is based on four rounds of the panel data in a nine-year period (2004 – 2013), among which up to the third round of the panel (2004, 2005, and 2009) I obtained the data from the World Bank, and the fourth round I collected myself (2013). The original panel survey was intended to assess the potential for market-based insurance instruments to mitigate the household vulnerability of cash crop growers (Christiaensen and Sarris, 2007b). The original panel sample in Ruvuma covered 892 households in 36 villages, which are farmer-representative in Ruvuma with stratified random sampling (Sarris, 2004). In Round 3, the input voucher section was added as a part of the questionnaire in order to look at who was targeted in the pilot year (Christiaensen and Pan, 2009a). I obtained the panel data set of Rounds 1 to 3 with list of households and locations from World Bank researchers with the condition that I use only for academic purposes.

I used the 144 households who reported having received vouchers in the pilot year in Round 3 as treatment households and 205 other households that reported that they had 'not received

vouchers’ or were ‘inapplicable to answer’, in the way that I picked up 1.5 times the number of other households as the recipient households from the respective villages as control households. This made a total of 349¹¹ panel households in 33 villages.

Since the objective of the original panel survey was to assess the viability of insurance mechanisms for cash crop growers, the selection of original panel sample villages was biased toward having more cash crop growing districts and villages than those where no cash crop was grown, whose bias I have to consider for analysing the data.

The timings of NAIVS’ voucher distribution, panel survey period and qualitative research are shown in Figure 4. The harvest season for maize is from June to August. Each panel survey was conducted in the lean season, from February to April. Thus, Round 3 crop production data provide information for the previous agricultural season, that is, the year previous to the introduction of the pilot programme. Round 4 collects the data for the third year (without counting the pilot year) of the programme. I will refer to my Round 4 panel data as ‘Author’s data’ in this thesis.

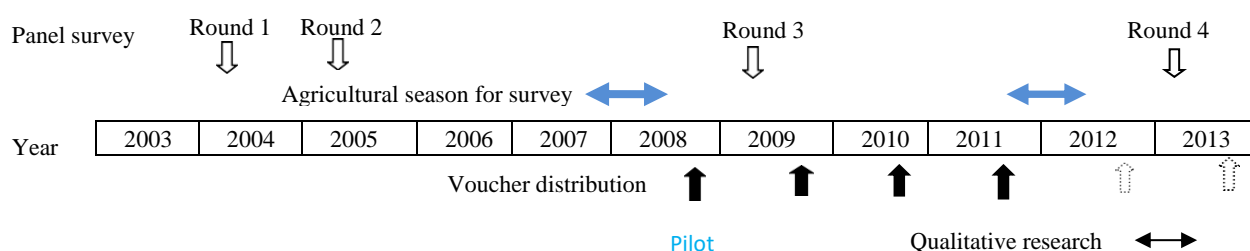


Figure 4: Timing of NAIVS voucher distribution, panel survey and qualitative research

Note: Line with both arrows suggests the agricultural season surveyed (November to June in the next year)

Source: Author

The household survey questionnaire covered household socio-demographic characteristics, activities of household members, off-farm income, household assets, land ownership and use, crop production, farm inputs, livestock production and sales, marketing of crops, extension, access to credit, shocks, household consumption expenditure by item, and extended information on experiences of input vouchers than the one in the questionnaire in 2009 (Appendix 3). The village survey questionnaire covered basic data: geographical and agro-ecological information, socio-economic information, information on shocks, labour and input-market information, and marketing information, as shown in Appendix 4. The questionnaire was translated into Swahili to conduct the survey. I employed the following survey team: 1 survey supervisor (I performed as another supervisor); 11 survey enumerators (including 1 district agricultural extension officer per

¹¹ Out of 349 households 309 households have the household consumption expenditure data, which would be used for the panel regression analysis.

district, totalling 4, and 7 others); 4 data enterers to the programme; 1 data programmer; and 6 data entry checkers.

Before conducting the survey, I carried out a three-day training for enumerators on the survey questionnaire, and piloted the survey in two villages, after which I modified the questionnaires in order to fit it in local context. After each day of survey, I checked the data for any gaps or problems of consistency and if necessary I asked enumerators to revisit households to revise them until the errors were corrected. After each day of survey, I also asked enumerators what they had perceived or understood from the survey or from the villagers, in order to get a better understanding of the contextual information. I cleaned data by the methodology seen in the Appendix 5.

Table 2 shows the voucher receipt experience of the panel sample in each round and mobility from non-recipient to recipient households. Because of the problem of recalling, I use voucher receipt data from 2008/09, the pilot year of the programme from the data of Round 3¹². Since it was found out that the different households were selected each year, about half of non-recipients¹³ in Round 3 became recipients in Round 4; thus the ratio of households who ever received vouchers doubled, from a third to two-thirds. I will look into the characteristics of recipients and non-recipients in Round 3, and of the group changing from non-recipients to recipients in Round 4, in Chapter 6.

Table 2: Recipient / non-recipient households of the panel sample households

Voucher receipt	Round 3	Change of voucher receipt during Round 3 and 4		Round 4
Recipient	103	-	-	204
	-	Non-recipients	101	-
Non-recipient	206	-	-	105
Total	309	-	-	309

Source: Christiaensen and Pan (2009a) and Author's data

3-4-2-2. Data analysis

For analysis of the impact of voucher receipt on maize yields, income poverty (household consumption), household assets and sending children to school, I will adopt the Difference-in-Difference methodology with Propensity Score Matching (Heckman et al., 1997; Khandker et al., 2010). I will look at each of the difference-in-difference estimates of the voucher receipt of those recipient households who received vouchers in the pilot year, in 2010/11 or in any year of the programme, and of the 'graduates' who received vouchers for more than three years. I will also analyse the characteristics of each of these recipient households and those who were selected but did not receive vouchers in the pilot year, by using difference-in-difference estimates. In the

¹² There are some discrepancies between the data of Round 3 and Round 4 surveys.

¹³ Includes households who answered "inapplicable".

regression analysis, I will consider the endogeneity among independent variables and the error term (Heckman and Vytlacil, 1998; Ricker-Gilbert et al., 2011).

3-5. Challenges in the fieldwork

Other than being an outsider and a female researcher, other challenges existed in the fieldwork such as in the selection of enumerators with adequate capacities and qualities: even though these were introduced by the local government statistical agency as being ‘experienced’ in surveys, their quality was not guaranteed. Even with the training given to them and my own daily checks after they collected data, some of them did not learn from errors and made the same mistakes every day. Another issue was their lack of motivation to work properly. One, being sent to interview the household which runs the local pub, ended up drinking the local brew until evening. Another spent the whole day on the plot of an interviewee who grows drugs on the slope toward Lake Malawi¹⁴. After those incidents I had to ask them to leave the work, and then replaced them. Their poor performance might have been due to lack of incentives to do the work better because I was offering low pay. The reason I asked the local statistical agency to introduce their local enumerators was that I thought that they were experts in enumeration in household surveys and comprehension of local culture and tribal languages might be needed in the interviews. Actually, however, I found that almost all the interviewees could converse in Swahili so the enumerators did not need to be local personnel. I might have been able to hire more qualified, motivated and younger ones to work on my research. Another issue was the abstention of a local agricultural official from participating in enumeration. I asked district agricultural officers in charge of vouchers to take part in the survey team as enumerators, for they knew the people in the villages and the local farmers’ agronomic and voucher practices and conditions. I also expected that they would know what was happening with vouchers in these villages. However, after being trained, a district agriculture officer in charge of vouchers of District A did not show up in the survey activities. After a couple of days, he brought another officer who was not in charge of vouchers to take part in the survey. In the process we had had some disagreement, which he claimed was the reason that he wanted to leave the survey activities. However, I suspected that he did not want to be in the survey as he knew that farmers would be alleging fraud in voucher management. The rains and the remoteness of the area also made difficult our fieldwork. We went to the area near the border with Mozambique, or to the villages near Lake Malawi, where we had to find guest houses far from the villages being surveyed. Once, a female enumerator had to sleep in the car as there was no adequate room in the guest house in the village under survey. Muddy roads often hindered our fieldwork, and people and villagers had sometimes to help us rescue our car

¹⁴ Information from villagers.

from muddy holes. In one village we surveyed, we found a pick-up truck from the District Office and villagers seemed to get together in the meeting. I heard that magic-makers had created lions who were killing the livestock so District Officers came with guns to catch the lions, but failed, so they were discussing what to do with the magic-makers that created and controlled the lions. I was so surprised that all the villagers, even the District Officers, believed that magic-makers controlled lions. I felt that the remoteness influenced this belief.

However, I do not think that it affected the content of the information which the interviewees provided for my research as this is not the sort of the issues concerning witches or magic makers.

I took their consent to participate in the research by informing them of the research purposes and that their responses would be anonymous in my thesis. In almost all cases, they were willing to participate in my research, even happy for me to record the interviews. In one village, however, a survey team with another supervisor found that some of 'the panel' households to which they had asked village leaders to guide them were not real panel households, as the information on household members did not correspond to the previous panel data. They then asked the village leaders to find the right panel households, but not all of them could be found in the end. I suspect this might be due to the fact that village leaders did not want to disclose their illicit behaviours in voucher management and so guided the data collectors to the households of their 'friends' instead of the panel households. However, without their cooperation my fieldwork could not be conducted.

3-6. Conclusion

In this chapter I present the analytical framework of this thesis. My analytical framework is two-fold. One part is the theory of change, based on economic theories and programme processes which is explained in detail in the next Chapter. With prior assets and a food crisis as the preconditions, the improved inputs are provided as the programme inputs, with the NAIVS programme as the process, and increased maize yields and production as the outcome. This outcome may be affected by leakage to wealthier farmers, displacement of previous commercial input use, weather and input use efficiency. The programme aims to bring about increased national food security as well as increased household food security as a short-term impact, while indirect impacts should be lower real maize producer prices and increased agricultural labour wages. These would reduce real farm income for the majority of Ruvuma farmers, who are net food-seller households, but who also benefitted from increased maize production on the other hand, while increasing the income of poor net food-buyer, labour-surplus households. If the programme continues long-term, it will bring about the long-term impact of asset accumulation. All these impacts are affected by the national and international maize markets, maize import and export, and national food security policies, and also affect local maize and labour markets.

However, the real implementation of NAIVS was affected by the social and political relations of the actors, and the power relations among these actors. Another part of the framework therefore uses an actor-oriented approach, which analyses these social relations which might have also been affected by NAIVS. Most SSA countries import the majority of their inputs. Foreign input supplier companies supply inputs to these countries, to be imported by input traders and distributed to the regions by transport companies. With support from the World Bank and other aid agencies, the Tanzanian government provides input subsidies. These, however, sometimes are captured by elites (politicians or government officers) before reaching the intended beneficiaries. A rise in input prices, additional contributions requirement made to village leaders and late delivery of inputs/vouchers all made it difficult for small-scale farmers to benefit from subsidies, which were mostly obtained by middle-scale farmers or captured by village or upper-level government elites, in collusion with agro-dealers. Voucher distribution was also affected by gender and tribal issues, with women and minority tribal groups tending not to benefit. This caused an increasing gap between middle-scale farmers on the one hand, and small-scale and vulnerable (female-headed, minority group, elderly-headed, sick or disabled-headed, poorer) farmers on the other, and made it difficult for the latter group to step up out of poverty. In the globalised market economy, foreign input supplier companies have the most power, while small-scale and vulnerable farmers are the most powerless. The implementation of NAIVS was affected by this power relationship, and at the same time promoted it.

I am using a mixed-methods approach in order to analyse in detail whether and how NAIVS worked to increase national and household food security in Tanzania, focusing on the Ruvuma region. For the quantitative research I will mainly use the panel data of four rounds, concentrating on rounds 3 and 4 which capture the agricultural data of the year previous to the pilot of NAIVS and its third year, respectively, in order to analyse the impact of NAIVS. The panel consists of 349 households in 33 villages, two-thirds of which received the vouchers at least once, while others received none. I use Difference-in-Difference with Propensity Score Matching considering endogeneity for regression analysis. I will, however, recognise the data limitations of my research as this was a little skewed in order to have data from more cash crop growers in the panel sample.

For the qualitative research, I will use information from 113 key-informant interviews, including 23 extensive interviews, four farmer group interviews and five group interviews with VVC members, ten extensive village meetings. The research topics were the participants' knowledge, experiences, evaluation and opinions of the programme, and voucher distribution and management. I may also have limited information as an outsider and female researcher, and I will recognise this limitation in my qualitative research.

Chapter 4. The Tanzania NAIVS Programme: Intention, design and implementation

Considering the subsidy as ‘money’, VVC members are changed every year (VVC chairman in Village L in Mbinga).

If vouchers are used properly, they can improve [the farmer’s] life (Village chairman, Namtumbo).

4-1. Introduction

Executing a development project is a complex process. A development project is composed of activities, output, purpose, and goal (BOND, 2003; FAO Forestry department, 2015)¹⁵. Its cycle is flown from problem identification, formulation, implementation to evaluation, this being called project cycle management (FAO, 2001; EC, 2004). The proper development of a project requires a good project intension, design and framework (Figure 5), and good programme design is the key to successful programme implementation.

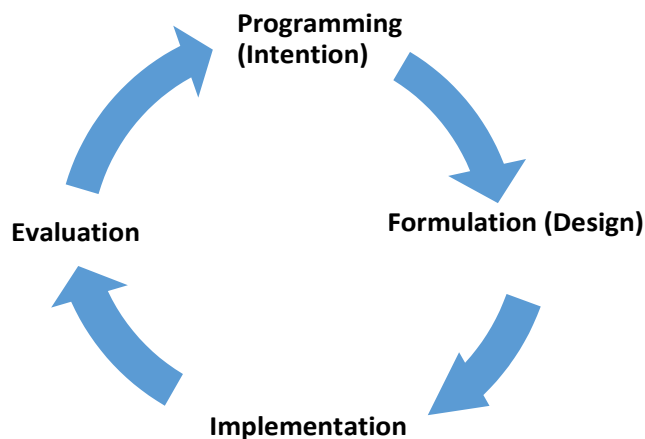


Figure 5: Project cycle management

Source: Author modified from EC (2004)

However, projects are sometimes not designed well if the targeted group is not clearly identified, as is the case with NAIVS. Good project implementation requires that institutions have sufficient capacity and that there is an enabling culture. Projects are also sometimes not properly implemented due to the failure to set up the institutions required; to those institutions’ lack of capacity to implement; or to lack of incentives for

¹⁵ It is also expressed as activities, outputs, objectives and impact (COOP Africa and ILO Cooperative Programme (2010) *Project design manual - A step-by-step tool to support the development of cooperatives and other forms of self-help organisation*, Geneva: ILO.)

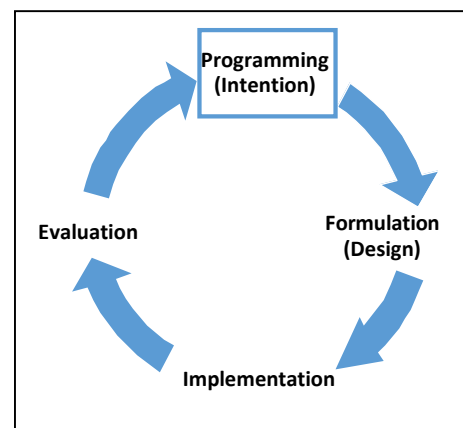
those individuals working for the projects or stakeholders who are affected by social norms, such as corruption. We now are talking about the programme on input subsidy. Here I define the programme composing of several projects. The programme also has the programme objective, design, implementation and evaluation. Thus here I now talk about the market-smart input subsidy programme, as it consists of the project of subsidy delivery, the one of training of agro-dealers, and/or of the monitoring and evaluation of these projects.

Druille and Barreiro-Hurle (2012) mention that the subsidy programme design should be aligned with the programme objective and truly ‘market-smart’, which prevents market failure. A synthesis study on subsidies reports that the programme needs careful design and implementation, given that its cost sometimes exceeds benefits because of leakage to wealthier farmers, displacement of commercial purchase, and lack of accompanying output price support and good trade policies (Jayne and Rashid, 2013).

In this chapter I will explore in detail how NAIVS evolved from intention through design to implementation. I argue that there were several flaws in its design and implementation which hindered its effectiveness and efficiency. I will then analyse the political economy of the programme, as this underlies the flaws in implementation. I will conclude by analysing the challenges to the programme’s design and implementation.

4-2. Intentions behind NAIVS

Now I will look at the intention of the NAIVS. In line with the national development plan, that is, the National Strategy for Growth and Reduction of Poverty I & II (Swahili abbreviation: MKUKUTA I & II), the Agricultural Sector Development Strategy (ASDS) was first implemented through the Agricultural Sector Development Programme (ASDP) in 2006 with a sector-wide approach. The objective of ASDS was to achieve a sustained agricultural growth rate of 5 per cent per annum



through a transformation from subsistence to commercial agriculture. To implement the strategy, the ASDP aimed to improve agricultural growth, reduce poverty and improve food security through 1) enabling farmers to have better access to, and use of, agricultural knowledge, technologies, marketing systems, and infrastructure; and 2) promoting private investment in agriculture within an improved regulatory and policy environment (URT, 2011a). The input subsidy – the focus of my research – is situated within the first point of this framework. And in 2011 after the regional initiative of The New Partnership for Africa’s Development (NEPAD) – Comprehensive Africa Agriculture Development Programme (CAADP) compact, the Tanzania

Agriculture and Food Security Investment Plan (URT, 2011b), which accords with the state-led ASDP, was developed.

In 2008, Tanzania faced a world food and input price crisis and it was projected that ‘the global food and farm input prices (were) also likely to remain significantly higher than the historical levels’ (World Bank, 2009a: 1). In order to mitigate the risk of food insecurity, the Tanzanian government launched a ‘market-smart’ subsidy called the National Agricultural Input Voucher Scheme (NAIVS) in 2009, learning from the success of the Malawian experience (SOAS et al., 2008; Dorward and Chirwa, 2011). The programme document states as its objective ‘to contribute to higher food production and productivity in targeted areas by improving farmers’ access to critical agricultural inputs’ (World Bank, 2009a: 35), in order to mitigate the potential effects of imminent or future emergencies. The programme has three components: 1) improving access to agricultural inputs (fertiliser and seed); 2) strengthening input supply chains; and 3) project management, and monitoring and evaluation.

NAIVS aimed to ensure emergency food security at national as well as household levels, especially for poor and vulnerable households who are more prone to crisis, by providing inputs to increase maize and rice production. However, it also aimed for the programme itself to be more sustainable, increasing the incentives for farmers to use subsidised inputs by subsidising their market price by 50 per cent, while farmers had to pay the rest half. In order to get high marginal productivity, it targeted areas with a high potential to use inputs, and small- to middle-scale farmers. The first group was targeted because of its vulnerability to price shocks, and the second because they are able to pay top-up and have the capacity to invest in complementary inputs to allow the subsidised inputs to be effective, and both groups are less prone to displacement of previously purchased inputs than the wealthier households. And the programme document states that ‘since NAIVS does not target the ‘poorest of the poor’, it was planned that the Tanzania Social Action Fund (TASAF) would provide complementary social protection for poor and vulnerable households through the provision of public works, as well as support to villages in food-deficit districts. There were also other initiatives, including the rehabilitation of small-scale irrigation facilities, integrated soil fertility management, the development of the seed sector, and other productivity-enhancing interventions by the Agricultural Sector Development Programme (ASDP).

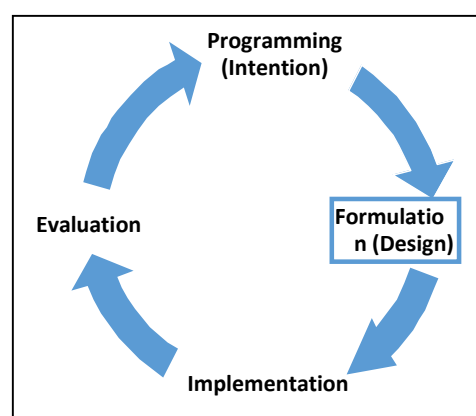
As an emergency response, the programme was ‘short-term’ to complement other programmes supporting medium- to long-term agricultural development. It therefore had an ‘exit strategy’, aiming to provide subsidy for three years so that the recipients could accumulate sufficient income to continue purchasing commercial inputs afterwards. The approach had originally been tested as a pilot in ten districts in 2008/09 and scaled up to full operation in 53 out of 169 districts of high-potential zones for maize and rice production in 2009/10. The programme planned to operate for five years, with the World Bank initially planning to support

finance for the first three¹⁶. During the five-year period, late-coming entrants in the second and third years were able to receive three years' worth of vouchers as the programme was expanding. The second year (2010) corresponded with an election year, when the most vouchers were distributed in the end (URT, 2014e).

To avoid market distortion, the programme used the private sector for input procurement and delivery, while the vouchers were delivered through public administrative channels. In order to increase the number of agro-dealers, several training activities were conducted and credit guarantees were provided to allow them to buy inputs from the Tanzania Fertiliser Company. Vouchers were redeemed by the ex-parastatal bank, the National Microfinance Bank (NMB), which has branches in each district.

4-3. Design of NAIVS

This section looks at the following key characteristics of the programme design: 1) beneficiary criteria; 2) input voucher package and exit strategy; 3) institutional set-up for voucher management and decentralised targeting; and 4) private sector development.



4-3-1. Beneficiary criteria

According to World Bank (2009a: 36), out of about 5.5 million farm households and 4 million small-scale poor farm households who were eligible for input support¹⁷, NAIVS targets 2.5 million small-scale poor farmers with the objective of helping them to increase food security and reduce poverty through the provision of vouchers. Selection criteria, according to NAIVS's Project Implementation Manual, were that the beneficiary must be 1) a full-time resident of a target village; 2) head of a household cultivating maize and/or rice on not more than one ha., that is, small-scale farmers; 3) willing to use the inputs provided; 4) willing to act as a role model for other farmers in the use of good agricultural practice; and 5) financially able to co-finance the inputs purchased with vouchers. Furthermore, as mentioned above, priority would be given to female-headed households and farming households who had not used improved inputs for the previous five years, and rice farmers with access to irrigation facilities. Only one voucher would be provided to each selected household head, even when more than one household member was an independently practising farmer (URT, 2009b).

¹⁶ It later partly financed the whole five years.

¹⁷ Information obtained from an interview with an officer at the Input Section of MAFC (November, 2012).

However, MAFC later distributed new Strategic guideline for implementation and procedure for NAIVS for 2011/12 which was informed to Regional Secretariat (RS) with slightly different beneficiary selection criteria (MAFC, 2011) (Appendix 6). The principal revised points are that the beneficiary had to have land suitable for the cultivation of one acre of maize or rice, which was also mentioned as a criterion by several village leaders, by eliminating the land criterion for small-scale cultivation, i.e., less than one ha. of maize/rice. This change was made for securing the beneficiary criteria – who has the land at least one acre of maize/rice cultivation. The original criteria – less than one hectare – was set for targeting small scale farmers, given that the average land size per household was 2 ha. in 2007/08 (URT, 2012c), but in practice the ability to pay has become more important criteria, for such small-scale farmers could not pay the top-up even they were selected. Thus having made aware that the subsidies were for small-scale farmers, this change made not only to target to small-scale farmers by cases.

Other reasons have been attributed for the change in beneficiary criteria. One agro-dealer in Songea, for example, claimed that vouchers had been distributed to regions where maize and rice were cultivated very little, so misused there. However, the study suggests that these food-shortage areas have relatively higher marginal productivity of input use because of the original lower fertiliser use compared to water availability, and have higher cost involved for bringing in food. The Public Expenditure Review on NAIVS suggests that the additional bag of maize/rice produced because of subsidised inputs in these food shortage areas was therefore more economical than the additional two bags of maize/rice in food surplus areas (URT, 2014e: 18, 59).

This change bore out the words of an MAFC official: “the programme targets small- to middle- income farmers. The ‘top-up’ criterion is the most important one, for the poor farmers can’t pay the top-up. If they can’t pay, they can’t get the inputs.”¹⁸ The World Bank programme official also suggested in the interview in November 2012 that “the programme targets production-surplus households. This means that it is targeted at middle-scale farmer households.” Also I heard the same from several key informants in the field. The design of 50 per cent subsidy made it difficult to target small-scale farmers, thus, targeting to middle-scale farmers just reflected the real recipients under this design. By introducing this change, the programme made clear that it did not aim at ensuring the household food security of the poorer group, but rather at national food security through increased national maize/rice production.

4-3-2. The input voucher package and amount of subsidy

The subsidy amounts to 50 per cent of the projected market price of the input package, whose ratio to actual input price at the time of purchase by farmers is susceptible to change due to

¹⁸ Interview with an MAFC official, November 2012.

changes in the input market price. The input package consists of nitrogen, phosphate and improved maize or rice seeds sufficient to apply to 0.5 hectare of maize or rice cultivation, that is, 100 kgs of nitrogenous fertiliser (Urea), 50 kg (1 bag of Di-ammonium Phosphate (DAP)) or 100 kg (2 bags of Minjingu Rock Phosphate (MRP)) of phosphorous pentoxide, and 10 kg of improved maize / rice seeds (hybrid or open-pollinated varieties (OPV)). The improved-yield seeds and phosphate fertiliser are to be used in planting, and the nitrogen fertiliser is for use six to eight weeks after planting¹⁹. It was intended that farmers should purchase the complete package, which consists of three separate vouchers designed for each type of input. The programme document suggests that given the low level of input use prior to the programme (8 kgs per hectare) the programme was expected to increase yield significantly. After receiving vouchers for three years, maize farmers were projected to more than double their yields, from 1,120 kg/per ha. in the base year to 2,450 to 3,200 kg/per ha. In the same way, rice yields were projected to rise from 1.735 kg/per ha. to 2,800 – 3,300 kg/per ha. (World Bank, 2009a: 22).

4-3-3. Institutional set-up for voucher management and decentralised targeting

For the purpose of voucher management, Voucher Committees (VCs) were established at each government level, namely national (National Voucher Committee (NVC)), regional (Regional Voucher Committee (RVC)), district (District Voucher Committee (DVC)), ward (Ward Voucher Committee (WVC)) and village (Village Voucher Committee (VVC)) (Figure 6). The voucher committee chair is assigned to the highest political figure at national level to ward level, namely the Minister of Agriculture, Food security and Cooperatives (in the case of the NVC), the Regional Commissioner (for the RVC), the District Commissioner (for the DVC) and the Ward Councillor (for the WVC). Meanwhile, the VVC chairperson is selected from VVC members. VC members are composed of government officials, representatives of input supplier companies, agro-dealers, farmer associations, non-governmental organisations (NGOs) and the NMB. For proper targeting and transparency, actual targeting of beneficiaries was decentralized to the village level, according to the number of allocated vouchers to the village and the beneficiary criteria mentioned in the Section 4-3-1. The VVC is composed of six members, who come from different hamlets, a lower level than villages (in Swahili *kitongozi*), three women and three men who have been approved by the village assembly. Finally, the position of VVC Secretary is normally assigned to the Village Executive Officer (VEO), the top government official, who is assigned by the District Executive Director in the village (MAFC, 2011).

¹⁹ Interview with District B agricultural official November 2012.

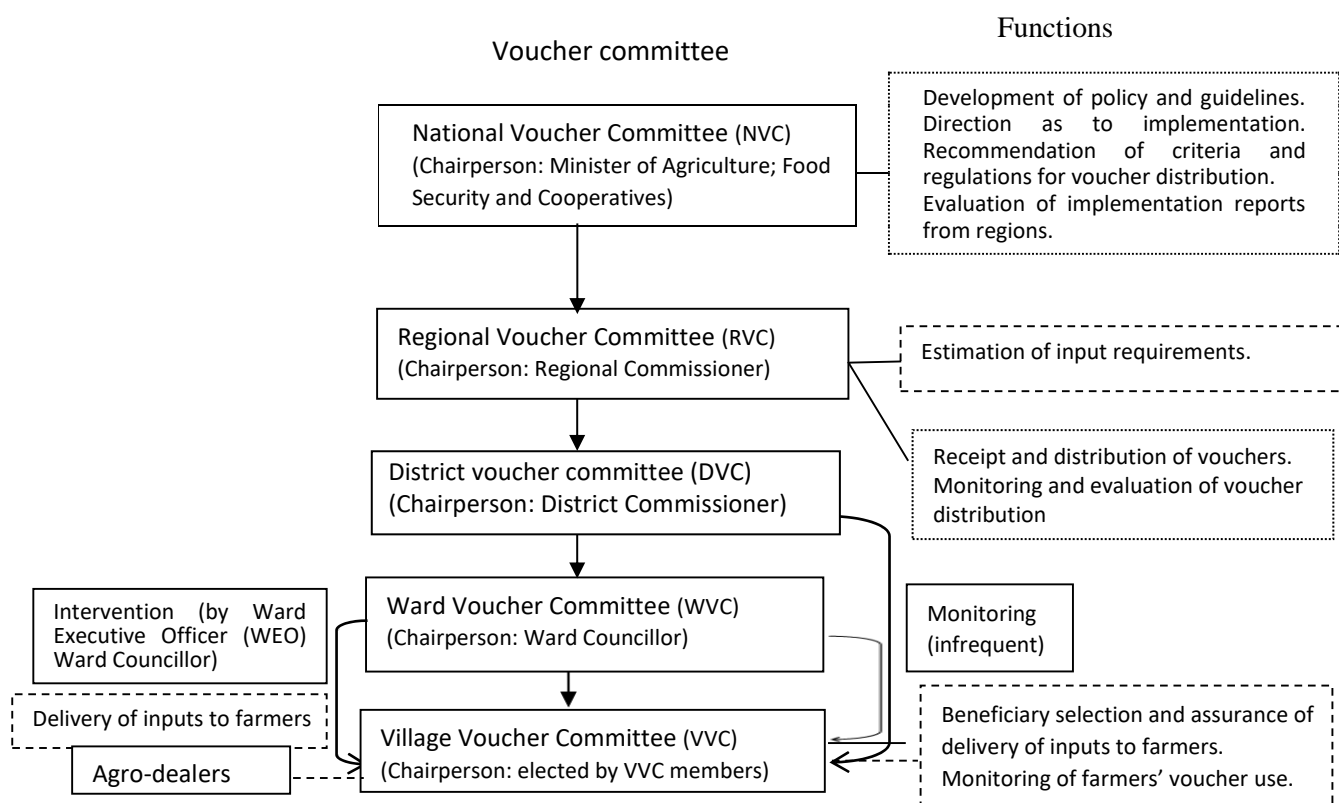


Figure 6: Structure for voucher management

Source: The author, developed from (MAFC, 2011) and fieldwork findings.

Notes: 1) Arrows show direction of orders and actions (monitoring and intervention respectively).

2) Dotted line shows collaboration on voucher management between agro-dealers and VVC.

3) Cells with broken line borders show the functions of voucher committees and agro-dealers.

Allocated voucher numbers to regions are based on the criteria to be mentioned later in 4-4-1 and on prior requests from each region, and announced by the NVC to the RVC in the middle of September, so that the district can prepare to communicate the voucher allocation to village level before the time of planting, that is, the end of November – early December, in unimodal rainfall regions such as in Ruvuma²⁰. According to Regional Secretariat (RS) Ruvuma, the RVC is convened from August to September in order to determine voucher distribution to each district and inform it accordingly. After allocation from national to regional level, vouchers are normally delivered from national level to the regions around November to December, depending on the planting season of the region, i.e., earlier for bimodal area (rainy seasons are: from October to January for short rain, March to May for long rain); and a little later for unimodal area (where it rains from November to April), where the unimodal area accounts for about 90 per cent of national maize production (World Bank, 2009a: 103). The RVC assigns a number of vouchers to the districts and the DVC, in coordination with the WVC, assigns them to villages. The VVC had already submitted its request for a certain number of vouchers to the WVC and DVC earlier in

²⁰From interview with MAFC official, November 2012.

the year, it is then that the villages were informed of the actual number of vouchers to be received in the year. Then VVC allocates them to each *kitongozi*. VVC members selected from each *kitongozi* select beneficiary candidates from their *vitongozi* (plural form of *kitongozi*) in collaboration with *vitongozi* chairpersons. The VVC compiles lists of beneficiary candidates from these selected names to develop a provisional village beneficiaries list, which is then discussed and confirmed at the village assembly. Once finalised, the list of beneficiaries is displayed on the village government office notice board for transparency and accountability, and forwarded to the upper Voucher Committee level (ward, district, etc.).

Vouchers are normally delivered by District agricultural extension officials to villages. When vouchers and inputs are delivered to the village, farmers selected for vouchers are told to come to the village office with 'top-up' money ready. They sign the vouchers and are taken to the agro-dealers by VVC members, in some villages farmers were taken to the agro-dealers of their own choice, while others were taken to the ones pre-determined by VVC members, which is not in line with the programme design of free market where farmers can choose the agro-dealers.

4-3-4. Private sector development

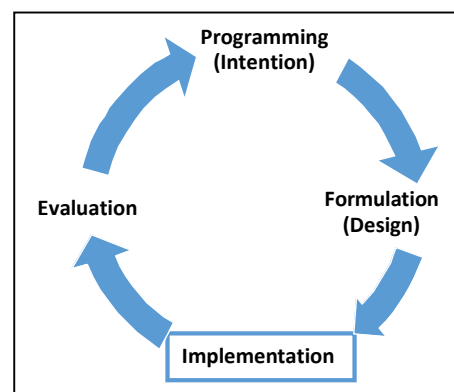
The programme promoted private sector development by letting it procure and distribute inputs and provided training on the input business to encourage new agro-dealers to enter the sector. The NVC assigns input suppliers to procure inputs, mostly imported. The DVC assigns agro-dealers to distribute inputs in each village. More than two agro-dealers should be assigned to deal with the vouchers in each village to encourage competition. By the time the vouchers arrived in the regions, the agro-dealers were supposed to buy and bring inputs to the villages and put them in the temporary storages they had set up there. The stored inputs were looked after by a guard/agent who was hired to deal with subsidised inputs, also sometimes with commercial inputs. When the vouchers arrived, the dealers were waiting for the voucher-recipient farmers to come to the store with payment of 'top-up' money, whereupon they sold the inputs, and signed and retained the vouchers. They kept a ledger book to record the subsidised inputs sold and redeemed the vouchers at the National Microfinance Bank (NMB).

4-4. Implementation of NAIVS

4-4-1. Voucher distribution at national and regional levels

An analysis of the implementation of NAIVS at regional level begins with an explanation of how vouchers were distributed in Ruvuma.

NAIVS provides subsidised inputs to 2.5 million households in the country by providing more than 500,000 tons of fertilisers and 50,000 tons of improved seeds. Although it was subject to change following decisions taken by the National Agricultural Input Voucher Scheme-Forum (NAIVS-National Forum) each year, the basic criteria for allocating vouchers to regions and districts are as follows:



- Districts with soil and rainfall patterns suited for maize cultivation
- Total number of households who cultivate not more than one hectare of maize or rice²
- Total area under maize and rice cultivation
- Total maize and rice production
- Area under irrigation (World Bank, 2009a)

NAIVS was originally designed to target only zones with a high potential for increasing maize/rice production by using inputs. However, political imperatives led to the extension of NAIVS to all regions and farming districts in the country. In 2008/09, when a pilot programme was operated in 11 regions, 737,400 households were beneficiaries. After the programme started, this number increased year on year, reaching up to 2,011,000 households in 2010/11, which corresponded to the election year before decreasing to about 1,800,000 in 2011/12 (URT, 2014e) (Table 3).

As Potter suggested before FISP began in Malawi and Maliro suggested about the distribution of vouchers during the programme, the programmes may have had a political influence as much driving force as any technical (agricultural or safety net) issue (Potter, 2005: 35; Maliro, 2011: 146)). The political influence can also be seen in the case of NAIVS from the fact that the number of vouchers distributed in the election year (2010) was the highest during the programme period.

Table 3: Number of vouchers distributed in the country and allocation to Ruvuma

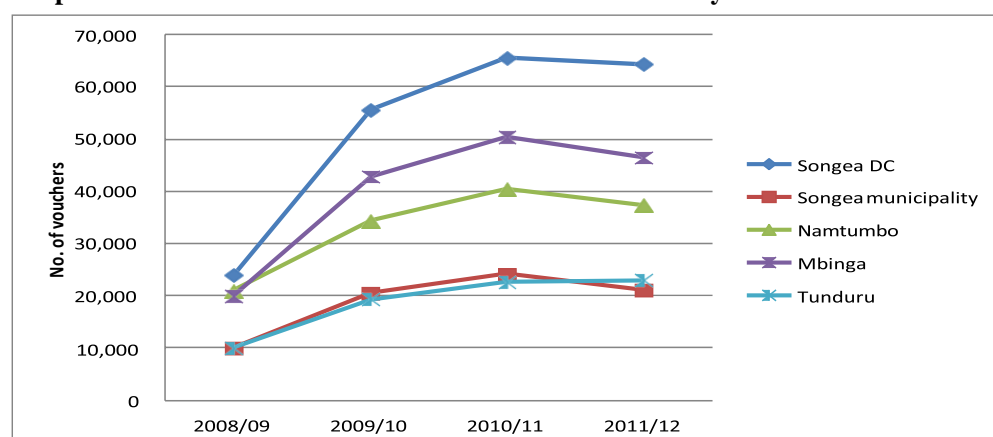
Year	2008/9	2009/10	2010/11	2011/12
Total vouchers distributed in the	730,667	1,511,900	2,011,000	1,779,867
Vouchers allocated to Ruvuma	85,000	172,740	203,412	192,469
Proportion of national total received in	11.5%	11.2%	8.0%	10.7%

Source: Author, developed from RS Ruvuma (2012a), RS Ruvuma (2012d), RS Ruvuma (2012b), RS Ruvuma (2012c), URT (2014e)

²¹ As mentioned earlier, it was up to 2010/11.

The RS data shows that the number of vouchers allocated to the Ruvuma region in different years was also in parallel with the change in number for the whole country. The proportion of vouchers allocated to Ruvuma of the national total was around 8.0% to 11.5%, which was higher than originally planned in the programme document, and was relatively large considering that its share of the maize production in the country was 9 % in 2007/08 (URT, 2013d). Table 3 shows that in 2010/11 more proportion of vouchers were allocated to other regions than Ruvuma than in other years. Approximately an average of 33,000 tons of Urea and 7,200 tons of hybrid seeds were distributed each year from 2008/9 to 2011/12 in Ruvuma. For the first application (phosphorous fertiliser), there was no disaggregated data between MRP (100 kg in the package) and DAP (50 kg in the package), thus the available data only shows that about 670,000 vouchers were distributed for the first application during the period in the region.

Graph 1: Number of Urea vouchers allocated to Ruvuma by district



Sources: Author, developed from RS Ruvuma (2012a), RS Ruvuma (2012d), RS Ruvuma (2012b), RS Ruvuma (2012c)

As we saw in Graph 1, the Songea district received the largest allocation of vouchers in Ruvuma, and about 2.8 times that of Tunduru, the smallest recipient in the region. Additionally, maize seed vouchers represents 98 per cent of the total number of seed vouchers allocated from 2008/9 to 2011/12.

Employing data on the number of Urea vouchers allocated, we now turn to the volume of subsidised inputs compared to the number of agricultural households. Urea voucher allocation represents a more accurate measure of the total number of beneficiaries than phosphate fertiliser and seeds as it has no alternative in the subsidy package, and reflects the closer to the true picture of receiving vouchers than other inputs, whose situation will be explained later in section 4-4-3.

Table 4: No. of Urea vouchers allocated and ratio to total number of agricultural households

	2008/09	Ratio to total agricultural HHs (%)	2009/10	Ratio to total agricultural HHs (%)	2010/11	Ratio to total agricultural HHs (%)	2011/12	Ratio to total agricultural HHs (%)	Total	Proportion in total (%)
Songea DC	24,000	72.8	55,640	163.8	65,658	187.8	64,417	179.2	209,715	32.1
Songea municipality	10,000	27.0	20,500	53.9	24,110	62.0	21,096	53.0	75,706	11.6
Namtumbo	21,000	62.4	34,400	99.7	40,471	114.5	37,393	103.3	133,264	20.4
Mbinga	20,000	23.3	42,900	48.7	50,475	56.0	46,517	50.4	159,892	24.5
Tunduru	10,000	18.8	19,300	35.9	22,698	42.0	23,046	42.4	75,044	11.5
Total	85,000	39.4	172,740	78.0	203,412	89.7	192,469	82.9	653,621	

Note: Number of agricultural households interpolated into and extrapolated from the National Agricultural Sample Census 2007/08²² and the Population and Housing and Census 2012 respectively. Agricultural HHs: Agricultural households.

Sources: The author's calculation, adapted from RS Ruvuma (2012a); RS Ruvuma (2012d); RS Ruvuma (2012b); RS Ruvuma (2012c); URT (2012c); URT (2014a).

We could see that in Songea and Namtumbo the number of vouchers relative to number of agricultural households exceeded 100 per cent in several years. If all vouchers reached to farmers in these two districts all the households received vouchers. From the total number of vouchers allocated and agricultural households (238,055 in 2011/12) we know that an average of nearly 2.9 Urea vouchers were distributed per agricultural household in the region during the four years (one pilot year plus three years of the programme) (Table 4). This means that the number of vouchers distributed in the region, was big enough for nearly all the region's agricultural households to have received three years' worth of vouchers, i.e., to be able to 'exit'.

Other than in the pilot year, from 2009/10 to 2011/12, the number of vouchers were enough to be allocated to about 83 per cent of the region's households, although there were differences between districts. National Agricultural Sample Census 2007/08 report that the average maize plot area per panel household is 1.4 ha. in Round 4²³. The voucher package was designed for 0.5 ha. of maize cultivation, and the input use ratio among the agricultural households before programme implementation in the region was only 30.6 per cent (URT, 2012c). For these I estimate the ratio of subsidised Urea in relation to the total regional requirement to be medium scale of the subsidy programme - $(0.5 \text{ ha.} \times 0.83) / (1.4 \text{ ha.} \times 0.7) = 41.8$ per cent without displacement if these rates of input amount per ha. is adequate.

Secondly, the high number of vouchers per household in Songea district was probably due to the fact that vouchers were distributed to each farmer rather than to each household. In Songea district, there were 37,854 agricultural households and 116,215 individual farmers, meaning that there was an average of three farmers per household, 108,080 of whom were

²² The National Agricultural Sample Census 2007/08 defines an 'agricultural household' as one that meets at least one of the following criteria: 1, owns or farms at least 25 square meters of arable land; 2, owns or has kept at least one head of cattle, or five goats, sheep, or pigs, or 50 chickens, ducks or turkeys, as of at least the agricultural year 2007/08 in its entirety.

²³ Adjusted by sampling weights. The National Agricultural Sample Census 2007/08 Ruvuma region report suggests that in Ruvuma household planted an average of 0.8 ha. of maize.

engaged in maize cultivation (URT, 2012c; NBS, 2013c). The panel data suggests that two panel villages in the district received more vouchers than the number of total households; one particular village received nearly twice as many vouchers as there were households in 2010/11 and 2011/12, and reported in the village meeting that they had distributed vouchers per individual farmer.

However, the panel household data results do not seem to corroborate this. From 2009/10 to 2011/12 the average subsidised Urea per recipient household was about 100 kg, twice the packaged amount per year in the villages. And only very few households on the panel reported that more than one household member had received vouchers. This means that due to the late delivery of vouchers most of the recipient households received two bags, rather than packaged one bag of Urea, but without receiving improved seeds nor phosphate (planting) fertilisers, as several farmers in District A informed. Considering the number of vouchers to be allocated in the region being sufficient for most of the households having received a voucher every year, the panel data results suggest that less vouchers were distributed in the villages than being reported in the District governments' data. This may indicate that a number of vouchers reported by the RS's data went missing and did not reach the households, although a part of this discrepancy might also be due to under-reporting.

On actual implementation, several reports mentioned deviation from the above-mentioned design and rule. As concerns targeting, I observed how the programme diverged from its design in the following ways.

4-4-2. Targeting

To ensure effectiveness and efficiency, targeting has become a key issue in the design and implementation of programmes concerned with poverty, food insecurity and vulnerability (Basley and Kanbur, 1989; Chinsinga, 2005). However, the beneficiary criteria for targeting varied among villages and occasionally diverged from the rule, as also found in Malawi's Farm Input Subsidy Programme (Maliro, 2011: 126) as follows:

4-4-2-1. Targeting wealthier households

The actual beneficiaries were not small-scale farmers, but middle-income farmers, as confirmed by several agricultural officials, including the official in RS who told us that "small- and medium-scale farmers are many, among whom medium-scale farmers have been receiving subsidised inputs. They normally cultivate 10 to 20 acres (4 to 8 ha.)", though the case of panel sample households have less than this: recipient farmers owned 7.4 ha. and cultivated 2.9 ha. on average, while non-recipient farmers owned 4.6 ha. and cultivated 2.0 ha.

I heard in several villages that the village leaders were applying new criteria which they had been informed during the programme period of by the MAFC (MAFC, 2011), that is, that recipient farmers must 'cultivat(e) more than one acre of maize or rice.' However, as the size for

cultivation in Ruvuma is relatively big in the country, this criterion does not classify households in the region, as among the panel sample households, only one panel household cultivates less than one acre of maize or rice.

Another criterion I heard about in several villages was that recipient farmers should have contributed physically and financially to village activities, such as building school buildings, constructing roads, etc., in which case most of elderly or female heads of household could not be eligible as they were not physically nor financially capable of making such a contribution. The heads of households who satisfied this criterion tend to be young and healthy males, and belong to better-off households.

Another criterion was 'being willing to act as a role model for other farmers in the use of good agricultural practice'. A farmer in Songea district mentioned that "they chose me because I am hard-working, and they thought that I would be a [good] example to others." This criterion tended to target better-off and educated farmers, for the poor farmers do not have the physical and financial capacities to apply good agronomic practices, even when they are trained to be aware of their effects.

Meanwhile, in other villages village leaders and farmers mentioned that the poor and vulnerable households were targeted as the one of the programme objectives. One farmer in a focus group discussion in a village in Songea district stated that he "was chosen because (he was) a poor person in the community, that is also a criterion" (Farmer A); while another told us that "they consider those who have health problems, are poor or elderly, or have livestock (...) for example, those vouchers could help to grow fodder grass for the livestock belonging to elderly or sick people who cannot take their livestock out to graze" (Farmer B). But in some cases elderly recipient households have some help from children living in other households or others for help or in exchange of something to help their plots.

However, I also heard in other villages that female-headed and disabled-headed households had difficulty to get subsidised inputs, because they were not able to pay the top-up or extra payment asked by the VVC members, or were not able to contribute to village activities. Even when they were selected, it was difficult to get subsidised inputs because of the reluctance of village leaders to provide them. Some told us that when they went to the office day after day to get inputs, they were told by agro-dealers and village leaders to come back the next day, and when they did so they were told that the inputs were finished on the day, this continued many days, until they finally gave up.

4-4-2-2. Failure to apply a three-year 'exit' strategy; thinly distributed vouchers

While RS's data reports that a high number of vouchers was allocated to the region, as we saw in Section 4-4-1, I heard from villagers in most of the villages that the "number of vouchers distributed was small compared to the number of households", except in one village very close to

Songea town where almost twice as many vouchers were distributed in 2010/11 and 2011/12 as there were agricultural households. Distribution was thin because fewer vouchers were distributed to most of the villages so village leaders had to select the recipient households. The allocation of few vouchers to the villages caused problems for village leaders, as shown in claims such as “we don’t want farmers to think we are exercising ‘favouritism’, by only giving vouchers to a few of them for three consecutive years.” Resistance to targeting, social tension and ‘egalitarianism’ were also observed in Malawi (Chinsinga, 2005: 146-147). As the Malawian programme tended to distribute vouchers to the villagers in rotation, so that, as VEOs or VVC chairmen in several villages in Tanzania also mentioned, they were able to “select beneficiaries that did not benefit previously”, and prevent complaints from villagers who would not have been selected. This practice, thin distribution of vouchers was one of the reasons for reducing the number of households that received vouchers for three years in Ruvuma. Given that only little less than a third of all the recipient households received for three years or more, we cannot see the application of the ‘three-year exit strategy’ rule (Table 5). From the prevalence of the practice of allocating vouchers over one or two years only, the impact of receipt on either maize yield or income poverty might have been smaller than had been expected.

Table 5: Ratio of sample recipient households by number of years of voucher receipt to total sample households among all recipient households

	1 year	2 years	3 years	4 years	All recipients
Ratio to total sample HHs	0.28	0.16	0.13	0.10	0.66
Ratio to sample recipient HHs	0.42	0.27	0.18	0.15	1.02

Source: Christiaensen and Pan (2009a); Author’s data

Even so, in those villages where few vouchers were distributed, farmers still claimed that the village leaders had distributed the vouchers either among themselves, or to friends, relatives, and government institutions, which was more prevalent as fewer vouchers were distributed. I was often informed of the claim by village leaders that the officials and politicians at higher level than villages, that are, ward executive officer or ward councillors, or sometimes *katibu talafa* (the politician selected at the level between district and ward) put pressure to village leaders to ask for their ‘portion’ of vouchers from their villages.

The above findings in the field corroborate panel data, which show that more than half (67 per cent) of the recipient households received vouchers for only one or two years (Table 6). Here we notice the large gap between the above RS data concerning the average number of vouchers distributed per household and the panel data which reveals the number which actually reached the households. As mentioned above, RS data shows that an average of 2.9 vouchers of Urea were distributed for all the agricultural households in Ruvuma, meaning that almost all the

households would have ‘exited’ – received three years of vouchers - the programme. The panel sample reveals that households reported an average of only 1.3 years of voucher receipt during the period. If the panel households represent all the households, the data suggests that more than half (55 per cent) the vouchers disappeared, although there might have been due to a tendency to report lower voucher receipt or mis-reporting on the part of panel households, who might have expected that continuation of the programme by doing so. With this acknowledgement of the data limitation, we can say, however, that the scale of ‘missing vouchers’ in the region was considerable. These vouchers might have disappeared between regional and village distribution. This ‘leaking’ was also found in other studies such as the one of FISP by Maliro (2011) and the study of the Targeted Input Programme in Malawi, although the ratio was much smaller, being as low as 10 per cent of the vouchers distributed in the surveyed villages²⁴ (Cullen and Lawson, 2005: 57). I now analyse the reason for this gap between ideal and actual practice. The reasons for it could be listed as 1) capture by politicians and leaders from region to village level, as mentioned by officials in RS; and 2) the sale of vouchers by farmers.

This high number of missing vouchers corroborates the information received from Agricultural Officers in the RS office who mentioned that some individuals had cheated the system, obtaining vouchers to which they were not entitled, or for political purposes such as allocating vouchers to their political allies; in the case of politicians, this was probably to obtain money. One of them at first stated that ‘it was 60 per cent’, but ended up claiming that ‘about 20 per cent of all the vouchers’ were obtained by politicians (Regional Commissioner, etc.). This large gap suggests weak institutional capacity to implement voucher distribution at regional and lower levels.

Table 6: Households by duration of voucher receipt and ratio to total number of panel households

One year-recipient HHs

	2008/9	2009/10	2010/11	2011/12	Total	Ratio to total	Ratio to all recipients
Recipient households	33	11	21	21	86	0.28	0.43

Two year-recipient HHs

	2008/9 & 2009/10	2008/9 & 2010/11	2008/9 & 2011/12	2009/10 & 2010/11	2009/10 & 2011/12	2010/11 & 2011/12	Total	Ratio to total	Ratio to all recipients
Recipient households	15	4	4	11	2	15	51	0.17	0.26

Three year-recipient HHs

	2008/9 & 2009/10 & 2010/11	2008/9 & 2009/10 & 2011/12	2008/9 & 2010/11 & 2011/12	2009/10 & 2010/11 & 2011/12	Total	Ratio to total	Ratio to all recipients
Recipient households	10	2	4	18	34	0.11	0.17

Four year-recipient HHs

	All uptaker	Ratio to total	Ratio to all recipients
Recipient households	28	0.09	0.14

Source: Christiaensen and Pan (2009a); Author’s data

²⁴ 228 villages selected using a multi-staged sampling frame.

Table 6 shows that among those households which received vouchers for any given two or three years, the groups receiving vouchers in two or three *consecutive* years comprise a high share of the recipients in those years. Therefore, it seems that a rule obtains whereby once a household is selected as a ‘recipient household’, it continues to be issued with vouchers in consecutive years. Given that the number of two year-recipient households is about 1.5 times that of three year- recipients, it looks as though that there might also be a rule that two- rather than three-year receipt is more popular because of the limited number of vouchers allocated to the villages for distribution. There might be a tendency towards actually selecting the same households in consecutive years, or years of receipt may have been wrongly reported, either because recipients had forgotten in which year exactly they received vouchers, or due to fatigue on the part of the interviewees which led them to report simply that they received them in consecutive years. As regards ‘interviewee fatigue’, I observed during the household interviews that some interviewees had difficulty recalling whether or not they had received vouchers or in which year they have received in years earlier than the previous agricultural season. The difficulty in recalling might have been further exacerbated by the complexity of either getting all the inputs or just a part, or having shared them, or having given some part of the package to other farmers, even when they stated officially that they had ‘received’ them. In any case, the data concerning the number of years over which vouchers were received (Table 5) appear more reliable than those concerning which particular year they were received in.

It could be expected that after two or three consecutive years of receiving vouchers, selected households would increase their income, although some two year-only recipients do not conform to the three-year receipt under the ‘exit’ programme design. Furthermore, according to information from several informants the ‘exit’ strategy was impossible in practice because of the small amount of subsidised inputs and the low profit gained by using the input package due to increasing input costs: I heard from several informants that the input package for one acre of maize or rice cultivation was only sufficient for their own home consumption, and not to give a profit. Furthermore, the profit progressively became less than expected during the period because of the increase in real input prices while the face-value of vouchers remained almost constant.

Meanwhile, 14 per cent of the panel received vouchers every year. These households might have obtained them from other households who could not pay the top-up, or been selected by villages who were giving vouchers to individual household members farmers or been favoured by village leaders. On this issue, the NAIVS impact study reports a much higher rate, using national level data, such as ‘60 per cent of the ‘graduates’ still receive vouchers in the fourth year’, suggesting that ‘another farmer in the same household received vouchers’ (URT, 2014e: 34). The impact study report uses the term ‘graduation’, not ‘exit’.

Officials in RS Ruvuma and some agro-dealers mentioned that some District

Commissioners in Ruvuma and other regions in the Southern Highlands who have the authority to distribute vouchers seemed to confiscate them, and were forced to leave the office. And these cases were reported by press from which people knew when I told them that I was researching on NAIVS, some of the informants said: “Ah, there are lots of problems of corruption”. Cooksey cites that there were reports by the Controller and Auditor General and the Parliamentary Accounts Committee of massive corruption and irregular voucher management (Cooksey, 2012).

MAFC officials reported that they also monitored agro-dealers by making some visits to the villages, and where they had found cases of cheating the system, in some cases they prosecuted, with the offenders being jailed²⁵. In Mbinga district, three agro-dealers were sent to either the Corruption Prevention Bureau or to the court. Tanzania Fertiliser Company Ltd. (TFC) Manager in the Songea office informed me that he had also been monitoring the agro-dealers in terms of voucher management and loan repayment and farmers groups such as tobacco farmer associations, and had reported some cheating agro-dealers and farmer groups to the court. In some cases, agro-dealers had received inputs with loans from the TFC or the banks, and had left the region even without distributing inputs nor paying back the loan.

Some agro-dealers mentioned that the previous input subsidy programme was better than the current voucher system which has been subject to far more cheating. However, the MAFC official told me that the previous input transport subsidy programme had also faced problems of cheating by the agro-dealers, as it could not trace whether they actually delivered inputs to the farmers, because the subsidy amount was provided to the agro-dealer before them delivering vouchers while the vouchers could be traced to the farmers who received them by their signatures to vouchers, thus NAIVS would be better. However, a signature itself is not sufficient evidence since I often heard in some villages that village leaders signed dead persons' names or children's names, or asked villagers to sign even when they had not received the subsidised inputs. Thus vouchers cannot work as a guarantee that the person of signature actually received subsidised inputs. Without close monitoring and checking of voucher management at the micro-level, it seems that the system does not function effectively and efficiently.

In the Round 3 and 4 surveys, we asked about whether they were selected for or had received vouchers from 2008/09 to 2011/12, although there were two sections in Round 4 (Household Roster and Voucher sections) asking whether households had been selected for or in receipt of vouchers in each subsequent year of the programme. As the answers in the Voucher

²⁵ Interview with officials in the input section of the MAFC in November 2012 and January 2013.

section do not seem reliable²⁶ I present the data by Household Roster. Although there is data for 2008/09, i.e., in Round 4, the Round 3 data are more reliable as there is a shorter recall period. Over the years under study, the ratio of selected and voucher-recipient households to the total number of panel households did not change to any great extent, being around 35~41 per cent and 31~37 per cent respectively (Table 7).

Table 7: Ratio of households reporting selection for and receipt of vouchers to total number of selected sample households (%)

	2008/09	2009/10	2010/11	2011/12
Round / Section	Round 3	Roster	Roster	Roster
Selected (A)	41	35	39	35
Received (B)	33	33	37	31
Difference (A)-(B)	8	2	2	4
Ratio of (B)/(A)	80.5	94.3	94.9	88.6
Recipient ratio to total	10.7	10.7	12.0	10.0

Note: Out of 309 panel households. For 2008/09 the data is of Round 3. For other years the data is of the Household Roster section of Round 4.

Sources: Christiaensen and Sarris (2004); author's data

The big difference between the ratio of selected and received households to the total sample in 2008/09 - the pilot year - might have been due to that since farmers were unaware of the importance of using the full input package in the pilot year, even if they had been selected for vouchers, when they found out that they had to pay the top-up many of them chose not to receive their inputs. It may even have been the case that they were not aware of how the programme itself worked, so that in several villages they felt they were being cheated as they had been asked to pay top-up for nothing. Many selected farmers rejected to receive vouchers thus there were many 'returned' vouchers in the record of local government in the pilot year. However, as they came to understand the programme better, and the efficacy of all the inputs became apparent to previously sceptical farmers, they became more willing to use the package as prescribed. The above data suggest that the ratio of the households who did not receive vouchers after having been selected among the selected households decreased from 20 per cent to 11 per cent over the course of the programme.

4-4-2-3. Targeting farmers within one household – multiple voucher receipt by one household

In some villages where a larger number of vouchers was distributed (in 2010/11 and 2011/12), vouchers were given to individual farmers rather than households. This occurred especially in the

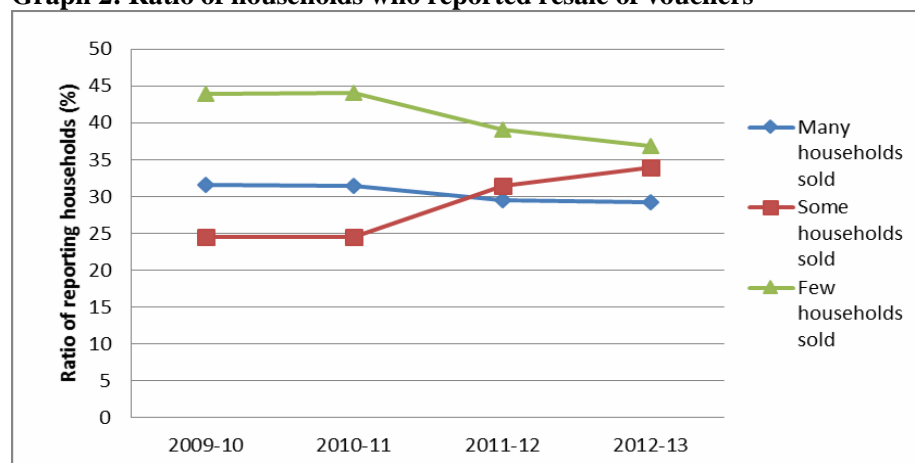
²⁶ The households of positive answer for voucher receipt supersede the ones selected for vouchers. The reporting errors might occur due to the respondent fatigue and / or owing to some complications of having received either only one part of the package (Urea), or of not having received the input package at all even though they were officially recipients and had signed the voucher to show they had received the full package.

main voucher recipient district, Songea district. In the two surveyed villages in Songea district, the number of vouchers exceeded the number of households in two years. One village is very close to Songea town and is on the main road to Namtumbo town. Another has very fertile land, famous for beans cultivation and is on the main road from Songea town to Dar es Salaam, where I observed there were many tractors in the town. Thus the concentration of vouchers to these villages were due to their political-economic power as villages and their high fertility of the land. On the former village the agricultural input official and village leaders declared that they were distributing vouchers ‘per farmer’, if there were independent farmers within one household. In a village in Songea district, a VVC member mentioned that he had received four vouchers in his household as it contained ‘four independent farmers’. It seems that even with more vouchers distributed, there was still elite capture in that way.

4-4-3. Resale of vouchers

In the survey question as to whether other villagers had sold their vouchers, unlike the information from the qualitative interviews above, responses did not change markedly from year to year, with high response levels maintained throughout and as many as 28 per cent of participants answering that ‘many’ villagers sold vouchers across the four years under study. The proportion of respondents who reported that ‘some’ villagers had sold their vouchers increased during the period, while those reporting that ‘few’ villagers had sold their vouchers decreased.

Graph 2: Ratio of households who reported resale of vouchers



Source: Author's data

The maintaining or worsening situation of resale of vouchers shown in Graph 2 over the years under study does not correspond to the information from several informants who suggested that the number of such individuals had dropped over time to ten per cent as they became aware of the importance of the input package.²⁷ However, there was also information which was almost in line with the Graph 2: an informant told that the proportion of farmers who had sold their vouchers in

the first year of the programme was as high as 40 per cent on average in the region;²⁸ and a farmer in a Mbinga village suggested that the resale or sharing of vouchers was still practised among almost half of the programme beneficiaries up to the second and third years of the programme.

Other study participants informed me that in the fourth year of the programme, some farmers still engaged in the sale of vouchers because they did not have sufficient money to pay the top-up. This corroborates with the above quantitative findings that there was some difference between selected and recipient households (Table 7).

The general lack of interest in using programme inputs and preference for selling vouchers or inputs (seeds) to other wealthier farmers or to agro-dealers was corroborated by a VVC member in Songea district thus:

The committee gives the vouchers to the farmers; now, these farmers collect the full set of vouchers from the committee then they go to the agro-dealers. Now, with these agro-dealers we don't know what happens there. The agro-dealers issue a full set of hybrid seed and fertiliser I think, but we don't know what the farmers do – whether they sell it or whatever – when they come back from agro-dealers.

Additionally, in a farmer group discussion which also took place in Songea district, a farmer articulated the situation thus:

I think most farmers who are not trained take the hybrid seed and first application, but when they get home, they don't use them (and sell them to others) (...) It is very common – even the government knows about this: it says that both these agro-dealers and the farmers are dishonest (...) but these farmers don't understand the importance of improved farming methods, which are many. There are only a few farmers who understand the importance of good farming methods, who normally take the whole set, and want the government to increase the vouchers.

It was also suggested that the lack of interest in using the subsidy package was because “many farmers don't like improved seeds, as they can't use them the following year and have to buy them each year, while the traditional seeds could be used the following year” (Agricultural extension official, Districts A and B).

Additionally, a farmer in Songea district mentioned the following:

Regarding the seed, most farmers don't like to follow the improved farming methods: they prefer to follow traditional methods; they don't like to use this hybrid maize

²⁷ Official of input supplier company B, Songea District.

²⁸ Manager of input supplier company A, Songea District.

seed (...) they prefer traditional seed because it grows quicker.

4-4-4. Increase in top-up prices

One reason why some selected households did not receive the promised vouchers might have been an increase in top-up prices, while voucher face values remained constant, those of fertilisers in particular. Many informants in the field confirmed that the prices of such inputs went up in 2010/11 and again in 2011/12, which made it difficult for them to pay top-up. Indeed, in one farmer group discussion, farmers suggested that there had been a considerable increase in the price of fertiliser in 2010/11:

The input price went up a great deal in 2010/11: it was TZS [Tanzania Shilling] 21,000 (equivalent to 8 BP²⁹) per bag of Urea in 2008 but from 2010/11, it was TZS 52,000 (equivalent to 23 BP³⁰). It was TZS 30,000 (equivalent to 15.7 BP³¹) per bag of DAP [diammonium phosphate: a fertiliser] in 2008 and has been TZS 54,000 (equivalent to 23.8 BP³²) per bag since 2010/11. But the price of seeds has remained the same: TZS 7,500 (equivalent to 3 BP³³) per bag of maize. For the whole package it was about TZS 132,000 (equivalent to 51 BP³⁴) last year.

Moreover, if farmers were unable to pay the top-up for the full package, they sought to share the inputs with others. In a remote village in Mbinga, I found that 50 per cent of the panel recipient households shared vouchers owing to the aforementioned price rises in 2011/12, although informants indicated that only 25 per cent had done so in 2010/11. I will make a detailed comparative analysis of changes in the market and subsidised, top-up prices of fertiliser, as well as the voucher package as a whole in the period under study in the Chapter 8.

4-4-5. Late delivery of vouchers

Another reason for the resale of vouchers was their late delivery, as reported by many informants, especially in 2010/11 and 2011/12 when there was widespread late distribution relative to the planting season. The original project document stipulates that:

Vouchers must be printed in April to May in order to reach beneficiaries by July to August, when farmers have just harvested and have enough cash to pay the top-up

²⁹ Exchange rate (100 BP=257,229 TZS) as of 1st December, 2011.

³⁰ Exchange rate (100 BP=226,938 TZS) as of 1st December, 2010.

³¹ Exchange rate (100 BP=191,056 TZS) as of 1st December, 2008.

³² Same as footnote 7.

³³ Exchange rate (100 BP=250,700 TZS) as of 3rd December, 2012.

³⁴ Same as footnote 6.

(...) [Since] Parliament only approves the budget in August to September (...) the resolution of this matter should be treated with some urgency by the MFEA [Ministry of Finance and Economic Affairs] and MAFC [Ministry of Agriculture, Food Security and Co-operatives] (World Bank, 2009a: 40).

However, the implementation of the project did not follow these guidelines. In an interview, an official of the Agricultural Input Voucher Section, MAFC, informed me that the budget was approved in July to August, and budget allocation within the Ministry was approved from August to September, when the voucher procurement process was initiated, and it took about four and half months for the vouchers to reach the farmers, which means the delivery would be late for planting.³⁵

This was corroborated by farmers who reported that after 2009/10, vouchers and inputs tended to be delivered too late for the planting season, normally not arriving until mid-December to mid-January, and sometimes not until mid-February. Even when such late delivery was anticipated at central level in 2011/12 and RS took measures to ensure that alternative documents were made available, according to informants (including some from the MAFC), these were merely subject to the same delay. This inefficiency prompted farmers either to take Urea only or not to bother with the first fertiliser application and improved seeds at all; or, when they eventually received the vouchers, to sell those which were by that time superfluous to their own requirements.

4-4-6. Subsidised input receipt by type of inputs

In respect of fertiliser usage, for the first application I found a tendency to increase the amount of Minjingu rock phosphate (MRP), which the programme introduced widely as a better alternative to DAP and because it is the only fertiliser produced in the country (see further discussion in Chapter 6). Although many informants argued that they did not like MRP, because of its complicated way of application and that DAP was more effective in terms of increasing yield, farmers tended not to use DAP as much due to its high price.

This corroborates the panel data. In the pilot year, 34 per cent of panel households received subsidised Urea; although more than 50 per cent were issued with maize seeds; a little under 50 per cent received MRP; while only 4 to 6 per cent received DAP. There was some displacement of commercial Urea usage as farmers in Ruvuma had been used to spreading Urea before the programme was implemented. And due to late delivery of vouchers and as some of the farmers did not know the effects of the other inputs, they were reluctant to spend their money

³⁵ MAFC official, December 2012.

on them.

As shown in Table 8, the ratio of those in receipt of each input to the total number of sample households remained virtually constant throughout the study period. The largest ratio is found in respect of Urea, which almost all recipients received; followed by that for maize seeds, at approximately 20 per cent of total sample households; and for MPR reducing from 17 to 14 per cent, inputs being principally restricted to these three items. If we consider the range of programme-prescribed inputs, those farmers in receipt of the full package represented almost 50 per cent, although the figure was a little lower in 2010/11 (Table 9). Conversely, those who received Urea only amounted to about 33 per cent of the total, a ratio that remained virtually constant, although, again, it dropped a little in 2010/11.

Table 8: Number of programme beneficiary households by input type and year reported (%)

	2009/10		2010/11		2011/12	
	No. of households	Ratio to total sample (%)	No. of households	Ratio to total sample (%)	No. of households	Ratio to total sample (%)
Urea	102	33.2	113	36.8	96	31.3
DAP	11	3.6	17	5.5	14	4.6
MRP	51	16.6	53	17.3	43	14.0
Maize seeds	61	19.9	64	20.8	55	17.9
Rice seeds	1	0.3	2	0.7	1	0.3
Other	1	0.3	1	0.3	2	0.7
Any input	102	33.2	115	37.5	98	31.9

Source: Author's data

Table 9: Number of programme beneficiary households in receipt of different types of input (%)

Source: Author's data

	2009/10		2010/11		2011/12	
	No. of households	Ratio to total recipients	No. of households	Ratio to total	No. of households	Ratio to total recipients
Urea only	34	33.3	34	29.6	32	32.7
Maize seeds only	0	0.0	2	1.7	0	0.0
Urea+maize seeds	7	6.9	10	8.7	9	9.2
Urea+MRP+maize	43	42.2	37	32.2	34	34.7
Urea+DAP+Maize	10	9.8	12	10.4	11	11.2

4-4-7. Return of vouchers

A few recipient households reported that they had returned vouchers or given them away (Table 10). In terms of Urea, the proportion of such households rose to more than ten per cent in 2010/11. This increase was probably due to the higher number of vouchers distributed that season, which resulted in their being distributed even to households that either could not pay the top-up or did not want the vouchers in the first place.

Table 10: Reasons for not using vouchers to obtain prescribed inputs

	2009/10				2010/11				2011/12			
	Returned them	Gave them away	Total	Ratio to total recipients	Returned them	Gave them away	Total	Ratio to total recipients	Returned them	Others	Total	Ratio to total recipients
UREA	7	1	8	8.2	12	0	12	10.8	2	1	3	3.2
DAP	7	1	8	8.2	10	0	10	0.1	2	0	2	2.1
MRP	7	1	8	8.2	10	0	10	0.1	2	1	3	3.2
Maize seeds	7	1	8	8.2	10	1	11	0.1	2	1	3	3.2
Rice seeds	6	1	7	7.1	10	0	10	0.1	2	0	2	2.1
Other	2	0	2	2.0	2	0	2	0.0	0	0	0	0.0

Source: Author's data

In the Round 3 survey, 80 per cent of the households which had opted to receive vouchers reported that they had actually been issued with them (Author's calculation). The main three reasons cited by the rest of the selected households for their failure to obtain the vouchers were that: they did not have the cash and, either could not get credit, or did not want to get credit; or there was no instruction on how to use the package best.

Table 11: Reasons for non-receipt of vouchers by selected households (Round 3)

Did not have cash and did not want to get credit	Did not have cash and could not find credit	Cost/effort of collecting fertilizer is too large	There was no instruction on how to use package best	Total
5	7	1	6	19

Source: Christiaensen and Pan (2009a)

In the Round 4 survey, reasons for the non-receipt of vouchers differed slightly from those offered in Round 3 (Table 12). Although the main reason cited was still lack of cash, the second most common explanation was reluctance or inability to obtain credit, which was followed by the fact that there was no adequate system to administer the vouchers at village level.

Table 12: Reasons for failure to purchase subsidised inputs even when selected for voucher issue

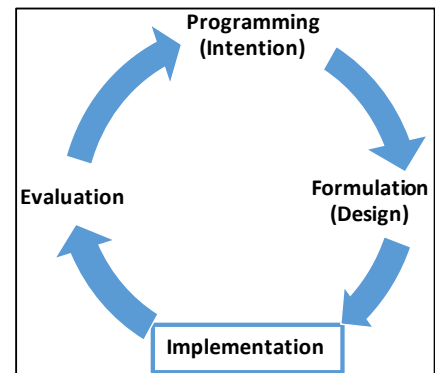
Did not have cash and did not have anybody to lend money	Did not have cash and could not find credit	Poor voucher administration in the village	Total
11	3	5	19

Source: Author's data.

4-5. Political economy of voucher management

Policy makers should consider the social component of a behaviour change induced by projects, since our behaviours are affected by relationships and the social contexts of where we live (World Bank, 2015c: 42). Corruption is one of the social norms which affects the effective operation of

projects (Mungiu-Pippidi, 2013). In Uganda, traditional systems rule over formal ‘modern’ ones, and thus fiscal corruption may be understood in a context of political economy where access to resources depends on patron-client networks (Fjeldstad, 2005). In Tanzania several studies suggest that neo-patrimonialism is the norm (Bratton and Walle, 1994; Booth, 2005; Pan and Christiaensen, 2012). Several authors suggest that ‘neo-



patrimonialism’ is prevalent in many African countries (van de Walle, 1999; deGrassi, 2008; Chirwa and Dorward, 2013). Patron-client relationships exist where there are very few opportunities for upward mobility in the shape of, for example, higher education, foreign intervention, extensive travel, wider communications networks, etc., and communities remain highly reliant on patrons (Cammack, 2007: 600). This situation may be even more prevalent under democratically-elected governments (Poulton, 2012: 2).

The majority of the informants whom I encountered in the field suggested that frauds and illegal behaviour within the management of NAIVS vouchers was a problem. Based on the empirical data, mainly, qualitative, this section looks at why, how and in which contexts these behaviours or actions occurred, and how they affected the effects of NAIVS and the lives of farmers.

Several reports of frauds in voucher distribution were made in key informant interviews in villages and towns. The majority of these concerned cases in villages where vouchers were taken up by village leaders or upper level bureaucrats or politicians, in collusion with agro-dealers. Farmers explained the frauds in the villages as discrimination or financial extortion on the part of village leaders and VVC members. But sometimes they did not report as they were afraid of being penalised by village leaders afterwards. The cause of these frauds are listed as follows: firstly I found that the structure of the VVCs did not work properly; indeed, I often heard that these were operated by VEOs, the secretary of VVC, the powerful village bureaucrats whom people call ‘President(s) in the village’. Secondly, most VVC members were not properly trained, eventually VVCs were actually controlled by the VEOs. Farmers mentioned that VEOs often collaborated with government extension officials at ward or village level and then colluded with agro-dealers. This made it non-transparent for villagers as to who had received vouchers. In several villages voucher distribution was actually controlled by the politically powerful people, namely, VEO, Ward/Village Agricultural Extension Officers, Ward Councillors, Ward Executive Officers, and agro-dealers, where the VVC or village assembly did not have any control.

In many villages, farmers mentioned favouritism in voucher distribution, claiming that VEOs and VVC members selected their friends and relatives as beneficiaries. They also

claimed that leaders sometimes wrote ‘ghost’ names so that they could keep the vouchers themselves, a practice which was also observed in the Targeted Input Programme in Malawi (Cullen and Lawson, 2005). In some villages, farmers claimed that VEOs and VVC members reserved vouchers for themselves first, and gave the rest to their friends and relatives, and that they also rewarded those farmers who made financial contributions to village activities, which was also seen in the Malawian case (*ibid.*). In many villages, farmers mentioned extortion, whereby they were asked by VEO and VVC members to pay extra money in addition to the top-up. One reason for this was that the work of VVC members is voluntary work – thus unpaid, although they had to dedicate several days to VVC work, especially at the time of voucher distribution. They had power on voucher distribution. I therefore heard in several villages that they used their power to consistently make an extra charge on farmers to be selected in order to compensate their work.

A district agricultural official in charge of vouchers was trained as a district office enumerator for my panel survey, however, later, the official decided that he did not want to participate in the survey. I suspect that he was afraid that the situation I was told of by villagers that “these corrupt activities were known to all, including village and district officers and leaders” would come to light.

In other villages, even when the farmers knew which agro-dealer would provide good quality inputs at cheap prices, some VVCs assigned a pre-determined agro-dealers to each of them. Under this system, the agro-dealers would not lose any of the vouchers brought to the villages but farmers sometimes had to buy inputs at higher prices. This is an instance of collusion between VVC and agro-dealers. Numerous poorer farmers stated that they were unable to afford even subsidised inputs because of the high price of seeds and fertiliser, together with the extra charge.

Bayart traces the roots of the corruption to the colonial state (Bayart, 1993). Since independence, there has been a ‘hasty construction of a new bureaucracy in the place of colonizers’ (de Sardan, 1999: 32), and the state of post-colonial Africa is now criticised by the western world as a legacy of the colonial system (Tripp, 1997: 60). De Sardan (1999) argues that the corruption in Africa is culturally rooted, pointing out five common sets of social practices: gift-giving, negotiation, solidarity networks, predatory authority and redistributive accumulation, last of which might be seen through NAIVS implementation. Corruption is socially accepted as legitimate because it is historically and culturally embedded (*ibid.*:34). Fjeldstad et al. (2003: 67) cite the study of Ghana (LeVin, 1975) and the case of Uganda (Tumwesigye, 1998) to argue that as there is no social stigma attached to corruption, even the bureaucrats sacked from their positions because they had acted corruptly, often did not express any guilt or shame.

Secondly, there was poor implementation capacity at lower level of government. There was a poor record of voucher management at district and village levels, as I found substantial discrepancies between the beneficiary data I obtained from villages and those of their respective

district governments (Table 13). The list of 200 beneficiaries in Village B, District C for 2011/12 provided by the district government repeats 40 names (20 per cent) and 31 beneficiaries (16 per cent) are missing from the beneficiary list obtained from Village B government office. Data provided by the district government are missing from the beneficiary lists of 2009/10 and 2010/11, but the data indicate that the 151 beneficiaries in 2009/10 are included among the 200 beneficiaries in 2011/12. Recalling that the programme targets the same households up to three times, we assume that the beneficiaries for 2009/10 and 2010/11 appear on this list. However, if the beneficiary list from the district government is compared with that from the village government, 39 per cent, 47 per cent, and 16 per cent each year respectively of the beneficiaries from 2009/10 to 2011/12 are missing from the beneficiary lists obtained from the village office. They are ‘missing vouchers’.

Table 13: Number of beneficiaries in Village B according to the beneficiary lists obtained from District C and Village B (2009/10 –2011/12)

Year	No. of beneficiaries	No. of beneficiaries common to lists obtained from District C and Village B	No. of beneficiaries missing from the list from Village B
2009/10	151	92	59
2010/11	177	94	83
2011/12	200	128	31

Source: The author’s calculation from CD source beneficiary lists provided by District C government, and beneficiary lists provided by Village B.

At a regional level, the Ruvuma agricultural officer also suggested that “as a political figure, the Regional Commissioner sometimes intervenes in the allocation of vouchers; sometimes he allocates vouchers to CCM [*Chama Cha Mapunduzi* (Tanzanian Conservative Party)] members.”³⁶ He went on to suggest that as much as 20 per cent or even more (60 per cent, he mentioned once) of the total number of vouchers might be illegally distributed in this way. This corroborates the information from some villagers that fewer vouchers had actually been distributed than had originally been promised. This might have been due to the fact that the leaders and VC members from region to village levels retained vouchers for themselves, as mentioned in Section 4-4-2-2.

Cooksey (2012) notes that political motives distort voucher distribution in NAIVS. He suggests that CCM made use of NAIVS in seeking votes, and that making ‘misallocations from national level down undermined the objective of targeting the subsidies at a broad group of smallholders’ (p.17). The largest number of vouchers was distributed in the election year, i.e., 2010/11, which contributed to the CCM victory. This politicised voucher allocation has benefitted the local elites, who have been allowed by ruling elites to plunder local development budgets and extract rents from farmers and businesses in order for the latter to secure the loyalties of the former. In the case of Ghana, input subsidies were used for political ends by the government so

that assistance was distributed to those villages where the ruling party had lost control in the previous presidential election (Banful, 2011). Chinsinga suggests that the subsidy in Malawi was deeply politicised and that technical debates on improving programme effectiveness were always preceded by political motives (Chinsinga, 2012a: 2). He suggests that ‘there are formal and informal coupon distribution’ (ibid., p.15), with informal distribution going to the areas where the Conservative Party had strong support. Such a politico-economic interpretation of input subsidy implementation could be explained in terms of ‘neo-patrimonialism’. Several authors suggest that the input subsidy programmes are inherently so politicized that they would be difficult to reduce or discontinue due to the pervasive vested interests with which they have become associated (Maliro, 2011; Chirwa and Dorward, 2013; Jayne and Rashid, 2013).

The private and politicised appropriation of vouchers has rendered beneficiary targeting and the very programme itself ineffective and inefficient. Subsidised inputs seized by politicians and village leaders might have been sold on the open market or provided at a discount to agro-dealers who redeemed their ‘expenses’ from the NMB without selling them to legitimate project beneficiaries. Alternatively, these inputs might have been sold to better-off farmers or exported through agro-dealers. Several informants in the field mentioned that farmers sold fewer vouchers in the later years of the programme, because of an increased awareness of the effect of inputs on maize yields. However, I heard of several cases of fraud and collusion between farmers and agro-dealers continuing at the time of my fieldwork, i.e., during the third year of the programme.

The above qualitative information as well as district government data suggests that from regional to the ward level, leaders obtained vouchers because subordinate leaders and VVC members favoured them in the hope of benefitting later on. The practice is maintained because village leaders and VVC members receive little or no pay and are often de-moralised. Some of these cases were reported to the court and subsequently penalised, as in the resignation of two District Commissioners in the region. According to the informants and a MAFC official, some of these cases were reported to the police and the accused were taken to court. MAFC officials mentioned the existence of a monitoring system through regular reporting from the districts and the despatch of ad-hoc monitoring missions. But informants mentioned that these attempts were still very few to capture all the frauds. In other cases such corruption was not reported, went unpunished and seemed to continue. These frauds and cases of collusion rendered the programme inefficient by causing many inclusion and exclusion errors in the targeting. Chirwa and Dorward suggest that in the Malawian FISP ‘the extent of elite capture does not appear to be as great as that reported by Pan and Christiaensen (2012) in Tanzania (in Kilimanjaro)’ (Chirwa and Dorward, 2013: 247) (In parenthesis by author). Possible reasons for the higher rate of elite capture in Tanzania than in Malawi are 1) more resources are available as the input voucher package in

³⁶ Interview in November 2012.

Tanzania is larger than that in Malawi, and therefore attracts more fraud; 2) the subsidy programme has a shorter history and the institutions designed to create greater accountability were less developed than in Malawi; and 3) Kilimanjaro and Ruvuma – the study area – are more remote areas than the average rural areas in Malawi, which is a smaller country, and thus less likely to be monitored and more easily abused.

Many scholars have argued that there are limits to state action in SSA. Ekeh (1975: 91) suggests that there are two ‘public realms’ in SSA. The first is based on the primordial groupings, ties and sentiments which influence and determine the public behaviour of individuals, is moral, and operates on the same moral code as the private realm. The second is civic public realm, such as the military, the civil service, the judiciary or the police, which is amoral and constitutes a place from which one seeks to gain, if possible in order to benefit the moral primordial public realm. Hyden (1980) suggests that ‘the fragmentary economic base that characterises a society where the peasant mode is strongly articulated gives rise to social formations in which primordial orientations are highly rational’ (27-28). This leads to limits to ‘state’ action in the civic public realm.

In the case of NAIVS, farmers knew that they were entitled to receive vouchers if they were smallholders and able to pay top-up. Their report on corruption was given to me not only out of anger, but also because they were struggling to get their own share of the resources on offer: they might have expected that after informing me that they had not got the vouchers to which they were entitled, those vouchers would be forthcoming.

Tensions were higher when there were few vouchers relative to the village population. Many village leaders (VVC chairpersons, village executive officials, village chairpersons) mentioned that if the village was allocated with very few vouchers, they would not want them because they feared that a majority of villagers would accuse them as if they were doing favouritism and fraud because only few villagers would receive vouchers. Input subsidy was thus a source of conflict in the villages from which the wealthier and more powerful ultimately benefitted. The subsidies brought differentiation (Guyer, 1981) among villagers, with the wealthier and more powerful increasing their wealth and power, while the poorer and less powerful did not get the expected benefits. Without subsidy, however, they would have suffered to a greater degree given the higher input prices and stagnant low maize prices, which will be discussed in Chapter 8. Furthermore, if farmers received subsidy, they could either use the inputs or get some money by reselling subsidised inputs or vouchers to wealthier leaders or agro-dealers. Knowing this, most villagers, both leaders and farmers, insisted that they needed more vouchers. A big agro-dealer in Songea, who has recently expanded both input and output (maize) business because he had means of transport, seems to be a big businessman with significant political and economic power in the area. He was very vocal about NAIVS, wrote articles about it in the newspapers and spoke of fraud carried out by leaders at regional, district and village levels.

“I don’t know anybody,” he said; “there might be conflict of interests”, and described frauds as follows:

The problem is with our leaders, especially in the way they implement the programme. They blunder because they know that the farmers have nowhere to complain. They may provide 2,000 vouchers, but out of those they take away, say, 300 vouchers and send them back (...). They send them to the agro-dealers they collude with. For instance, if I am the District Commissioner (DC)’s choice, I can get these vouchers because I am ‘his’ man. That’s where I differed from the district leaders. So the leaders hated me, but the farmers liked me.

At times he confronted the DC, believing that the latter was behaving illegally, while he said that he himself was on the side of the farmers. One example of this was when he was chosen by the villagers as the agro-dealer for dealing with subsidised inputs in the village, but the leaders of the ward did not want him to serve. The villagers did not like this decision and demonstrated against it, at which point the DC sent police officers to arrest them. The following day the agro-dealer went to the Office of Security Service and the Officer Commander of the District to ask them to release the villagers, telling the leaders to ‘stay clear of politics’. As to the politics of the input business, he explained

You know, our regions in the south are the breadbaskets of this country, especially in maize production. Nearly all the DCs in this part of the country took part in such terrible games, and hence some of them have been sacked and one has been transferred from one district to another. They usually asked the agro-dealers to give them a bribe of TZS 2,000,000 (equivalent to 798 BP³⁷). Normally the agro-dealers paid them, but after that the inputs did not reach the villages. I didn’t behave like that, so I quarrelled with them more often than not.

If leaders receive 600 vouchers, they distribute 500 and give the remaining hundred to the agro-dealers. These 100 vouchers are distributed among agro-dealers and leaders from district to village levels.

He went on:

It became a big scandal in 2010 (when the most vouchers were distributed), when the Regional Commissioner (RC) and DC formed a committee to look into the issue. Some extension officials were arrested and remanded in custody. It was published in the media.

He said that in 2010/11 and 2011/12 about 15 per cent and 25 per cent of vouchers, respectively,

were lost due to these frauds. He also mentioned small agro-dealers who lacked capacity or did not intend to engage in the business but merely obtained loans and then ran away:

The problem with the Tanzanian government is that it recruits agents who lack experience, who have no agricultural education, because in 2009 there were 150 agents. But nothing was done, the farmers did not get the services, instead the agents quarrelled with each other in the stations where there were ten agents, quarrelling over the vouchers, that is, who should get more vouchers, you know.

In the case of Ruvuma, up to the year 2011/12 we found that difficulties had been experienced in assigning agro-dealers without incurring abuse. The system was therefore changed in 2012/13 so that the MAFC assigned several input supplier companies which were responsible for contracting out to the agro-dealers which distributed vouchers in the regions³⁸.

His quotes must be political, as he has taken up a position in opposition to the DC who is in conflict with the RC and is a large-scale agro-dealer. But the fact of the illicit behaviour by politicians and agro-dealers could be true, although things might have been expressed rather exaggeratedly because of his political position against DC.

4-6. Conclusion

In this chapter we have seen how the NAIVS programme evolved through intention, design and implementation. The intention of the programme was to respond to the food and input crisis emergency by ensuring food security especially that of poor and vulnerable households facing food and input price hikes. This accords with poverty reduction and economic growth under the overall framework of the National Strategy for Growth and Reduction of Poverty, and to prioritising the provision of inputs and services in the ASDP. This was therefore originally meant to be short-term and had an 'exit' strategy. After the crisis ended in 2009, the programme changed its direction toward more sustainable footing, by encompassing future loan provision after the programme period.

The targeted group therefore changed during the programme, officially in 2011, from small-scale farmers with less than one hectare under maize or rice cultivation to middle-scale farmers, who cultivate more than one acre of maize or rice and are able to pay top-up. However, this reflected the reality revealed since the pilot year. As poor farmers were not informed of the effects of the inputs in the first years and could not pay the top-up, which itself

³⁷ Exchange rate (100 BP=250,700 TZS) as of 3 December, 2012.

³⁸ Information from various informants (MAFC, The World Bank, local government officials, etc.).

became more difficult as the years went by due to the increase in input prices, the beneficiaries became better-off farmers. However, the change in the targeting group made it also difficult to achieve the stated 'exit' strategy, which in turn made it difficult to achieve the programme objective of either poverty reduction or economic growth. Furthermore, this 'exit' strategy did not fit well with the culture of village leaders who did not like to be seen as exercising favouritism, and who thus distributed vouchers 'thinly', with 68 per cent of recipient households receiving vouchers for only one or two years.

The implementation of the programme was also flawed, due to the frequent late delivery of vouchers, corruption, neo-patrimonialism, politicised voucher allocation, illegal collusion between leaders and agro-dealers, missing vouchers and resale of vouchers by farmers. We found a large gap between the government data on the number of vouchers distributed in the region and the number of vouchers received as reported by panel households. According to government data, during four years of the programme (including the pilot year) all the farmer households could have 'exited'; meanwhile, a little more than half of panel recipient households were actually issued with vouchers only in one or two years. These 'missing vouchers' might have been captured by leaders from regional to village level, or by agro-dealers.

Village leaders explained that this practice was due to the allocation of a smaller number of vouchers to the villages and to their attempts to avoid accusations of favouritism, which led to turmoil in the community. However, this did not prevent some farmers from claiming that leaders had favoured families and friends. We also found that some selected farmers sold their vouchers due to late delivery in most years, lack of awareness of effects of inputs, and lack of capacity to pay the top-up in the face of increasing prices and no access to credit. All these flaws in implementation made the programme relatively ineffective and inefficient.

Vouchers are changeable to money, thus became as a source of conflict. When fewer vouchers were distributed, tension became higher among villagers, village leaders, agro-dealers, government officers and lower level politicians. But in the end politicians, government officials, village leaders and agro-dealers got most of the benefit, while small-scale, poor farmers were least benefitted from the programme.

The challenges of effectiveness and efficiency would be met by making clear the programme's intention, by providing an adequate programme design and implementation plan to fulfil that intention, and by developing the institutional capacity to run the programme without fraud and mismanagement. A plan must then be put in place to prevent the illegal behaviours, including proper monitoring and evaluation for implementation to be accountable and a mechanism for voucher delivery which is independent of the government administration system must be established.

Chapter 5. Characteristics of voucher recipients

Only a few local farmers will be able to pay the balance because some of them won't have the (money for) top-up for the voucher; and, for that reason, most of these vouchers will go to the wealthy farmers...and to government officials...or government institutions (Farmer group discussion, Songea district).

5.1 Introduction

Market-smart subsidy programmes generally have a dual objective: 1) to enhance national food security and accelerate economic growth through increased crop (mainly maize or rice) production; and 2) to reduce poverty by targeting poor, small-scale farmers and to enhance their household food security through better access to inputs (Chirwa and Dorward, 2013; Ricker-Gilbert et al., 2013a). Thus, one of the main features of the smart subsidy is the targeting of eligible households, that are, in most cases, poor small-scale farmers.

However, seeking to reconcile the two aspects of such a target sometimes leads to conflicting implementation techniques and challenge in attempting to ascertain exactly who should be targeted: in order to effectively achieve the increase in maize production, selected households might well comprise those with high marginal productivity, but may or may not necessarily be poor. Moreover, the decentralised targeting that is employed for most of subsidy programmes is based on the eligibility criteria, which, although it is supposed to be more cost effective has often suffered from elite capture and fraud, and thus invariably does not work well in practice as seen in the previous chapter.

A synthesis of recent studies on subsidy programmes informs us that intervention costs outweigh the benefits, given that the effect in terms of increased production has been found to be limited due to low fertiliser use efficiency, diversion from intended beneficiaries, and displacement of previously commercial input use (Jayne and Rashid, 2013). Indeed, research suggests that subsidy programmes tend to benefit wealthier households that previously purchased commercial inputs, thus crowding out commercial input use (Xu et al., 2009a; Ricker-Gilbert et al., 2011; Pan and Christiaensen, 2012). The study of Targeted Input Programme in Malawi suggests that between 14 per cent and 18 per cent of households that had received subsidy in 2011/12 did not satisfy any criteria for eligibility (Chinsinga, 2005: 148). Additionally, voucher distribution has often been observed to be manipulated by political interest, a phenomenon that arises from the targeting of areas in which the government wants to win popularity (Banful, 2011; Jayne et al., 2013).

The characteristics of voucher recipients have been observed to influence the

effectiveness of a subsidy programme such that, in terms of input use, the aforementioned limitations to efforts aimed at increasing production affect impact on yields and poverty reduction. Two studies, on Zambia and Malawi respectively, found that wealthier subsidy beneficiaries who had previously purchased commercial inputs and displaced them caused voucher programme inefficiency (Xu et al., 2009a; Ricker-Gilbert et al., 2011). Finally, employing quantile regression analysis, Ricker-Gilbert and Jayne (2012) argue that fertiliser subsidies do not in fact increase crop production for poorer households at all, and, therefore, do not reduce poverty.

In Chapter 4, we saw how the targeting of village households could deviate from programme guidelines; focus turned from poor, small-scale farmers to middle-income agricultural households; the programme was susceptible to elite capture through collusion or fraud; and vouchers frequently went missing from regional level before they could reach the villages. In this chapter, using district data and empirical panel and qualitative data collected from the study area, I explore the question of exactly who received vouchers in the region.

5.2 Characteristics of sample households

In this section, I firstly consider the characteristics of my panel sample of 309 households and their possible relationship with analysis of programme impact on maize yields and poverty reduction.

5.2.1 Sample distribution and voucher receipt experience

Panel sample distribution by district and voucher receipt experience is shown in Table 14 and Appendix 7. I mix the population of Songea district and Songea municipality for the panel sample analysis, since one panel sample village in Songea district became to belong to Songea municipality by the time of Round 4 survey. According to the data of Population and Housing Census 2012, Mbinga district has the biggest number of agricultural households located in the region sharing 40 per cent, followed by Tunduru district with 24 per cent, the rest was approximately equally shared between Songea (district plus municipality) and Namtumbo. From the Census data of the ratio of agricultural households in rural households my panel household distribution by district tells that Mbinga district was oversampled by 28 per cent, while Namtumbo district was under-sampled by 47 per cent, followed by Songea district by 17 per cent. Thus I would weigh the panel sample by inverted number of these over- and under-sampling of each district.

Table 14: Ratio of district population to total population of Ruvuma and sample panel distribution

	Census: Agricultural households in 2011/12	Census: Agricultural households in rural villages	Ratio of Agricultural households to region total (%)	Ratio of panel sample to region total (%)	Over- sampled	Weight to be made
Songea district	32,983	30,410	15.41	16.18	0.83	1.21
Songea municipality	37,025	8,072	4.09			
Mbinga	85,811	79,375	40.23	51.46	1.28	0.78
Namtumbo	33,633	31,414	15.92	8.41	0.53	1.89
Tunduru	53,299	48,022	24.34	23.95	0.98	1.02
Total	242,751	197,292	100.00	100		

Source: The author's calculation based on data from NBS (2013a); NBS (2013b); NBS (2013c); NBS (2013d); NBS (2013e).

The main cash crop in Mbinga district is coffee and the one in Tunduru is cashew nuts. Since input subsidies were for maize or rice cultivation, the big ratio of these two districts on number of households in the region would make the impact of input subsidy smaller, given a possibly higher ratio of input usage with these cash crops through, for example, exchanging vouchers in order to buy other inputs such as Calcium Ammonium Nitrate (CAN) for coffee (as asserted by a farmer in a farmer group discussion in Mbinga). Accordingly, my panel study results might have been skewed such that the programme impact on maize yields it reveals is lower than was actually the case.

Table 15: Sample panel distribution and voucher receipt experience during the programme

District	Number of households	Ratio to total (%)	Voucher receipt				Recipient rate
			Number of recipients	Ratio to total recipients	Number of non- recipients	Ratio to total recipients	
Songea district	50	16.2	44	0.22	6	0.06	0.88
Tunduru	74	24.0	40	0.20	34	0.32	0.54
Mbinga	159	51.5	99	0.49	60	0.57	0.62
Namtumbo	26	8.4	21	0.10	5	0.05	0.81
Total	309	100	204	1	105	1	0.66

Source: The author's calculation based on data from Christiaensen and Sarris (2004); Christiaensen and Sarris (2005); Christiaensen and Pan (2009a); Author's data

As shown in Table 15, of my 309 panel households, there were about twice as many voucher-receipt households as non-recipient households. 50 per cent of all recipients were found in Mbinga, about 20 per cent in Songea district and Tunduru, and 10 per cent in Namtumbo. The highest recipient rate was found in Songea district, with a rate of 88 per cent of the district sample, followed by Namtumbo with 81 per cent. Even in the district of Tunduru, which returned the lowest rate, slightly more than 50 per cent of the sample had received vouchers at some time during the programme. In total, about 67 per cent of sample panel households had received vouchers up to the fourth year of the programme.

5.2.2 Changes of landholdings and their usage

When looking at the change in landholdings between Round 3 and 4, ranging from 6.8 ha. in 2009 to 5.9 ha. in 2013, the average area of sample panel landholdings was bigger than the regional average of 4.0 ha. reported by the National Agricultural Sample Census (the author's calculation) (URT, 2012d) (Table 16). Also the area of land under cultivation of 2.6 ha. (in both rounds) was bigger than the regional average of 2.0 ha. found by the Census (URT, 2012c: 21). Accordingly, I infer that panel sample households were probably selected from relatively better-off households, that is, after villages were selected with stratified random sampling (Sarris, 2004), sample households might have been selected from accessible and better-off households in each village. Therefore, I consider the bias of households being relatively 'better-off' in interpreting regression results, as discussed in detail in this chapter and Chapters 6, 7, and 8.

Table 16: Average land characteristics by ownership and area under cultivation (ha.)

year	Recipients		Non-recipients		All				Ratio Recipients/NR	
	Owned (A)	Cultivated (B)	Owned (C)	Cultivated (D)	Owned	Rate of change (R4/R3)	Cultivated	Rate of change (R4/R3)	Owned (A)/(C)	Cultivated (B)/(D)
Round 3	7.7	2.9	5.0	2.2	6.8		2.6		1.53	1.31
Round 4	6.3	2.8	5.1	2.3	5.9	0.9	2.6	1.0	1.23	1.21
Total	7.0	2.8	5.1	2.2	6.3		2.6		1.38	1.26

Source: The author's calculation based on data from Christiaensen and Pan (2009a); Author's data.

5.2.3 Household members' / relatives' election to position of village leader

By reanalysing myself panel data from rounds 1–3 that were surveyed by Pan and Christiaensen (2010; 2012), it emerges that 60 per cent of the panel sample household heads were village leaders in Kilimanjaro. This is an incredibly high ratio of village leaders; however, according to the sampling frame document, the original panel households were selected randomly in the villages (Sarris, 2004). In my data in Ruvuma Region the ratio of local elites receiving vouchers in the pilot year was higher than this, as much as 71 per cent, while of the VVC members 25 per cent, compared to 14.5 per cent in Kilimanjaro. From this I could say that the level of elite capture in Ruvuma was even higher than the level of Kilimanjaro as shown in Table 17. Table 17 shows of the comparison between Kilimanjaro and Ruvuma on the mean values of the panel households out of the number of households being 'not eligible', 'eligible and not redeemed' and 'eligible and redeemed' across 'member of household has elected position in village' and 'member of households is village voucher committee'.

Table 17: Comparison on the ratio of being selected and in receipt of vouchers in the pilot year in Kilimanjaro and Ruvuma

	Not eligible		Eligible and not redeemed		Eligible and redeemed	
	Ruvuma	Kilimanjaro	Ruvuma	Kilimanjaro	Ruvuma	Kilimanjaro
Number of observations	488	602	50	18	144	152
% of member of household has elected position in village	61.0	37.5	72.0	44.0	71.0	57.5*
% of member of household is in village voucher committee	9.0	3.7	16.0	4.9	25.0	14.5*

Note: *Hypothesis means

Source: For Ruvuma author calculation from Christiaensen and Pan (2009a); Pan and Christiaensen (2012)

The average ratios of the percentage of households with elites to total households and voucher recipient and selected for vouchers of the round 1 to 3³⁹ and my panel are shown in Table 18. My panel data⁴⁰ show that about 20 per cent ((1 – 33.8 per cent) / 42 per cent) of the selected households for vouchers in the pilot year did not receive vouchers. My panel data also show that about 65 per cent of voucher recipients in the pilot year and 67 per cent of voucher recipients in any given year of the programme were village leaders, that is, holders of any official position in the community. At the same time, about 17 per cent of voucher recipients were VVC members, a lower percentage that derives from the fact that there were fewer VVC members (13 per cent) in the sample. And either village leaders or VVC members occupy as much as 68.5 per cent of the voucher recipients in any year. My panel sample households were also about 13 per cent points more likely to be selected for the programme, and about 13 per cent points more likely to receive vouchers in the pilot year than those in the original panel sample. And as many as 67 per cent of them were in receipt of vouchers in any given year, which is more than twice the proportion of the panel in the round 3. Such results could be correlated with the larger proportion of village leaders in my panel sample. Although in my analysis I control for these memberships I consider that the panel sample is composed of high ratio of village leaders and VVC members, which might affect the results on general trend of all the panel in this chapter, Chapters 6, 7, and 8.

³⁹ The panel rounds from 1 to 3 are the whole panel households, although there were attritions in Round 2 and 3.

⁴⁰ 305 households, i.e. representing all data variables, including those on individuals such as election to official village positions.

Table 18: Comparison of sample household characteristics

	Rounds 1 - 3 (677 households)	Round 4 (305 households)
Percentage of total sample households	(%)	(%)
Household or relative with one or more village leaders	56.2	61.3
Household or relative with VVC members	10.8	13.2
Household or relative with leaders or VVC members	81.9	84.6
Household or relative with village leaders and VVC members	57.5	63
Households selected for voucher in pilot year	29	42
Voucher recipient in pilot year	20.9	33.8
Voucher recipient in any year	30	66.6
Percentage of voucher recipients in pilot year		
Household head village leader	65.5	65.4
Household head VVC member	21.1	20.6
Households head either village leader or VVC member	68.5	68.9
Percentage of voucher recipients in any year		
Household head village leader	66.7	67
Household head VVC members	16	16.9
Household head either village leader or VVC member	67.6	68.5

*Household head elected to position.

Source: Christiaensen and Sarris (2004); Christiaensen and Sarris (2005); Christiaensen and Pan (2009a); author's data.

5-3. Characteristics of voucher recipient households

5.3.1. Regression strategy

In order to examine the characteristics of voucher recipients, I use quantitative and qualitative information. On quantitative analysis I use logit estimates, which employ a normal cumulative distribution function and utility theory, or rational choice perspective on behaviour, giving similar results to a logit model that is based on a logistical function (Gujarati and Porter, 2009).

In my analysis, the decision of the i th household to apply for programme participation or not depends on its access to vouchers, I_i , which is determined by one or more explanatory variables, X_i , such that the larger the value of I_i , the greater the probability of a household being selected for and receiving vouchers, as represented by the following formula:

$$I_i = B_1 + B_2 X_i$$

Here I place the hypothesis for research question I mentioned in Chapter 1 that: the more assets households have, the more likely they received vouchers. In order to analyse which assets were more related to the likelihood of receiving vouchers, I use the following composite asset framework, into which I factor five types of household as well political capital, as utilised in a typical sustainable livelihoods framework (Scoones, 1998; Carswell

et al., 1999; Carney, 2003), and introduced in the present thesis in the Theory of Change in Chapter 3. The analysis comprises an integrated quantitative as well as qualitative inquiry. Use of panel survey variables to measure each capital type is shown in Table 19.

Table 19: Variables adopted for the measurement of assets reported in household panel survey

Asset	Variable
Human capital	Age, gender, education level, health of household head, household size, number of farmers in household, and information and training on input use.
Financial capital	Amount of cash income, contribution to social functions in previous year, amount of outstanding borrowing and access to credit.
Natural capital	Soil quality ⁴¹ , total land area, and land area under cultivation.
Social capital	Amount of remittances/gifts from neighbours or family members outside the village, household members belong to social and religious
Physical capital	Distance to road and irrigation facilities, number of head of livestock (bullocks, cows, goats, pigs, chickens) owned ⁴² , having modern house roof, amount of Urea / improved seeds used, and total annual household consumption per capita.
Political capital	Household members/relatives are elected for positions in village, or in Village Voucher Committee.

5-3-2. Descriptive statistics of recipient and non-recipient households, and non-recipient households dropped from sample

Before looking into detail each category of the households who were selected for and received or did not receive vouchers in the pilot year or during the programme, I look at the difference in mean values in the Round 3 survey of the variables for the assets framework among these groups, but also look at households who reported as not received in the pilot year and are dropped from the sample households because of the propensity score matching⁴³ (Table 20). In the human capital variables the households selected for but did not receive vouchers with the eldest household head, with the biggest percentage of male heads, the highest proportion of heads having completed standard four, the heads being healthiest, and household size and number of farmers being the biggest. In almost all the variables the selected households in the pilot year followed them as the second place. It suggests that the selected households in the pilot year had bigger human capital. Meanwhile, non-recipient households in any year are headed by youngest, most proportion of female-headed, heads with lowest proportion of having completed standard four, the size of households and number of farmers in the households being the smallest, and the least proportion having received training on input use (1 per cent of the number of households).

⁴¹ Farmer's own judgement.

⁴² Value of each breed of livestock taken from median price in survey data.

⁴³ Propensity score matching uses only households who match between the treatment and control groups.

Table 20: Descriptive statistics of mean values of asset variables in Round 3 for recipient and non-recipient households

Types of capital	Variable	Not selected in pilot year	Selected in pilot year	Selected but not received in pilot year	Received in pilot year	Non-recipients in any year	Received in any year	Dropped households
	Number of households	177	128	25	103	102	203	25
Human capital	Househod head age	46.8	49.6	54.9	48.3	46.3	48.8	50.4
	Gender of household head (Male=1, Female=0)	0.88	0.98	1.04	0.96	0.88	0.94	0.96
	Education of household head (Completed standard 4=1, if not=0)	0.70	0.80	0.85	0.79	0.68	0.78	0.50
	Household head is sick/disabled (Sick/disabled=1, if not=0)	0.15	0.19	0.07	0.21	0.19	0.15	0.13
	Number of farmers in the household	2.90	3.15	3.28	3.12	2.71	3.15	3.39
	Household received training in input use (Yes=1, No=0)	0.04	0.02	0.03	0.02	0.01	0.04	0.05
	Household size	6.2	6.7	7.4	6.6	5.8	6.7	6.9
Financial capital	Annual cash income (Thousand TZS)	252.7	343.3	226.0	371.7	286.6	292.8	159.8
	Amount of contribution to social functions (Thousand TZS)	18.9	21.4	15.4	22.9	19.3	20.3	15.1
	Amount of borrowing (Thousand TZS)	289.0	197.6	158.8	207.0	365.0	193.1	26.3
	Whether household member belongs to primary society, SACCO, or other economic group (Yes=1, No=0)	0.17	0.33	0.26	0.35	0.12	0.31	0.00
Natural capital	Quality of land (Good=1, Average=2, Poor=3)	1.90	2.00	2.20	2.00	1.90	2.00	1.64
	Size of owned land (acre)	14.6	18.0	17.1	18.2	11.3	18.3	10.7
	Size of cultivated land (acre)	5.90	7.26	7.08	7.30	5.04	7.20	5.17
Social capital	Amount of remittance/gift received from relatives/friends (Thousand TZS)	66.0	104.5	46.1	118.6	66.9	89.8	40.3
	Household member belongs to religious/ social group (Yes=1, No=0)	0.40	0.48	0.43	0.49	0.32	0.49	0.30
Physical capital	Average distance of parcels to all weather road (km)	1.99	2.34	3.30	2.10	2.00	2.20	1.86
	Average of parcels with access to irrigation facilities (average of parcels with access=1, not=0)	0.13	0.17	0.12	0.19	0.10	0.17	0.01
	Number of bullocks	0.08	0.21	0.06	0.24	0.05	0.18	1.67
	Number of cows	0.38	0.82	1.19	0.74	0.49	0.61	2.67
	Number of goats	2.19	3.31	3.76	3.21	2.12	2.94	4.90
	Number of pigs	0.94	1.22	0.82	1.32	0.91	1.13	2.14
	Number of chickens	5.48	8.71	6.64	9.21	4.26	8.13	8.46
	Houseroof is metal/stone/concrete (Yes=1, No=1)	0.58	0.80	0.78	0.80	0.49	0.76	0.48
	Annual total household consumption per adult equivalent (Thousand TZS)	134.4	193.6	163.2	200.9	113.3	182.3	128.4
	Amount of urea used (kg)	35.9	80.5	47.9	88.4	9.3	77.3	32.6
	Amount of improved seeds used (kg)	0.2	2.4	1.1	2.8	0.1	1.6	0.1
Political capital	Household members/relatives are elected for position in village (Yes=1, No=0)	0.58	0.66	0.59	0.67	0.45	0.69	0.78
	Whether household member/relative is VVC member (Yes=1, No=0)	0.10	0.17	0.07	0.20	0.05	0.17	0.17

Note: Values are mean values adjusted by sample weighting by district level.

Source: Author's data

On the financial capital recipient households in the pilot year had the biggest financial capital in all variables except for amount of borrowing, the latter was headed by the poorer groups, namely, non-recipient households in any year and households who were not selected in the pilot year.

Again non-recipient households in any year had the smallest financial capital. On natural capital though the quality of land was headed by the selected households that did not receive in the pilot year, recipient households in any year or in the pilot year, or selected households in the pilot year had the biggest land sizes owned and cultivation. On social capital recipient households in the pilot year had the biggest amount or remittances / gifts from relatives / friends and were more likely to belong to religious / social groups. Meanwhile on the remittance / gifts the recipient households in the pilot year had the biggest amount. The biggest proportion of belonging to religious or social group was found in the recipient households in any year. On physical capital, interestingly, not-selected households in the pilot year and non-recipient households in any year had the closest parcels to all weather roads, while the selected households in the pilot year had the biggest distance or parcels to all weather roads, which is counter-intuitive. On all the other variables except for numbers of cows and goats, recipient households in the pilot year had the biggest values. Number of cows and goats were headed by the selected households who did not receive vouchers. This suggests that they had other expenses for taking care of these livestock, and had other source of income from them, thus for them the subsidized inputs were not such a priority. As for political capital, it was found that about 60 ~ 70 per cent of the sample household heads are elected to positions in the villages, which is implausibly high. This might partly be reporting error or due to the way in which the questions were framed. The recipient households in any year had the biggest proportion of being elected for positions in the village, while the biggest proportion of household member /relatives being in VVC was found in recipient households in the pilot year. In the pilot year when the programme was not well known to the people, vouchers tended to be obtained by VVC members themselves, but as the programme came to be known widely with years, vouchers became to be captured by village elites.

Throughout the variables, non-recipient households in any year, headed by younger, most proportion of female, least educated, with smallest household size had the smallest values, owning and less access to resources, except for the remittance / gift from relatives / friends, which they could get relatively more than other groups, since probably they needed them much. Meanwhile, the recipient households in the pilot year, though with lower education attainment, had the biggest values of almost all the variables. The selected households that did not receive vouchers in the pilot year were headed by the most elderly, male, with biggest household size and number of farmers in the households, had least cash income and less total household consumption, with receiving less remittance / gift and less contribution to social functions, and used less amount of improved seeds, which might be related to elderly household heads. Because of smaller income

and lack of interest in using improved inputs they did not receive vouchers in the pilot year. Recipient households in any year, being a big mixed group, because they were rotating the recipient households, had the middle level of values for almost all the variables, except that they had the biggest land size for cultivation and the biggest proportion of belonging to religious / social groups, and more household members / relatives were elected for positions in the village. It suggests that they had more social and political power to be selected for vouchers.

25 households which reported not receiving vouchers in the pilot year but which were dropped from the sample households have older, less educated heads, are more numerous and include more individual farmers. It seems that they maintain more livestock than the average of the whole sample; however, in most of the other capitals they have lower values compared to the other households. This group depends more on livestock rather than crop production, with lower income and other assets. However, their political capital, such as the mean value of being elites and village voucher committee members, is of the highest value. Dropping these livestock-oriented households from the sample would not much distort the analysis of my research.

In the following sections I will analyse in more detail the characteristics of recipient and non-recipient households in the pilot year and recipient households during the programme.

5-3-3. Characteristics of selected households, recipient and non-recipient households in the pilot year

First I will see who were selected for and received vouchers in the pilot year. Firstly, I examine the characteristics of those households selected for programme participation in the pilot year, making logit estimates of coefficients of household variables and village dummy variables in order to see the marginal probability of the households with these variables to be selected for voucher. In this regard, there is one village for which there are no relevant characteristics data, which is therefore excluded from the analysis. The difference-in-difference estimates show that the use of improved inputs for maize cultivation in 2007/08, before the programme started, increased the likelihood of selection for programme participation in the pilot year such that the deployment of improved seeds and Urea increased such likelihood by 14–16 per cent and 32 per cent respectively, both figures being statistically significant (see Appendix 8). The farmers who used inputs before the programme were the ones who benefitted from the previous input transport subsidy, which tended to benefit only wealthier farmers⁴⁴. Also there is vast literature about ‘early adopters’ – who are generally wealthier in various types of human capital and have more access to soft (information and financial services) and hard (roads, vehicles and marketplaces) infrastructure (Boz, 2002; Boz and Akbay, 2005; Etoundi and Dia, 2008).

However, these results contradict one of the programme selection criteria, which states

⁴⁴ Information from interview with MAFC officer (October, 2012).

that, “(p)riority is given to farming households [that] have used little or no fertiliser and improved seed with maize or rice over the last five years.” Therefore, selection was not made based on this criterion, a finding that is corroborated by Pan and Christeiaensen (2010), who reach a similar conclusion based on their analysis of the use of inorganic fertiliser in 2007/08. Such an apparent inconsistency may be due to the fact that although first village leaders tried to follow the selection criteria, the corresponding households did neither know the effects of the inputs nor were willing or able to pay top-up to receive vouchers, thus the leaders ended up selecting the households who had used inputs before.

Indeed, in village A in Mbinga, I was told by VVC chairman that, “Since farmers did not know the programme, they thought that inputs were free, so that village leaders were cheating money from them instead of giving vouchers free.” Moreover, in the pilot year in this village VVCs had yet to be set up;⁴⁵ rather, village leaders selected households according to programme criteria and decisions were approved at a village assembly. Given that many farmers did not know enough about the programme in order to make an informed decision, leaders tended to simply select households that were willing to use the prescribed inputs and pay the top-up.

Such a lack of information in the pilot year in particular was also reported by many study informants, as exemplified by the following extract:

Since farmers did not know the effects of the inputs, many farmers sold them at a cheap price or even gave vouchers either to the agro-dealers or to other able farmers who could pay the top-up; that was mostly in the pilot year.

A government agricultural official also asserted that the volume of issued vouchers that were subsequently sold on rather than used directly by the beneficiary to obtain inputs rose to 40 per cent in the pilot year, while by the third year, it had fallen again to about 10 per cent.

In my logit analysis I found that the likelihood of selection to the programme in the pilot year was also enhanced in villages in which residents enjoyed the convenience of an accessible mobile telephone network and were, perhaps consequently, visited frequently by maize buyers, that is, farming households in such villages were subject to sufficient voucher allocation for the effective use of inputs (Appendix 8). In this regard, statistically, it emerges that an increase in number of visits by 1 per cent raises the likelihood of household selection by 10 per cent, a ratio that is statistically highly significant; and mobile phone access increases such likelihood by 22 per cent, which is significant.

However, the logit results do not show a significant effect on selection likelihood in terms of household members and / or their relatives being VVC members, or the percentage of illiterate

⁴⁵ Interview, village informant.

household members, as do Pan and Christiaensen's regression results (2010: 66). Nevertheless, a village executive officer (VEO) in Mbinga asserted that, "Beneficiary farmers are big farmers with education." I therefore infer that the selection of my particular panel sample and / or the use of different variables have affected the results differently.

I now turn to the characteristics of voucher recipients. The results show that households deploying improved inputs for maize cultivation in 2007/08 in those villages that exhibited higher positive ratios in terms of input sales and visits by maize buyers are more likely to receive vouchers in the pilot year of the programme (see Appendix 9). This might be because of the different selected variables in the analysis. Indeed, if the amount of Urea use in the previous year increases by 1 per cent, the likelihood of receiving vouchers in the pilot year increases by about 3 per cent, which is statistically significant; while with regard to improved maize seeds, a 1 per cent increase in usage raises such likelihood by 11 ~ 13 per cent, which is also statistically significant.

Yet, enhanced likelihood of receiving vouchers might also increase the displacement of previously purchased commercial inputs by subsidised inputs. Such speculation is corroborated by the finding that increased Urea usage compared to the previous year was more evident amongst non-recipient than programme-participation households, a point that is explored further in the next chapter.

Analysing the whole original Ruvuma panel sample regression results, Pan and Christiaensen (2010) suggest that households in higher local economic quintiles; amongst the village elite; having members on the VVC or in prominent religious and / or social positions; and/or literate heads all have a significant positive effect on the likelihood of receiving vouchers in the pilot year, which, they argue, demonstrates that there was elite capture of vouchers in the pilot year in Ruvuma. However, my sample panel analysis does not show any such elite capture in the pilot year, indicating negative results in this regard in terms of both the effect of household members being members of Saving and credit organisations (SACCOs), and/or of religious or social groups (see Appendix 9). This might be because of the different selected variables in the analysis. The households whose members / relatives were VVC members were more likely to be elites: having these members in the elected positions in the villages or belonging to religious / social groups, which are statistically significant (Appendix 10).

As pointed out in Section 5-2-3, 20 per cent of the households selected for programme participation in the pilot year did not receive vouchers, the reason probably being that they were not convinced that the prescribed inputs would increase crop yields sufficiently to offset the financial cost of having to pay 50 per cent of the market prices of supplies. In this section, I consider the characteristics of those households that did not receive vouchers after being selected for the programme in the pilot year. Out of a total of 128 selected households, 25 reported that they had not been issued with vouchers, the reasons given being that they did not have sufficient

cash or could not obtain credit to pay the top-up (29 per cent), they did not want to seek to obtain credit (20 per cent), or other factors for which there are no data available.

The logit regression results show that households headed by elderly members, owning an above average number of cows, and/or farming comparatively poorly irrigated land tended not to receive subsidised inputs after being selected for programme participation in the pilot year (see Appendix 11). In respect of the first result, although, in some villages, I found that households with elderly heads were positively targeted by the programme on grounds of vulnerability, I was informed by several such households that they tended to be poor, since their children got married to have different households or became independent farmers even within a household and due to an inability to engage themselves in much farming on account of their advanced age. This made it difficult for them to pay the top-up. This is probably the reason for the special arrangement that was made for the elderly in the pilot year, as exemplified by one Mbinga villager, who noted that, “In the early years, a village chairman selected elderly household heads for voucher receipt and gave them free inputs”, whose practices, though, in later years, was criticised as doing favouritism by villagers, so that the chairman was sacked. However, farmers in several villages also informed of ‘tendency to being conservative in terms of adopting modern agricultural technology’ such that elderly-headed household heads prefer using traditional seeds and not using fertiliser. Finally, the second and third results are reasonable since the more cows a household owns, the more financial resources it must invest in animal husbandry, and the less cash it has to devote to crop production – and without proper irrigation, no crop can be successfully grown.

5-3-4. Comparison between the findings of Pan and Christiaensen (2010) and my analysis

I will compare the panel results found by Pan and Christiaensen (2010) with my analysis, using the same panel data (Table 21). The difference is due to the different regression model: Pan and Christiaensen used the two-stage Heckman selection model, using marginal productivities of maize and rice, or total production, while my analysis is based on the logit model, as mentioned above.

Table 21: Comparison between the findings of Pan and Christiaensen (2010) by Heckman selection model and my own by logit model

	Pan & Christiaensen (2010)	My findings
Selected households in the pilot year	<ul style="list-style-type: none"> •With high marginal productivity of inorganic fertilisers •Bigger land size •Having VVC members or being members of religious, youth, women’s or social 	<ul style="list-style-type: none"> •Used improved inputs in 2007/8 •Reside in villages with cell phone access and more visits by maize buyers.

Selected but not received in the pilot year	•Generally poor	•Elderly-headed, have more cows, have less irrigated land, reside where there is less access to health facilities but more access to water facilities
Recipients in the pilot year	•Households with previous use of inorganic fertilisers. •Bigger land size •Ndelendele and Yao group	•Used improved inputs in 2007/8 •Reside in the villages visited by more maize buyers
Recipients in any year of the programme	-	There was elite capture. They are leaders, used inputs before, have little non-farm income, own more livestock and have higher household consumption

Note: For the selected but not received in the pilot year by Pan and Christiaensen is of the descriptive statistics.

Source: Author developed from Christiaensen and Pan (2009a); Author's data

For selected households in the pilot year, there were different findings. Pan and Christiaensen found that they were households with high marginal productivity of inorganic fertilisers, more land, and including VVC members or being members of religious, youth, women's or social groups. My findings were that they were households which had previously used improved inputs and which resided in villages with more cell phone access and more visits by maize buyers. As to selected households which did not receive vouchers in the pilot year, there was no regression study made by Pan and Christiaensen: my logit estimates are that households headed by elderly individuals, owning more cows, with less irrigated land and residing where there is less access to health facilities but more access to water facilities, were more likely not to receive vouchers. As regards recipient households in the pilot year, the two sets of findings agree that households which previously used improved inputs were well-represented. While Pan and Christiaensen found households with more land and the Ndelendele and Yao groups were more likely to receive vouchers, my finding was that households which reside in the villages visited by more maize buyers were more likely to receive vouchers. My finding on recipients in any year of the programme was that there was elite capture – the households with members / relatives are in elected positions in the villages, also used previously the improved inputs, have little non-farm income, own more livestock and have higher household consumption.

5-3-5. Characteristics of voucher recipients during the programme

As the programme proceeded, farmers became aware of the effects of the prescribed inputs on maize yields. Because of comparatively few vouchers per number of households in most of the villages under study ⁴⁶ the beneficiaries had to be selected. However, the selection criteria determined by the programme and actual implementation differed from the rule.

MAFC official in the input support section explained the criteria for selecting programme participants, suggesting that, "Beneficiaries are low- to middle-income farmers," but rather that

“small-scale farmers often can’t afford to pay the top-up.” Also, a World Bank official suggested that beneficiaries were “middle-income, production-surplus farming households”. An elderly widow also suggested that beneficiary farmers had to be able to make a “financial or physical contribution to village life,” which she did not have the capacity for, meaning that she was not eligible for the programme. Additionally, a farmer in Songea district asserted that:

The programme is good but the problem is when the intended beneficiaries don’t get vouchers. Powerful people benefit: they are the agro-dealers, district officials, village leaders, and VVC members.

In a farmer group discussion in Tunduru, it was stated that village leaders “don’t know who did not receive any vouchers in their sub-villages,” it having been already asserted that, “beneficiary candidates were selected in sub-village meetings where every household participated,” and, after that, “(recipient candidate) lists were approved in the village assembly.” Accordingly, they should have known who had benefitted or not each year, but when I asked them why this was not the case, they responded that they didn’t want to be seen as spying on neighbours. This suggests that they were envious of recipient households, considering the subsidy as merely supplementary income because they knew how the programme operated by then. Moreover, as mentioned above, there were many cases of collusion between farmers and agro-dealers, meaning that if neighbours heard about them, they might not want to talk about who received vouchers and who did not. It may therefore be concluded that fraud, illegal actions, and deviation from the rules in terms of voucher management were all prevalent.

We find that voucher recipients in any year of the programme were the households with one or more members and / or their relatives in the VVC, those who deployed improved inputs before the programme, those with comparative little non-farming income, those with more livestock, and those who exhibited higher household consumption (see Appendix 12). As seen above, there is a positive correlation between household members or their relatives who are in the VVC, those or their relatives who are village leaders (in elected positions), and those who belong to religious and/or social groups (Appendix 10). Therefore, the results suggest that as the programme advanced, it was village leaders and better-off households used to deploying improved inputs before the initiation of the programme who were issued with vouchers. In the traditional context of the study area, the elderly are invariably respected by villagers and thus have local power in this sense; however, here, I refer to the robustness of the young, that is, being active and mobile, and physically able to farm, with the propensity to access new agricultural technology and methodology, and obtain trials, about which I will mention as case stories in

⁴⁶ With the exception of two surveyed villages in Songea District.

Chapter 7. Although even given that there was a high percentage of leaders in the sample, the logit estimate allows a comparative analysis of the likelihood of voucher receipt in terms of elite versus non-elite community members, and shows that leader that the programme was biased towards households whose members comprised one or more village leaders.

I was frequently informed that leaders distributed vouchers to their friends and relatives, ‘doing “favouritism”’; and also learnt in the field of several cases of certain selected households returning vouchers to leaders because they were unable to pay the top-up, meaning that the elite secured them in the end by default. Given that, according to my above logit results, such elite capture was not significant either in the cases of households selected for vouchers or of recipient households in the pilot year, it may be inferred that any significant elite capture was evidenced in subsequent years when a greater number of vouchers was issued.

The logit estimate findings also suggest that better-off households were likely to receive vouchers. This result accords with much of the information collected through interviews with key informants, as exemplified by the individual who remarked that, “the programme benefits the middle income or better-off households, not the poor households.” The reasons for this given in the field were that, “Input prices rose up after the programme started,” and “village leaders and VVC members were asking additional money to the farmers”, both of which made it increasingly difficult for poor farmers to pay the top-up.

The effect of previous Urea application on voucher receipt could be due to the increased difficulty of paying the top-up in the face of escalating input prices over the course of the programme, about which I heard numerous complaints. Many farmers asserted that this made it difficult to get vouchers, which, in turn, meant that only those farmers used to deploying the prescribed inputs and aware of the benefits in terms of crop yield were willing to continue using them under the programme and considered it cost effective to pay ever increasing prices from year to year.

However, this means that the programme failed to promote new users of its tried and tested inputs as had been the aim; neither did it achieve poverty reduction amongst poor, small-scale, or vulnerable farmers due to increased crop production through continuous use of improved inputs; rather, it simply helped elite, well-informed, and better-off farmers to expand the gap between them and their less fortunate counterparts.

The positive effect of having less off-farm income suggests that the programme targeted households whose income derived mainly from farming, which is in keeping with its mission in the sense that such households should be more willing to invest in agricultural resources and technology. Keeping comparatively more chickens increases the likelihood of receiving vouchers by six per cent. This suggests that such households spend comparatively less on food than do neighbours who keep fewer chickens, and gain more income from selling eggs and chickens – meaning that they are better-off and can afford the top-up.

5-4. Conclusion

In this chapter firstly I considered the characteristics of panel sample households. I found a high ratio of members of elites among panel sample households. This was probably for practical reasons, and because village leaders preferred to select those households who were more accessible, or with which they had a closer relationship, for the panel. Sample households were found to own or farm larger areas of land than was the average for the region, and were also mainly traders in maize. Also I made a comparative analysis of those selected for the programme, and those that actually received vouchers in its pilot year as well as across the whole four years of its duration among my panel sample households and the original whole panel sample. It emerged that my panel sample households were about 13 per cent more likely to receive vouchers in the pilot year than was the case with the original whole panel sample for all rounds; and 36.6 per cent of my panel samples were found more likely to be voucher recipients in any given year of the programme, which is more than twice the ratio found in respect of the whole panel sample for rounds 1–3. These findings affect further analysis of the impact of voucher receipt on maize production and poverty, which I consider in chapters 6 and 7.

My regression findings suggest that in the pilot year, those households that had previously deployed improved inputs tended to be selected for vouchers. The regression results by Pan and Christiaensen (2010) and my findings on likelihood of being selected for and receiving vouchers in the pilot year are different, whose discrepancy is due to the different regression models. The only coincidental finding between the two is that the households with previous use of improved inputs were likely to receive vouchers in the pilot year.

The programme aimed to prioritise households with no or very little history of improved input usage during the five years before the programme; however, the reality tended to be the opposite practice: I surmise that leaders initially sought to adhere to selection criteria in the first year, but many targeted farmers were unaware of the programme itself thus of the benefits of the prescribed inputs in terms of increased yields, and therefore were not keen to pay the top-up. Recipient households in the pilot year exhibited similar characteristics: those with a previous prescribed-input history tended to be issued with vouchers. In this regard, such experienced households were probably more willing to use programme inputs in the first place, and, having obtained them, they would displace previously purchased inputs, which would decrease the effectiveness of the input use (Ricker-Gilbert et al., 2011). This will be analysed in the next Chapter.

Households that were selected for the programme but did not receive vouchers in the pilot year tended to be headed by elderly members, own more cows, and farm comparatively poorly irrigated land. Although initially targeted due to their perceived vulnerability, elderly-headed households tended not to receive vouchers, probably either because they were unwilling or unable

to change traditional farming practices or were too poor to pay the top-up.

Over its four-year lifespan, the programme expanded its target beneficiary pool, tending to include more village leaders, more households that had previously used Urea, those that were better-off, and those that generated comparatively less off-farm income. Elite capture and the targeting of better-off households – i.e. characteristics of those that wield power – did not conclusively emerge from my findings with regard to the pilot year, but was found to have a strong effect on voucher receipt in later years as the programme expanded and more farmers learnt about it. It seems that the tendency was initially to target according to preset programme criteria and, specifically, only accept those with a history of no or little improved input usage; but the intervention was later revised such that the programme focus was turned from targeting poor and small-scale farmers, to middle-scale cultivators and those that generated a food surplus. Now on the implementation due to late delivery of vouchers receiving subsidized inputs, especially first application fertiliser and improved seeds, was actually meaningless for farmers so that they did not want to receive them. At the same time, real input top-up prices increased, which made it difficult for poor farmers to get subsidised inputs. Under this situation, voucher management was increasingly manipulated by village leaders and experienced more cases of late delivery in subsequent years – all of which meant that only the better-off households could afford to pay the top-up and receive vouchers.

Chapter 6. Impact of NAIVS on maize yields

We are asking to increase amount of fertiliser vouchers: there is need of use of fertilisers, soil is tired. For maize, without fertilisers you will not have good production; without fertilisers farmers are living terrible life (Farmer, Tunduru District).

6.1 Introduction

In the previous chapter, we saw that the programme benefitted wealthier households with prior use of inputs who tended to be village elites – a situation that differed from the programme design, which stipulates targeting to small-scale or vulnerable households without prior use of improved inputs in the last five years (World Bank, 2009a). Households with sick or disabled heads tended to receive vouchers, but not their female-headed counterparts, as the programme designated. Moreover, as seen in Chapter 4, section 4-4-2-2, vouchers were thinly distributed to farmers for one or two years only, which made less of an impact on recipient household accumulated resources compared to that which had been set.

Several studies claim that Malawi's Farm Input Subsidy Programme (FISP) has increased maize yield (Holden and Lunduka, 2010; Chirwa and Dorward, 2013; Chibwana et al., 2014). Chirwa and Dorward (2013) cite a study by the School of Oriental and African Studies et al. (2008) that, in terms of yield responses to subsidised nitrogen and per kilogram of subsidised nitrogen use, found that maize yields increased by 18 kilograms with the deployment of hybrid seeds.

Other studies consider the displacement, mistargeting, and elite capture that all impact negatively on subsidy programmes (Xu et al., 2009a; Chirwa and Dorward, 2013; Jayne et al., 2013; Ricker-Gilbert et al., 2013a). For example, Ricker-Gilbert et al. (2011: 40) found that for every kilogram of subsidised fertiliser, 0.22 kilograms of commercial purchases were displaced. Moreover, using farm plot data in Malawi, Holden and Lunduka (2011) found that access to subsidies significantly enhanced the amount of fertiliser used at plot level, but that non-recipient households increased maize yields more than recipients, which is found in my analysis, given in 6.2.2, below. They concluded that such a contradictory result was due to the targeting of less efficient households.

In order to avoid the problem of displacement, the National Agricultural Input Voucher Scheme (NAIVS) applied eligibility criteria and targeting to households who did not use inputs before the programme. However, if the use of a given input was popular in a particular locality – as with Urea in the present study's research area of Ruvuma – such targeting was sometimes difficult because households without previous input use tended to be very poor and therefore

could not afford the top-up even at subsidised rates. Displacement also occurred when elite members of the community – generally the better-off farmers – ‘captured’ vouchers (Jayne and Rashid, 2013; Ricker-Gilbert et al., 2013a). Such individuals tended to reduce the impact of the programme in terms of either increased production and/or poverty reduction.

Accordingly, in this chapter, employing both qualitative and quantitative data, I consider whether the programme increased maize yields in the region under study.

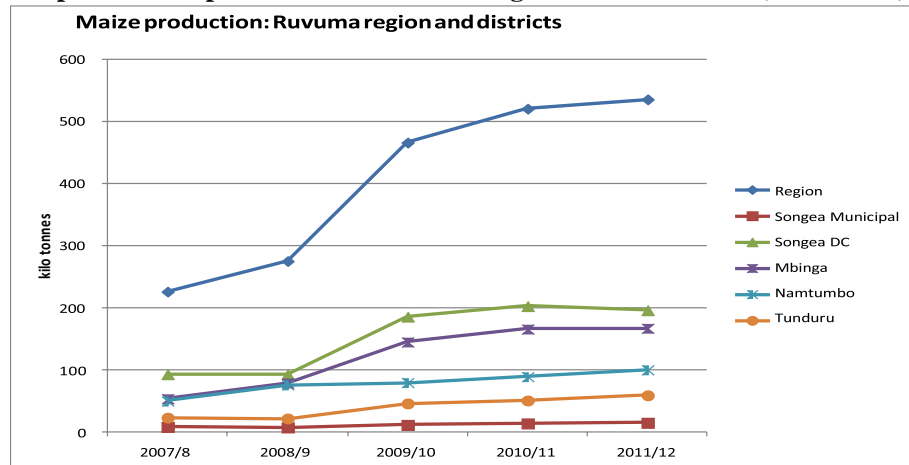
6.2 Maize production and input use

6-2-1. Maize production

Ruvuma is one of the ‘Big four’ regions in the Southern highlands – the principal maize production area in Tanzania. Below I present the analysis of maize production using data obtained from the Ministry of Agriculture, Food Security and Cooperatives, which is, however, different from National Agricultural Sample Census 2007/08 data, e.g. ratio of maize production in Ruvuma to country total as follows. From 2007/08 to 2011/12, Ruvuma itself accounted for about nine per cent of national output on average (URT, 2013d). Along with the growth in production of whole country, Regional Secretariat (RS) data (2012a) suggest that maize production in Ruvuma also increased by about 80 per cent during the period, although the increase ratio seems too large to be credible (Graph 3). Within Ruvuma, Songea district is the biggest maize producer, at 41.0 per cent of regional output in 2007/08; a production figure that rose sharply from 2009/10, the year the NAIVS programme became fully operational. The increase ratio of maize production during the four years does not accord with the voucher allocation in the region. Production increase was bigger in Mbinga than in Songea, by 214 per cent and 111 per cent, respectively, while Songea district received almost a third of regional total of voucher distribution and Mbinga received almost a quarter. This was probably either due to the less maize production in Mbinga than in Songea prior to NAIVS, thus more prevalent previous input use for maize in Songea district than in Mbinga, or reporting error, or that there might have been other support for increasing maize production.

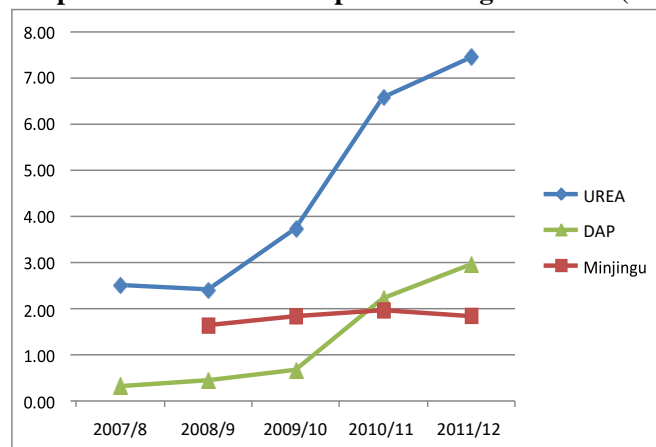
The escalation of regional total maize production was also suggested by an agricultural officer at the RS: “Production rose up because of subsidies. Ruvuma has normally good rain; sometimes there were droughts. Around 75 per cent of farms succeed cultivation normally.” This increase in maize yield in Songea district coincided with an upturn in fertiliser consumption, as seen in the data from Songea district government which shows that after introduction of the programme, consumption of Urea was increased up to three times in 2010/11 compared to 2008/9, and the consumption of DAP increased by more than six times (Graph 4). Considering the biggest voucher distribution in the district during the period, we may therefore assume that at least part of such an increase in maize production was a direct result of this intervention.

Graph 3: Maize production in Ruvuma region and its districts (kilo tonnes)



Source: Ruvuma RS (2012a).

Graph 4: Fertiliser consumption in Songea district (kilo tonnes)



Source: Author developed from Songea DC (2013)

6-2-2. Quantitative evidence on input use

Before proceeding with the analysis of maize yields, I consider closely the change in input use in the region in more detail, since this variable was believed to play a major role in increasing maize yields, which was the aim of the programme. National Agricultural Sample Census data for 2002/03 suggest that input use in Ruvuma was at 13 per cent, which was relatively high in nationwide terms (URT, 2006a). However, panel data indicate that almost 50 per cent of recipient households used Urea before engaging in the programme (Christiaensen and Pan, 2009a). Such a high ratio was corroborated by the analysis in the previous chapter.

Table 22 suggests that both recipient and non-recipient (in any year) panel households increased their input use, with the exception of improved seeds in respect of non-recipients. It is noted that the highest increase ratio was observed in the case of non-recipient household for inorganic fertiliser use, twice the ratio of recipient households, though the former used still lower amount than the latter. This could partly be an educational effect from NAIVS, or other intervention. A farmer in village I in Mbinga exemplified the positive effect of the intervention

in a farmer group discussion thus: “Before we received the (subsidised) fertiliser, we were suffering hunger: we had to use the money we had saved up to buy food for buying fertiliser.”

Table 22: Input use and increase ratio (%) among panel sample

Rounds	Recipient households				Non-recipient households				All households			
	Improved seeds	Rate of increase	Inorganic fertiliser	Rate of increase	Improved seeds	Rate of increase	Inorganic fertiliser	Rate of increase	Improved seeds	Rate of increase	Inorganic fertiliser	Rate of increase
Round 3	15.1		163.9		7		95		13.4		149.7	
Round 4	24.7	63.6	289.9	76.9	2.8	-60	219.6	131.2	23.2	73.1	277.2	85.2
All	21.9		228.5		5.3		153.6		20.1		214	

Note: Data represent crops other than maize.

Source: Christiaensen and Pan (2009a); Author's data

I now turn to the examination of increased input use in more detail. Tables 23 and 24 show changing average consumption levels in terms of both commercial and subsidised inputs for maize plots, classified by voucher receipt in 2011/12 respectively. These two tables show that the recipient households in 2011/12 purchased commercial inputs in the voucher package for maize plots by about three times as much as the amount purchased by non-recipient households in 2011/12, which shows the recipient households in 2011/12 might have been wealthier than non-recipient households in general, which was enabled to buy more commercial inputs. Table 23 shows that recipient households increased all the improved inputs for maize plots, among which the increase of MRP was mainly due to the voucher. The average maize plot area of the panel households was decreased slightly from Round 3 to Round 4 (1.44 ha. to 1.35 ha.). Thus in average terms, the increase of commercial purchase for maize plots even when their owners received vouchers in the year, suggests that there was no displacement of purchased inputs for maize. On the contrary, non-recipient households in the year reduced their purchase of commercial Urea and DAP for maize compared to the one in 2007/8, which was probably due to their lack of capacity to purchase these inputs for maize in 2011/12 under the increasing the real prices of these inputs, which will be looked at in more detail in Chapter 8. Meanwhile, they increased purchase of MRP and hybrid maize seeds, which was probably more accessible in terms of their prices.

Table 23: Changes in recipient households in 2011/12, patterns of averaged commercial and subsidised input usage for maize plots (rounds 3 to 4: kg)

	Round 3 (A)	Round 4 commercial purchase (B)	Difference (B) - (A)	Ratio (B) : (A)	Round 4 voucher	Round 4 all use (subsidized/ commercial) (C)	Ratio (C) : (A)
Urea	99.8	114.6	14.9	1.15	66.1	180.7	1.81
DAP	5.7	3.1	-2.6	0.54	4.6	7.7	1.34
MRP	1.5	5.1	3.6	3.33	35.2	40.3	26.33
Hybrid seeds	1.6	4.5	3.0	2.91	5.2	9.7	6.26
OPV	0.9	0.0	-0.9	0.00	0.0	0.0	-

Note: Data are of 98 households

Sources: Christiaensen and Pan (2009a); Author's data.

Table 24: Changes in non-recipient households in 2011/12, patterns of averaged commercial and subsidised input usage for maize (rounds 3 to 4: kg)

	Round 3 (A)	Round 4 commercial purchase (B)	Difference (B) - (A)	Ratio (B) : (A)
Urea	33.2	27.9	-5.3	0.84
DAP	1.2	0.0	-1.2	-
MRP	0.5	1.7	1.2	3.43
Hybrid seeds	0.4	0.6	0.2	1.45
OPV	0.0	0.0	0.0	-

Note: Data are of 207 HHs

Sources: Christiaensen and Pan (2009a); Author's data.

Since the survey period corresponding to Round 3 (2007/08) was a year before the pilot year of NAIVS, the input amount reported in Round 3 did not reflect the report of voucher receipt in the pilot year. As seen in the Chapter 5, the recipient households in the pilot year were wealthier households and had used the improved inputs for maize before the NAIVS, the report of voucher receipt in the pilot year (2008/09) could be considered to reflect the households' position on affordability of using inputs in the surveyed year. I will disaggregate the households' voucher receipt experience into more detail and look at change in amount of input usage for maize among them (Table 25 to 27).

Table 25: Changes in recipient households in 2008/09 but did not receive in 2011/12, patterns of averaged commercial and subsidised input usage for maize plots (rounds 3 to 4: kg)

	Round 3 (A)	Round 4 commercial purchase	Difference (B) - (A)	Ratio (B) : (A)
Urea	62.0	34.1	-27.9	0.6
DAP	4.0	0.0	-4.0	0.0
Minjingu	1.6	4.8	3.2	3.0
Hybrid	0.9	1.7	0.8	1.9
OPV	0.0	0.0	0.0	-

Note: Data are of 62 HHs

Sources: Christiaensen and Pan (2009a); Author's data

Table 26: Changes in households which did not receive vouchers in 2008/09 but received in 2011/12, patterns of averaged commercial and subsidised input usage for maize plots (rounds 3 to 4: kg)

	Round 3 (A)	Round 4 commercial purchase (B)	Difference (B) - (A)	Ratio (B) : (A)	Round 4 voucher	Round 4 all use (subsidized/ commercial) (C)	Ratio (C) : (A)
Urea	79.2	73.4	-5.8	0.93	59.2	132.6	1.67
DAP	0.0	0.9	0.9	-	4.4	5.3	-
MRP	0.0	6.1	6.1	-	24.6	30.7	-
Hybrid seeds	0.5	2.4	1.9	4.63	3.4	5.8	11.10
OPV	0.0	0.0	0.0	-	0.0	0.0	-

Note: Data are of 59 HHs

Sources: Sources: Christiaensen and Pan (2009a); Author's data

Table 27: Changes in non-recipient households, patterns of averaged commercial and subsidised input usage for maize plots (rounds 3 to 4: kg)

	Round 3 (A)	Round 4 (B)	Difference (B) - (A)	Ratio (B) : (A)
Urea	10.8	24.1	13.3	2.23
DAP	0	0	0	-
MRP	0	0.5	0.5	0.00
Hybrid seeds	0.15	0.08	-0.1	0.53
OPV	0	0	0	-

Note: Data are of 102 households

Sources: Christiaensen and Pan (2009a); Author's data.

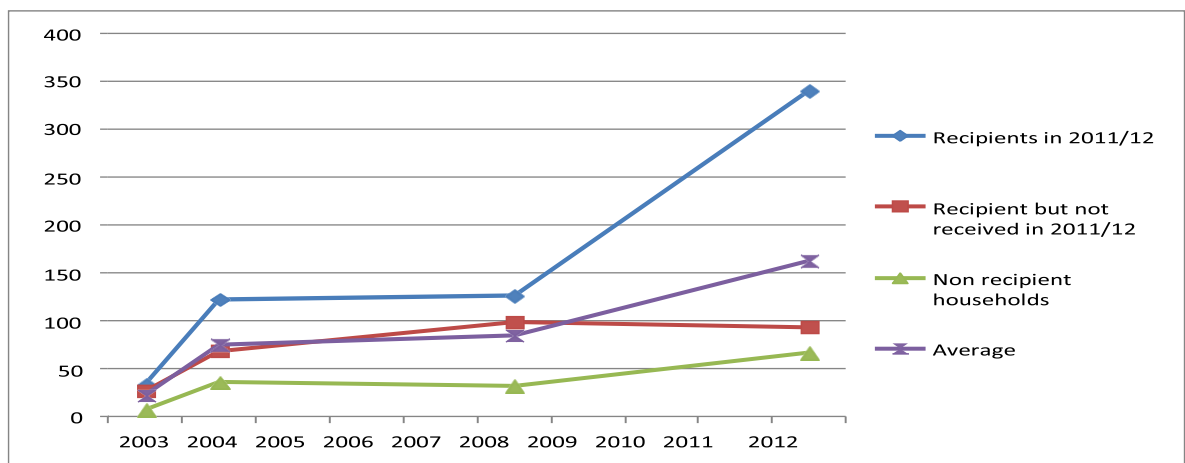
Table 25 shows that the recipient households in 2008/09 which did not receive vouchers in 2011/12 reduced their purchase amount of Urea for maize by 45 per cent, which might reflect their decline in affordability to purchase Urea, and did not tell the story that ever-recipient households continued to purchase inputs, as the programme had designed. Meanwhile, the non-recipient households in 2008/09 which received in 2011/12 had purchased Urea for maize higher amount in 2007/08 than the households grouped in Table 25, and remained almost the same purchase amount of Urea for maize as in 2007/08 even receipt of subsidy in 2011/12 (Table 26). This suggests precisely that there was no displacement of purchased Urea for maize by this household group. And the total usage amount of commercial and subsidized inputs for maize of this group is lower than the one of all the recipient households in 2011/12, which includes the group which received vouchers in both years. On the other hand, households which did not receive vouchers in any one year increased purchase amount of Urea for maize from rounds 3 to 4, which is in line the findings in Table 22 (Table 27).

From the analysis above, we did not find that there was displacement of input use for maize by recipient households in 2011/12, meanwhile, the households who received vouchers in

the pilot year but did not receive in 2011/12 reduced substantially the commercial purchase for maize from prior to NAIVS. As we have seen in Chapters 4 and 5, in increasing input prices, farmers' capacity for receiving vouchers and purchasing commercial inputs fluctuated as years went by. If they have capacity to receive vouchers, they were the ones who could maintain or increase commercial purchase, but if not, they ended up reducing their input use in all. This suggests the fluctuation of the capacity by farmers to purchase inputs during the years.

Graph 5 shows the panel households' total inorganic fertiliser usage patterns for all crops by voucher receipt experience. In 2011/12, households who could afford to pay the top-up seemed to invest much more in inorganic fertiliser than those who were unable to utilise vouchers that season. It also shows the slightly reduced usage of fertiliser by the recipient households in the pilot year who had previously been in a position to utilise vouchers but were unable to do so in 2011/12.

Graph 5: Inorganic fertiliser usage patterns by voucher receipt experience (kg)



Note: Reported total amount of inorganic fertiliser used.

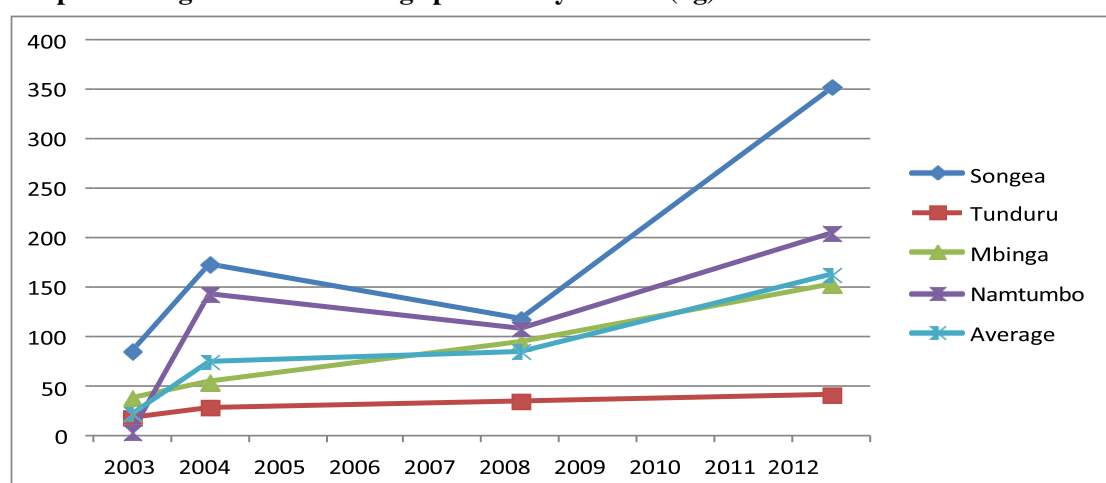
Sources: The author's calculation from Christiaensen and Sarris (2004); Christiaensen and Sarris (2005); Christiaensen and Pan (2009a); Author's data.

Graph 6 shows the same data as Graph 5 but disaggregated by district. Songea district ranks as the highest user of inorganic fertilisers throughout the period (2003–12), followed by Namtumbo district, which, although, it had previously experienced some increase, evidenced a lower rate than the former from 2008 to 2012. On the other hand, Mbinga district maintained a constant upward trend in voucher usage. This suggests that neither the input transport subsidy⁴⁷ nor that provided through NAIVS made a substantial impact on input usage in Mbinga, the latter, however, contradicts the relatively high voucher allocation to this district in the region. There might have been inefficient use of vouchers by frauds or illegitimate use, or missing vouchers, which might have been due to late delivery. Due to the district's focus on coffee production, inputs were also

⁴⁷ This was cited in the Chapter 5.

provided for coffee not only by NAIVS but also by other initiatives, such as coffee farmer associations, which were well established and numerous, having been observed in many villages. As the contracted farming with provision of inputs was prevalent in these associations, this input amount might not have been reported in the survey. In an earlier period, the impact of the 2004 input transport subsidy for maize and rice was only apparent in Songea and Namtumbo districts, while the other two districts did not show substantial changes in their respective input usage patterns that year. Input usage in Tunduru district was deemed to be too low, which might be due to under-reporting of the actual usage.

Graph 6: Inorganic fertiliser usage patterns by district (kg)



Note: Reported total amount of inorganic fertiliser used.

Sources: The author's calculation from Christiaensen and Sarris (2004); Christiaensen and Sarris (2005); Christiaensen and Pan (2009a); Author's data.

6-2-3. Qualitative evidence on input use

Next, drawing on qualitative data from interviews and farmer group discussions, the outcome that a generally upward trend in voucher usage notwithstanding, this did not lead to a concomitant increase in the deployment of inorganic fertiliser is explored. One reason for such an outcome might be that recipient farmers displaced previously purchased inputs for cultivation of other crops. In this regard, a ward agricultural extension officer (WAE0) in village C in Mbinga district claimed, "We don't need input subsidies for maize: we need them for coffee because main crop is coffee." Moreover, a farmer in Mbinga district stated that a voucher had procured a bag of calcium ammonium nitrate (CAN) rather than Urea: "CAN is good for coffee. The agro-dealer mixed it up with Urea for the voucher exchange; when the Urea's finished, we'll just ask for CAN because it gives a high yield for coffee." It seems that the voucher management in some villages in Mbinga tended to be manipulated for vouchers to be used for coffee production.

CAN is a fertiliser which contains nitrogen and calcium. Actually, however, CAN seems to be one of the adequate fertiliser used as growing fertiliser for maize farming as well, at least in Southern highlands. Agricultural research conducted by Uyole Agricultural Research Institute of

MAFC, the Research Institute which covers Southern highlands including Ruvuma, recommended that CAN should be used as growing fertiliser for maize farming (Malley, 2009; URT, 2012b). Thus, CAN could be used for maize as well, though from the above quotes, it does not seem the case. Finally, by way of summary, a VEO in another village explained that poor farmers could not usually afford to pay the top-up but sought to purchase with voucher at least one bag of MPR instead of prescribed two bags or a bag of Urea, with payment of top-up only for them.

These findings accord with the panel data results which show that eight per cent (26 households) of programme participants used subsidised CAN in coffee cultivation. This may be compared with the nine per cent who were found to deploy Urea with the same crop. Of all those who cultivated coffee (130 households), 12 per cent reported that they had obtained inputs with NAIVS programme vouchers; considering the relatively high voucher allocation in the district, this number looks small. This might happen because farmers were aware that the programme and its vouchers were not intended to facilitate coffee production, and so their use of inputs might have been under-reported.

No increase in input use by vouchers might also have been due to the low quality of inputs distributed by agro-dealers, as suggested in several villages. For example, a female farmer in Village A in Songea district noted that, “This fertiliser has no strength: some farmers suspect the agro-dealers are mixing the fertiliser with something else to increase their income.” Similarly, in Village F in Mbinga district, a VEO asserted that the inputs had expired and did not function properly; which he had reported to the district government but had merely been informed that in March, as the vouchers were delivered late, it was too late to return the inputs for analysis of the case. With regard to the programme’s utilisation of improved maize seeds, informants in some villages claimed that the variety distributed through the subsidy was unsuited to the of the area’s agro-climatic conditions – although programme guidelines stipulate that they should be (World Bank, 2009a).

Another issue was the late delivery of vouchers to the villages, which, as we saw in Chapter 5, was a common occurrence in terms of timing for the sowing season, as exemplified by the experiences of a farmer in Songea district:

The system [bureaucracy] is slow and difficult. First, you can go there: after writing your name and waiting for your vouchers, you are told that they have run out, and to come back later; you go back later, and they tell you that they are still waiting for some more; you go again for the vouchers, and they tell you that everything is finished, and to come back tomorrow. That also applies to the fertiliser – everything arrives late, very late [too late for planting]. It is already December – the rainy season – and time to plant.

This might be because of the limited capacity of agro-dealers, or of village leaders' illicit behaviour. In order to mitigate the problem of the late arrival of vouchers, a farmer in village H in Mbinga district explained that they farmed with traditional seeds and only applied urea. However, informants at a village meeting in village G, also in Mbinga district, asserted that since they had obtained their vouchers in January and did not get the inputs until the following month, such a late start was uncondusive to increasing the yield. Moreover, a farmer in village L in Mbinga district mentioned:

We have used up all the money on necessities that we had set aside to buy the inputs; that's why we say it is better that the inputs arrive in October, when we still have some money to buy them. When they came late, we had no money left, so we had to sell other products to get the money, so we were moving backwards. If we had any goats, we would have to sell them.

Nevertheless, many farmers in Songea and Mbinga districts stated that they had procured two bags of Urea even though the package stipulated only one (World Bank, 2009a). They explained that because the vouchers were received late in terms of the sowing season, they had been assigned the additional Urea instead of seeds and the first application of fertiliser. In this regard, it seems that vouchers were used completely in lieu of cash to pay agro-dealers. Also they were used to use Urea before NAIVS began. On the other hand, several individuals also asserted that they needed two bags of Urea per acre of maize. If this were so, it would be reasonable for them to buy two bags if the inputs arrived late. This assumption is corroborated by the panel data: according to Round 4 results, in 2011/12, 89 households received subsidised Urea at a rate of 92 kg per household, that is, almost two bags each. NAIVS had reduced the amount of subsidised Urea from two bags in the pilot year to one bag when the programme properly began in 2009/10 (World Bank, 2009a). However, due to the late delivery of vouchers, farmers used their vouchers to procure two bags instead of purchasing other inputs (planting fertiliser and seeds).

The manner in which such a state of affairs as that outlined above affects crop yields is no doubt dependent on the agro-climatic condition of any given location. Such extrapolation is beyond the scope of this study; however, the late delivery of vouchers, use of subsidised inputs for other crops, low quality of inputs, elite capture, and missing vouchers – some of which were touched upon in Chapter 4 – clearly had a negative impact on maize yield, and contributed to making the NAIVS programme in Ruvuma relatively ineffective and inefficient.

6.3 Analysis of crop-yield trends

In order to gauge the impact of the programme on maize yields, firstly, I examine general

maize and rice yield trends from survey rounds 1 to 4.

6.3.1 Issues around maize production and the area under cultivation

Different data-collection criteria for mixed-crop-production were employed across the four rounds: in Round 1 and Round 2, data were collected with regard to a maximum of 6 crops per parcel; while in Round 3, it was up to 11 crops per parcel; and in Round 4, it dropped down to 2 crops per parcel. Yet, the average number of cultivated crops per parcel reported by households in Round 3 was less than two. Therefore, we expect the little amount of data was lost in respect of Round 4.

In order to conduct an inter-round comparative analysis, I selected just two main crops per parcel for each round and made a detailed evaluation of crop production accordingly. Table 28 shows average parcel size and crop cultivation in respect of No.1 - No.4 parcels in rounds 3 and 4. Households reported the order of parcels along with the order of the parcel size and of the importance of the crops cultivated. In Round 3, about 90 per cent of households reported that they cultivated up to only four parcels. In rounds 3 and 4, maize cultivation clearly ranked first as the main crop; in Round 3, cassava or beans ranked first as the second main crop. In Round 4 coffee, rice or beans were the alternative main crops, which were the main cash crops, and cassava, beans and banana were the second main crops, which were mostly supplementary food crops.

Not only for maize, but the average total area under cultivation showed a reduction between rounds 3 and 4 (Table 29). The reduction might have been partly caused by Round 4 data having only captured two major crops per parcel, but might have also been due to the intensification of maize cultivation at the expense of other crops, though maize itself also reduced the cultivated area by six per cent. This might be due to the different data collection methodologies adopted between rounds 3 and 4 on asking crop cultivation per parcels as mentioned above, and/or reporting errors in Round 4.

Table 28: Average parcel size, proportion of households cultivating parcels, and proportion of households cultivating each crop in rounds 3 and 4 (%)

	Round 3				Round 4							
					Crop 1				Crop 2			
	Parcel 1	Parcel 2	Parcel 3	Parcel 4	Parcel 1	Parcel 2	Parcel 3	Parcel 4	Parcel 1	Parcel 2	Parcel 3	Parcel 4
Average parcel size (ha.)	1.5	0.7	0.7	0.2	1.3	0.7	0.4	0.2	1.3	0.7	0.4	0.2
Proportion of households with land under cultivation	98.4	65.3	53.57	26.95	100	78.2	65.1	38.4	40.9	34.3	27.8	13.8
Ratio of households to crops cultivated												
Maize	28.3	18.5	5.8	3.3	68.7	36.8	13.7	6.2	2.7	0.3	1.7	0.0
Beans	6.2	14.3	7.8	1.3	0.7	20.2	6.5	5.9	13.6	6.9	3.0	1.0
Coffee	7.1	2.6	1.6	1.6	16.9	6.2	10.1	6.5	0.0	0.0	0.0	0.0
Bananas	9.4	3.6	2.6	2.6	0.0	0.3	0.0	0.7	8.6	5.3	7.0	4.3
Millet	1.0	2.9	2.0	0.0	0.3	0.7	2.0	1.3	0.3	1.0	0.0	0.0
Wheat	0.7	1.6	2.9	0.3	0.3	0.7	3.3	0.7	0.0	0.3	0.7	0.3
Rice	4.9	8.8	4.9	2.3	2.0	10.1	8.5	3.3	0.3	0.0	0.0	0.0
Cassava	9.4	11.0	9.4	3.6	1.6	8.1	9.5	4.2	12.6	7.3	2.3	2.0
Yams	0.3	0.0	0.3	0.0	0.0	0.0	0.3	0.0	0.3	0.0	0.0	0.0
Sweet potatoes	0.3	1.6	0.0	2.0	0.0	0.3	1.0	2.6	0.0	0.0	0.7	0.0
Irish potatoes	0.3	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Groundnuts	2.6	3.3	3.9	2.9	0.0	1.0	2.0	1.3	2.0	1.0	0.0	0.3
Onions	0.0	0.0	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.3	0.7	0.3
Tomatoes	0.0	0.0	1.0	0.3	0.3	0.0	0.3	1.0	0.0	0.0	0.7	0.3
Pumpkins	0.3	0.3	1.0	0.0	0.0	0.0	0.0	0.0	0.3	0.7	1.0	0.3
Cabbages	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other vegetables	0.7	0.3	0.3	0.7	0.0	0.7	2.3	2.0	8.3	5.0	2.0	2.6
Sesame	1.6	2.0	0.3	0.3	0.7	1.0	1.0	0.7	1.3	1.0	0.0	0.3
Peas	0.0	0.0	0.0	0.0	0.3	0.0	0.3	0.0	3.3	1.7	1.0	0.3
Sugar cane	0.0	0.0	0.3	0.3	0.0	0.0	0.7	0.3	0.0	0.0	0.3	0.3
Papaya	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Other fruit	2.9	0.3	0.3	0.3	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
Tobacco	0.7	1.0	0.7	0.0	0.3	0.3	0.3	0.0	0.0	0.0	0.0	0.0
Cashew nuts	11.4	2.3	3.3	0.3	7.8	2.3	1.6	0.0	1.0	0.0	0.0	0.0
Sunflower seeds	4.2	3.9	2.6	0.3	0.0	0.3	0.7	0.7	5.0	2.6	1.7	0.7
Avocados	0.3	0.3	0.0	0.0	0.0	0.0	1.0	0.3	0.0	0.7	0.0	0.0
Other	5.2	2.3	2.6	3.3	0.0	0.0	0.0	1.0	0.3	0.3	0.3	0.0
Not applicable	2.0	18.2	0.0	0.0	0	0	0	0	0	0	0	0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: Round 3 data is the sum of two main crops per parcel. Up to third crop in each parcel is coloured in red.

Source: The author's calculation from Christiaensen and Pan (2009a); Author's data

Table 29: Average area under cultivation by crop and Round 4 to Round 3 ratio (acre)

	Round 3	Round 4	Ratio
Maize	3.6	3.4	0.94
Rice	2.1	1.6	0.76
Beans	2.6	2.1	0.81
Coffee	2.4	2	0.83
Cashew	10	7.2	0.72

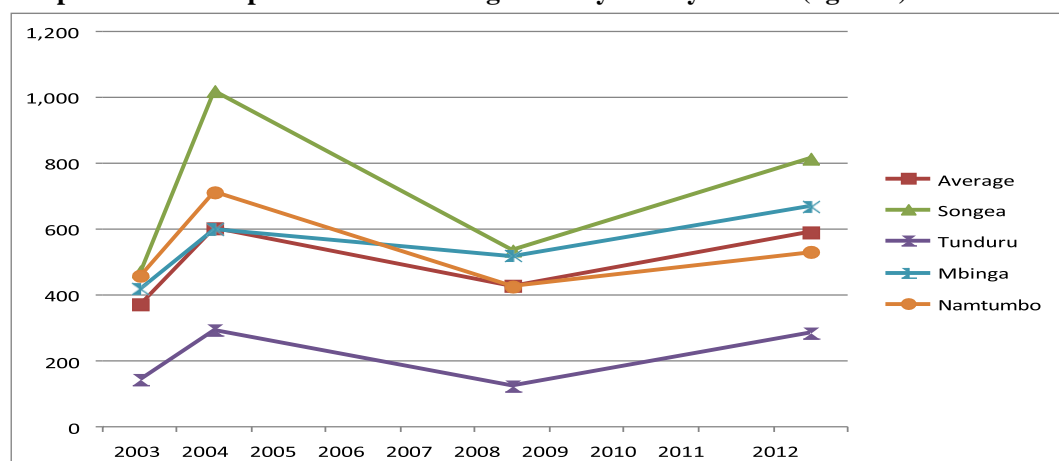
Sources: The author's calculation from Christiaensen and Sarris (2004); Author's data.

6.3.2 Changes in crop yields

Graphs 7 and 8 show maize and rice yield trends respectively by district across all rounds. Maize and rice yield trends seem to be related to that of input use, as shown in Graphs 6, 7 and 8, except for the rice yield's decline in 2004 in Songea. Maize yields across districts increased in Round 2 (2003/04), fell back in Round 3 (2007/08), and then rose again in Round 4 (2011/12) – the first probably being due to the effect of the input transport subsidy and the latter to the NAIVS programme. Songea district ranked top with the highest rate of increase from 2007/08 to 2011/12. The fact that it experienced similar yields as Songea district in 2007/08 notwithstanding, Mbinga district yields increased to a lesser extent, which corresponds to the lower increase of inorganic fertiliser use in Mbinga as seen in Graph 6. The substantial yield increase in Namtumbo district with regard to Round 2 was probably due to the fact that it benefitted from the input transport subsidy which started in 2003/4 to a greater extent than other districts. Although it was ranked second in 2003/04, Namtumbo district was ranked third in 2011/12, with a low rate of increase since NAIVS started, which is slightly different from Graph 6.

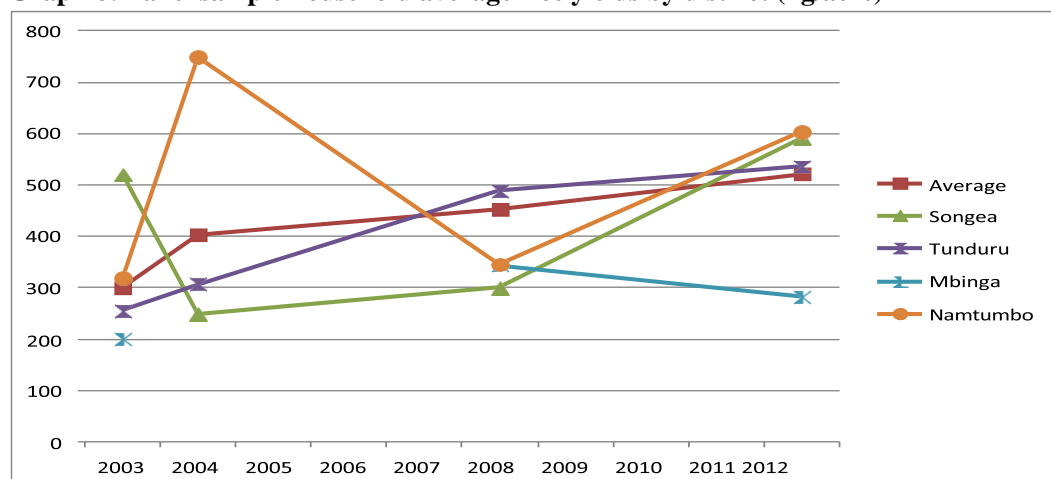
Average rice yields in all districts constantly increased over the period, an outcome that might have been due to few voucher allocation for rice with NAIVS and the other initiatives that promoted rice cultivation, the existence of which was noted by several informants in the field. The big increase since 2008 in Namtumbo district seems due to the fact that the district promoted rice cultivation through NAIVS, which corroborates the information from several informants that farmers used the inputs for programme-prescribed cultivation, which was mainly rice in that area (interview, Village B). Indeed, according to a village voucher committee (VVC) chairman, “Subsidised inputs are intended to be used for maize and rice, so they are rarely used for other crops; additionally, Urea is not good for tobacco.” If such claims were true, the lower increase in maize or rice yields in Namtumbo district were most likely due to the fact that its farmers tended not to obtain the full set of inputs due to the late delivery of vouchers. Rice main producer Tunduru increased rice yields up to 2007/08, however, after that there was little increase, which was probably due to the few voucher allocation to the district.

Graph 7: Panel sample household average maize yields by district (kg/acre)



Sources: The author's calculation from Christiaensen and Sarris (2004); Christiaensen and Sarris (2005); Christiaensen and Pan (2009a); Author's data.

Graph 8: Panel sample household average rice yields by district (kg/acre)



Sources: The author's calculation from Christiaensen and Sarris (2004); Christiaensen and Sarris (2005); Christiaensen and Pan (2009a); Author's data.

Although a detailed examination of the scale and impact of the input transport subsidy introduced from 2003/04 is beyond the scope of the present study, the number of panel households who used inorganic fertiliser increased dramatically from Round 1 to Round 2 – up to four times that found in Round 1 (see Table 30). However, an MAFC officer informed me that this subsidy tended to benefit only wealthier households⁴⁸.

Table 30: Number of panel sample households using inorganic fertiliser

Round 1	Round 2	Round 3	Round 4
40	157	177	182

Sources: The author's calculation from Christiaensen and Sarris (2004); Christiaensen and Sarris (2005); Christiaensen and Pan (2009a); Author's data.

⁴⁸ Interview in October 2012.

Another reason for the high yields in 2003/04 could be good rainfall. The village questionnaire asked whether sample households experienced low rainfall compared to a normal year, which was indeed the case from January to May in the surveyed agricultural season;⁴⁹ being most noticeable in respect of Round 4, followed by Round 1 (see Table 31). Conversely, in the survey year for Round 2 (2003/04) and Round 3 (2007/08), it seems that there was a better level of rainfall in the region. Data from Tanzania Meteorological Agency (TMA) does not have adequate information for 2003/04, but indicates that there was more than average rainfall in 2007/08 (Table 32).

Table 31: Proportion of villages reporting low rainfall in the surveyed agricultural season (%)

Round 1	Round 2	Round 3	Round 4
27.8	8.3	9.4	37.5

Sources: The author's calculation from Christiaensen and Sarris (2004); Christiaensen and Sarris (2005); Christiaensen and Pan (2009a); Author's data.

Table 32: Rainfall data in Songea (mm), 2002 - 2014

Year	January	February	March	April	May	June	July	August	September	October	November	December	Season total*	Ratio to average	Survey round
2002											870	1,910	9,990	1.02	Round 1
2003	1,600	2,260	2,550	670	130			10			230	-	-	-	Round 2
2004	2,190	-	1,550	2,130	0		0						0		
2005															
2006	-	-	-	1,960	40	0	30	20	10	0	890	3,760	12,960		
2007	3,190	2,320	2,110	690	-	0	20	10	10	430	140	2,850	10,850	1.11	Round 3
2008	2,290	2,920	1,920	590	140	0	0	50	0	10	-	1,630	8,689		
2009	1,980	1,740	3,210	99	30	0	10	0	30	0	910	1,320	10,140		
2010	3,260	2,310	1,460	730	150	30	20	10	0	30	0	1,590	11,230		
2011	2,210	3,070	2,780	1,470	110	0	50	-	-	-	520	1,440	8,370	0.85	Round 4
2012	2,870	1,110	1,720	590	120	0	0	0	-	0	800	1,720	6,210		
2013	2,860	760	-	-	70	0	0	0	220	400	1,060	1,480			
2014	3,850	1,730	-												
Season average	2,813.8	1,995.0	2,200.0	875.6	94.3	3.8	16.3	12.9	45.0	124.3	617.1	1,973.8	9,804.9		

Note: Season total is from November to May of the next year. Average represents the one from 2002/3 to 2012/13 when data is available.

Source: Author developed from URT (2014c)

In respect of rainfall in 2007/08, although it varied in different regions nationwide, the MAFC Annual report of 2007/08 states that there was increased revenue collection compared to 2006/07 due to prolonged rainfall (URT, 2008: 4). Another MAFC report asserts that the food sufficiency ratio in 2007/08 was 104 per cent, one of whose reason could be a better level of rainfall compared to normal years (MAFC, 2008). Nevertheless, good rainfall in 2007/08 notwithstanding, maize yield was lower than that experienced in 2003/04, the reason possibly being due to the phase-out of the input transport subsidy ahead of the initiation of the NAIVS programme.

Additionally, access to village agricultural extension officers (VAEOs) in surveyed communities improved between rounds 3 and 4, which might also have contributed to the increase in maize yield. Survey results reveal that the proportion of villages with access to extension services improved from about 55–60 per cent to more than 80 per cent during the period. However, many villages I visited were not served by VAEOs, but ward agricultural extension officers

⁴⁹ No village-level qualitative data is available that indicate low rainfall from November to December in the corresponding agricultural season: I acknowledge this as a data limitation.

(WAEOs), who were usually unable to get round all communities due to the large coverage area and a limited transport budget. Therefore, the finding that 80 per cent of villages enjoyed such access sounds somewhat high. However, this caveat notwithstanding, the data at least show some improvement in access to extension services.

General increases in maize and rice yields were achieved even in poor weather conditions in the 2011/12 season, the survey period for Round 4. In this regard, TMA data show that rainfall in this season was 15 per cent lower than average 2002/03–2012/13 levels (Table 32). It also emerges that in the 2011/12 season,⁵⁰ more than a third of surveyed villages experienced abnormal rain levels, for example, heavy rainfall, untimely rain, drought, and flooding. Conversely, less than 10 per cent of villages were subject to such conditions in 2007/08. Increased maize and rice yields under such adversity were supported by the introduction of the NAIVS programme, and, for example, better access to extension services and other initiatives. Such an upsurge in maize yields in respect of panel households is analysed in the next section.

Table 33 shows that the average yields of main crops cultivated by both recipient and non-recipient households increased during the period. Maize yield's increase of 40 per cent seems to be in line with Graph 7, which is different from the increase of about 80 per cent of the data from RS (Graph 3). Panel data do not represent the data from the RS, but we cannot judge which data is correct.

Maize, beans and cashew all showed significant increase on average, with a growth rate of more than 30 per cent; rice and coffee showed a slower average growth rate of 15 and 21 per cent respectively; and, as with other crops, overall average maize yields increased, with non-recipient households showing even a higher growth rate than their recipient counterparts. This high increase of non-recipient households would be a key for the Difference-in-Differences regression analysis later in the chapter. Despite the non-recipient's higher rate of growth, the difference between the yields of these two groups widened, which could have been due to the fact that recipient households tended to be wealthier; were thus in a position to deploy other beneficial inputs; and were able to achieve higher levels of input-use efficiency as they had access to technical advice from the VVC.

Rice yields increased by 30 per cent among recipient households, while those of non-recipients decreased a little, which suggests that NAIVS might have increased rice yields. On the other hand, rates of increase in terms of other crops cultivated by non-recipient households exceeded those of recipient households.

⁵⁰ Owing to the survey design, data corresponding to this season cover the period January to May 2012, a criterion that also applies to the 2007/08 season.

Table 33: Average crop yields of sample households in rounds 3 and 4 (kg/acre)

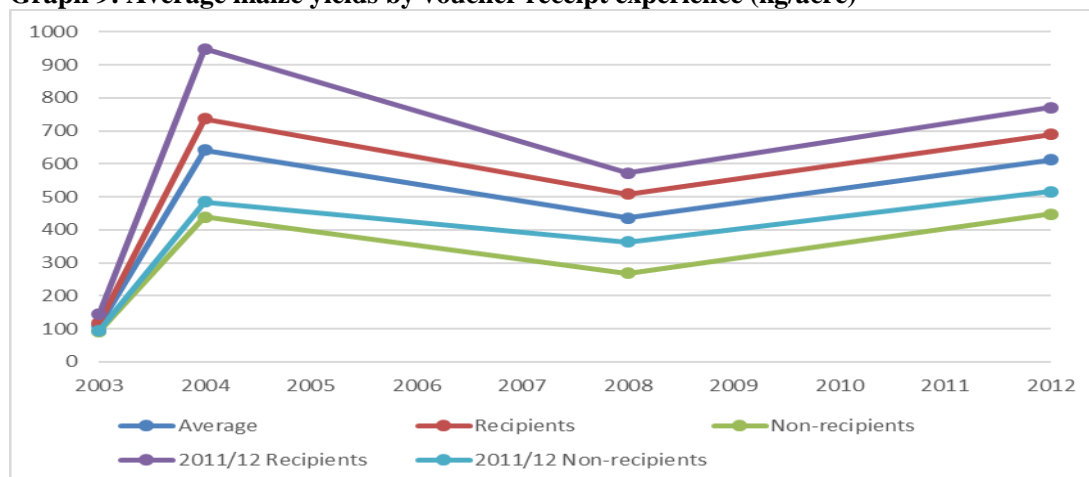
Crop	Voucher receipt	Round 3	Round 4	Difference R4-R3	Ratio R4/R3
Maize	Recipients	506.8	677.7	170.9	1.34
	Non-recipients	258.8	422.1	163.3	1.63
	Average	429.0	591.3	162.3	1.4
Rice	Recipients	448.5	564.9	116.3	1.3
	Non-recipients	459.5	433.0	-26.5	0.9
	Average	452.6	522.1	69.5	1.2
Beans	Recipients	145.1	181.9	36.8	1.25
	Non-recipients	109.0	181.6	72.6	1.67
	Average	133.2	181.8	48.6	1.36
Coffee	Recipients	376.2	433.7	57.6	1.15
	Non-recipients	258.1	384.2	126.1	1.49
	Average	343.8	416.0	72.2	1.21
Cashew	Recipients	57.2	47.5	-9.7	0.83
	Non-recipients	71.2	108.1	36.9	1.52
	Average	53.8	83.1	29.4	1.55

Sources: The author's calculation from Christiaensen and Pan (2009a); Author's data.

Although the yield growth of cashew nuts was the highest among the crops, considering the high maize yields, it looks likely that the recipient households tended to focus on achieving high maize yields, which was consistent with relative intensification to maize cultivation found in terms of plot areas, as seen in Table 28.

Graph 9 shows disaggregated average maize yields by voucher receipt experience in 2011/12 of 216 matched households. The groups increased more in 2004 than the ones in Graph 7, which might be because of characteristics of composition of these matched households. Maize yields increased substantially in Round 2 in terms of both recipient household groups. It seems that those benefitted from the input transport subsidy and the vouchers were of the same wealthier group, thus both the voucher recipient groups increased their maize yields in Round 2. As the scale of input transport subsidy was shrunk, the gap between the recipient and non-recipient households narrowed. Although susceptible to limited data availability, this suggests that recipient farmers enjoyed the benefits of this subsidy before the initiation of the NAIVS programme, but afterwards, the maize yields of all the groups have increased, though, reasonably, especially yields were bigger if they received voucher in 2011/12.

Graph 9: Average maize yields by voucher receipt experience (kg/acre)



Note: Combined recipient and non-recipient household data for 2011/12 represent 216 matched households (see Section 6.5.3). One case was eliminated due to the fact that it was an outlier in Round 2.

Sources: The author's calculation from Christiaensen and Sarris (2004); Christiaensen and Sarris (2005); Christiaensen and Pan (2009a); Author's data.

Table 34: Average maize yields of recipient households and non-recipient households (kg/acre)

Year	Average	Recipient households in any year	Non-recipient households in any year	2011/12 Recipients	2011/12 Non-recipients
2003	110.06	118.29	92.60	145.67	94.30
2004	641.67	736.43	439.38	949.23	485.16
2008	435.57	508.13	267.91	572.09	362.64
2012	612.18	688.73	447.50	770.50	515.95
Ratio: 2008:2012	1.41	1.36	1.67	1.35	1.42

Sources: The author's calculation from Christiaensen and Sarris (2004); Christiaensen and Sarris (2005); Christiaensen and Pan (2009a); Author's data.

There does not seem to be a straight common trend among recipient and non-recipient households (Table 34), which is probably due to the introduction of the transport subsidy at the time of Round 2. However, if the results of this round are discarded, I consider that there are similar trends between the two in terms of the results of rounds 1 and 3 – on the basis of which I proceeded to the regression analysis discussed in the next section (Lechner, 2011).

6.4. Impact of the NAIVS programme on maize yields

The programme aimed to achieve an immediate positive impact in respect of additional subsidised inputs on maize yield, provided that farmers had not used such inputs in recent years. Other than in a few villages in Mbinga district, where there were many fraud cases reported, key informants suggested that farmers had been able to increase their maize yields by applying subsidised inputs. However, as previously discussed, there were many ways in which programme implementation was conducted differently from its design, any or all of which may have hindered its impact. How

these factors affected the intended programme aim, and whether the quantitative data tell the same story as the qualitative interviews suggest forms the focus of this section.

6.4.1 Regression strategy

The ‘sustainable livelihoods framework’ noted that rural households draw on different forms of capital in planning the allocation of resources and designing a livelihood strategy (Scoones, 1998; Carswell et al., 1999; Carney, 2003), which I refer to for developing Theory of Change for this thesis, which was presented in Chapter 3. Variables used to indicate households’ assets were also presented in Chapter 5; in this chapter, I present those used in each specification.

Randomly choosing from a sample of observations on a programme or intervention is one method of avoiding selection bias. Given that I did not have access to randomised controlled samples (Duflo et al., 2008; Duflo et al., 2011) in my study, I subsequently used difference-in-differences (DID) methodology to control for unobserved fixed heterogeneity correlated with observed variables. With panel data gathered before and after programme initiation, this fixed component could be differenced out. Additionally, propensity score matching constructed a statistical comparison group that was based on a model of the probability of participating in a treatment, using observed characteristics; accordingly, participants may be matched on the basis of this probability – or propensity score – to non-participants (Khandker et al., 2010). In order to control time-invariant unobservable variables I use a fixed-effect, two-stage, least-square procedure, represented thus:

$$Y_{it} = \delta \cdot t_i + \alpha_{di} \cdot d_i + \beta_i (t_i \cdot d_i) + X_{it} + \varepsilon_{it} \dots \dots \dots (1)$$

where Y is maize yields of the household i in time t, i.e. round 3 or 4, 0 if round 3, 1 if round 4; i is the individual household; d_i is the treatment, 1 is when the household received vouchers or 0 if not; δ and α_{di} are coefficients of the time and treatment variables; (t_i * d_i) is the intersection term, which is equal to 1 when the household i received treatment in Round 4, or 0 otherwise; the coefficient of the estimated value of β_i represents the impact of the NAIVS programme of individual household i; X_{it} is the vector of household i’s characteristics in rounds 3 or 4; and ε_{it} represents residuals.

Thus the difference in maize yields between matched recipient households and non-recipient households and in round 4 or round 3 is explained by each household’s time dummy, treatment dummy, intersection term and covariates in rounds 4 or 3, respectively.

Firstly, matching should control for household characteristics to determine voucher receipt based on similarity in terms of probability of selection to the programme. Following existing studies, I included in my variables: size of landholding; and the gender, age, health status,

and affiliation to one or more official and/or social groups of the household head (Holden and Lunduka, 2011; Ricker-Gilbert et al., 2011; Pan and Christiaensen, 2012). These variables were used for either programme selection criteria in terms of the first two, or during programme implementation, as observed in the field with regard to the latter three. In respect of the present study, I also took into consideration the number of farmers in each household, as informants suggested in the villages where the number of vouchers allocated invariably exceeded the number of households, they were distributed to individual farmers rather than the household.

In terms of variables related to maize yields, a higher education level tends to mean that farmers had a greater awareness of the importance of improved inputs; ownership of more land due to being wealthier; and greater total household consumption expenditure per adult equivalent together imply the capacity to earn a higher income with which to pay the top-up. As in other studies (Pan and Christiaensen, 2010; Holden and Lunduka, 2011), I included soil quality since it was correlated with maize yield; whether any household member was a member of religious/social groups, in an elected position in the village, and/or of the VVC as a measurement of social capital, based on the finding of elite capture by Pan and Christiaensen (2011). Finally, since access to a market, distance to town, availability of input sellers, and access to a mobile telephone network all affected access to market which affects probability to voucher receipt at village level, these variables were also included in the analysis. On the other hand, input and maize prices, and rainfall were not included, as data on these variables were not available in all villages under study. Survey interviews also reveal that the engagement of children in farming activities during school holidays in particular was widespread, which facilitated yield expansion.

Endogeneity means that when there is a correlation between an independent variable and the error term, estimates will be biased (Heckman, 1979; Heckman and Vytlačil, 1998). In this regard, one study suggests that a 'self-selection' bias arose because voucher recipients tended to be originally better off and therefore used improved inputs before the implementation of the programme (Mathenge et al., 2014). There is such an endogeneity in the relationship between explanatory variables (amount of Urea and improved seeds utilised) and unobserved variables (training on input use, belong to SACCO, etc.), which are included in the error term.

Proxy variables for the independent variable are known as Instrumental Variables (IVs) (Heckman and Vytlačil, 1998; Khandker et al., 2010). Accordingly, I aimed to determine those IVs which affected maize yield through use of improved inputs only. In terms of the observed variate of Urea, amount of use of improved seeds, I used IVs to control for endogeneity. I found a 'proxy' for X_i (amount of use of Urea and improved seeds, respectively) which was uncorrelated with the error term (see Table 35). Since 'amount of Urea usage' and 'amount of improved seeds usage' are endogenous in respect of maize yield, when these variables were

regressed by means of explanatory variables; ‘training on input use’ and ‘belonging to a savings and credit co-operative (SACCO)’ were found to be IVs, respectively, in the case of voucher receipt in 2011/12. In the case of recipient households in any year of the programme, ‘training’ was found to be the corresponding IV in both variables.

Table 35: Instrumental variables

Endogenous variable	In case of voucher receipt in 2011/12	In case of voucher receipt in any year
Amount of use of Urea	Training on input use	Training on input use
Amount of use of improved seeds	Belong to SACCO	Training on input use

Source: Author’s findings from Christiaensen and Pan (2009a); Author’s data.

Training on input use was found to only contribute to maize yield when improved inputs were deployed. The Round 3 survey included variable on training in arable farming in general, and so might have been beneficial in terms of other agronomic management techniques, which would directly correlate with maize yield as opposed to via the use of inputs only. However, few of the farmers under study had had training of any kind in the field. Accordingly, given such scant knowledge on improved inputs found on the parts of many farmers, I consider this to be an adequate IV. Conversely, as the majority of accessed credit (92 per cent of households were found to use credit to obtain the first input, and about 50 per cent were found to use it to purchase the second input) was reported to be utilised to obtain improved seeds and fertiliser, membership of a SACCO is also an adequate IV; although not perfect, since credit obtained thus could also be used for agricultural tools and inputs not prescribed by the programme.

In the first stage log, the amount of Urea and improved seeds was only regressed by exogenous regressors, as per the following equation:

$$Y_2 = X_1\gamma_1 + X_2\gamma_2 + e \dots \dots \dots (2)$$

where Y_2 is the amount of Urea or improved seeds; X_1 is the exogenous variable; X_2 is IV – either ‘training on input use’ or ‘belong to SACCO’; and e is the residual. Accordingly, I calculated the predicted value Y_2 and substitute it with the original DID model. Thus,

$$Y_{it} = \delta_t * t_i + \alpha_i * d_i + \beta_k (t_i * d_i) + y'_2 B_1 + x_{1it} + e + \varepsilon_{it} \dots \dots \dots (3)$$

where Y_{it} is maize yield in the period t ; y'_2 is the predicted value of the amount of Urea or improved seeds; x_{1it} are the exogenous variables; and e is the residual from the first stage equation. Accordingly, I was able to test whether a given IV was endogenous or not.

6.4.2 Descriptive variable statistics

Table 36 shows the means and distributions of the variables of the recipient and non-recipient households in rounds 3 and 4 used in the regression analyses. From rounds 3 to 4 maize yields have increased for all the groups, including non-recipient in any one year. The latter is corroborated by the increase of input use by this group for Urea. Also increased usage of improved seeds was seen in the case of non-recipient in 2011/12. This suggests some educational effects to the non-recipient households. The real total daily household consumption has increased for all the groups, and was topped by the recipient households in 2011/12.

It also shows that the position of non-recipient households in 2011/12 who might have received in other years was better-off in the survey period (February - April, 2013) than the recipients in any one year. Human assets have improved for most of the groups: households whose heads having completed standard 5 increased for both recipient groups; health condition of household heads have improved a little for all the groups; and number of farmers in the households increased for all groups as well, indicating increading land pressure. Meanwhile, landholding decreased for all groups except for recipient in 2011/12.

Table 36: Descriptive statistics for regression analysis variables

Variable	Round 3				Round 4			
	Recipient in 2011/12	Non-recipient in 2011/12	Recipient in any one year	Non-recipient in any one year	Recipient in 2011/12	Non-recipient in 2011/12	Recipient in any one year	Non-recipient in any one year
Dependent variable: Maize yield (kg/acre)	590.9	330.4	520.4	284.8	742.0	464.1	663.8	417.5
Treatment variables								
Received voucher in 2011/12 (yes=1, no=0)	1.0	0.0	0.5	0.0	1.0	0.0	0.5	0.0
Received voucher in any one year (yes=1, no=0)	1.0	0.5	1.0	0.0	1.0	0.5	1.0	0.0
Explanatory variables								
Age of household head	55.9	48.5	52.1	47.5	58.7	52.3	55.7	51.0
Gender of household head (1=male, 0=female)	1.0	0.9	1.0	0.9	1.0	0.9	0.9	0.9
Household head completed standard 5 (yes=1, no=0)	0.8	0.8	0.8	0.7	1.0	0.7	0.9	0.7
Sick/disabled household head (yes=1, no=0)	0.2	0.1	0.2	0.2	0.1	0.0	0.1	0.0
Number of farmers in household	3.3	3.0	3.3	2.9	4.3	3.5	3.9	3.5
Land ownership (acre)	17.9	15.0	20.3	13.6	19.0	13.4	17.3	13.3
Real annual contribution to social functions (Thousand TZS)	24.9	21.9	24.4	19.7	42.4	57.6	27.4	50.4
Real total daily household consumption per adult equivalent (TZS)	578.0	485.7	535.6	393.5	1,446	956.1	754.4	620.3
Belong to religious/social group (yes=1, no=0)	0.5	0.4	0.4	0.3	0.4	0.4	0.4	0.3
Household members/relatives are in elected positions (yes=1, no=0)	0.8	0.6	0.7	0.5	0.8	0.6	0.8	0.5
Household member/relative is in VVC (yes=1, no=0)	0.2	0.1	0.2	0.0	0.2	0.1	0.2	0.0
Amount of urea used (kg)	123.1	40.9	93.8	10.9	220.2	35.2	130.6	29.5
Amount of improved seeds (kg)	3.3	0.4	2.0	0.1	12.4	1.4	7.5	0.1
Village variables								
Have market (yes=1, no=0)	0.3	0.2	0.2	0.3	0.2	0.0	0.1	0.0
Distance to town (km)	45.6	41.7	42.1	40.8	45.6	41.9	42.3	40.8
Have input sales points (yes=1, no=0)	0.2	0.1	0.1	0.1	0.3	0.2	0.2	0.2
Mobile phone network available (yes=1, no=0)	1.0	0.8	0.9	0.7	1.0	0.7	0.8	0.7

Note: 216 matched households and 219 matched households for regression analysis of voucher receipt in 2011/12, and in any year, respectively. Annual contribution to social organisations and total daily household consumption deflated by annual average CPI (2008–12 (=1.55: (NBS, 2010; NBS, 2014).

Source: Christiaensen and Pan (2009a); Author's data.

6.4.3 Impact of voucher receipt on maize yield

Propensity score matching results including variables, for voucher receipt in 2011/12 and in any year of the programme are found in appendices 13 and 15, respectively. Regression results on maize yields are shown in appendices 14 and 16. The residual e from equation (3) in each regression is statistically significant: therefore selected IVs are adequate. Average maize yield of the matched households increased during the period, but neither voucher receipt in 2011/12 nor in any year of the programme has a statistically significant impact on maize yield. Having had positive coefficients of time variables in all cases, this suggests that households who did not receive in 2011/12 and ‘never-recipient’ households also increased maize yield.

In terms of impact of voucher receipt in 2011/12 on maize yield, by controlling for the use of Urea using the IV, those households whose members did not belong to a religious or social group were found to have increased maize yield in Round 4 (see Appendix 14). However, this is somewhat counter-intuitive to the supposition that belonging to a social group constitutes significant social capital in terms of information exchange, including that on input usage, as such an assumption was found not to hold with regard to maize yield. In controlling for the use of improved seeds, male-headed households were found to increase maize yield by about 50 per cent, which is statistically significant. This was probably due to the fact that male heads of household had a greater likelihood of access to training and information on agronomic practices than their female counterparts: this supposition is explored further in Chapter 7. The regression on voucher receipt in any year of the programme also suggests that a male-headed household had the propensity to increase maize yield (see Appendix 16); a finding that is correlated with finding by Mathenge et al. (2014) in Kenya.

In terms of the qualitative findings on the correlation between programme participation and increased maize yield, farmers collectively cited all aspects of the substantial impact of the use of subsidised inputs, as evidenced in the following quotations:

[There is a] big difference. The harvest improved a lot with fertiliser: with the voucher input, from one acre, I get 18 to 20 bags per acre; from the other two acres [not treated with improved inputs], the difference is very big: I can get [only] 8 to 10 bags (Recipient farmer, Songea district).

The best part of the programme was this; after you had cultivated the soil following that method, you could harvest from 25 to 30 bags per acre. Traditional local farming normally produces this number of bags from four acres! (Recipient farmer, Songea district).

If the weather is good, I can get 15 bags per acre; with the voucher inputs, I can harvest even up to 18 bags per acre. Without the voucher programme, it goes back to how it was before – eight to ten bags per acre (Farmer group discussion, Songea district).

Before we started to use this fertiliser, we had a food shortage. This programme has made a big improvement: we have enough food now and some of us have even been able to buy some livestock – we just wish that the fertiliser would come in time (Farmer, Mbinga district).

But as mentioned by the last quote above, late delivery made negative effects to the yield. That might have been reflected the reality. Moreover, several non-recipient households reported that they had also increased their maize yields by purchasing commercial inputs. This might evidence the educational effects of NAIVS, or the effects of other input support initiatives to non-recipient households that were necessarily excluded from my regression analysis, although such omitted values might have affected the results.

Any other contradictions between the quantitative and qualitative results may be explained by reporting errors in both types of data collection. Firstly, as previously noted, recipient farmers were originally wealthier than their non-recipient counterparts, and so were better positioned to pay the top-up. Accordingly, the aforementioned qualitative data confirms that the perception of a positive programme impact did not only derive from the intervention itself, but from the ability to purchase inputs from other sources because they had the means to invest in other agricultural inputs.

Secondly, in the qualitative interviews, farmers as well as community leaders indicated that they expected the programme to continue if they provided positive feedback – confirmation bias (Copestake and Remnant, 2015). Furthermore, if farmers arranged interviews with me through village leaders, the latter might have given instructions as to the kind of response to be made and/or told them to make positive comments, because such feedback would affect the evaluation of their own performance as implementers of the programme. In interview, farmers also commented on the general benefits of using improved inputs, which did not necessarily mean programme-prescribed ones obtained through vouchers. This again arose through their own expectations or instructions from the leaders. Other than their own expectations, building trust between me and the informants in my quest for precise information would be difficult to establish in such a comparatively short visit to each village (normally, three to four days at most).

Thirdly, although it was comparatively difficult to make late changes to the household survey since the questionnaire was long and allowed for a wide range of variable responses, and it contained recall or measurement errors – particularly given that most farmers implemented

mixed-crop cultivation. Even so I suspect that there were more serious errors in reporting maize production and yields in respect of the qualitative research, owing to participant expectations around the continuation of the programme.

The regression results that indicate a negligible programme impact on maize yields correlate with the various factors that hindered effectiveness, which were noted earlier in this chapter. This was not corroborated by most of the qualitative findings which tells positive story. However, although I acknowledge the data limitation regarding other initiatives, with the aforementioned plausible errors in the qualitative data I would suggest that there was no significant impact of voucher receipt on maize yields in the region.

6.5 Conclusion

In this chapter, I discussed the emergent incongruity between qualitative and quantitative data findings in terms of the impacts of the NAIVS programme. The general trend of panel household survey results is towards improved input usage together with increased maize yields between rounds 3 and 4, which corresponds to the introduction of this subsidy programme. In order to determine whether or not the increase in maize yield was due to the programme, I analysed the panel data and qualitative findings. Firstly, I looked at the general trend of maize yields, which increased markedly in 2003/04, probably due to favourable weather conditions and the introduction of an input transport subsidy that year – which, paradoxically, also led to increased disparities between the yields of various farmers.

Secondly, in the qualitative interviews, most key informants in the region suggested that recipient households increased their maize yields from 4–7 bags to 12–25 bags per acre by using inputs from the voucher package, although outcomes would have been also dependent on soil and weather conditions, and individual agronomic practices.

Thirdly, regression results showed no statistically significant impact of voucher receipt on maize yield in 2011/12 in particular or, indeed, in any year of the programme. This might be due to the mixture of many hindering factors which were different from the programme design, such as late delivery of vouchers/inputs, lack of application of whole input package by farmers. As panel data suggest that the majority of the recipient farmers under study applied up to two bags of Urea only despite the prescribed input package with phosphate fertiliser and improved seeds, where 50 per cent of panel households reported that they had used Urea before the programme. Meanwhile, I can't find displacement of previously purchased Urea by the panel recipient households.

Contradictory results between quantitative and qualitative results might have been due to reporting errors in quantitative data (Deaton, 1997) and confirmation bias in qualitative data (Copestake and Remnant, 2015). But I would say that confirmation bias affected more in the

qualitative interviews. As we have seen in section 6-3, input usage of farmers depended on the receipt of vouchers in the year. For example, the error comes from such as: with the widespread knowledge of immediate impact of improved inputs on yields, in the interview recipient households in any year of the programme reported on the increased yields of the year when they received vouchers, not on overall trend of maize yield during the programme period. As we saw in the Chapters 4, 5, and this Chapter, the implementation of the programme was found too complicated to be precisely recalled by the qualitative data on the impact of the programme, which got messy. The programme might have helped in some way their source of income through getting Urea with cheaper price. In those cases due to some tendency among majority of stakeholders (farmers, village leaders, government officials and agro-dealers) to favour the continuity of the programme, which encouraged their statement toward its positive evaluation. This was found to be correlated with those factors which militated against the positive impact of the programme, such as late delivery of vouchers, low quality of delivered inputs, some displacement of Urea and DAP, elite capture, and mis-targeting – all of which were discussed in chapters 4 and 5. Finally, the contradictory finding is due to the fact that non-recipient households increased input usage to a greater extent than their recipient counterparts, which made it difficult to discern the impact of the programme. It could indicate that the programme had an educational effect, or could be partly due to the other aforementioned initiatives. Such indirect effects of the programme on the wider economy are addressed in Chapter 8.

Thus I would conclude in the line of quantitative results, that there was no significant impact of voucher receipt on maize yield in the region.

Chapter 7. Changing livelihoods through input subsidy

‘They should continue for it helps farmers with school fees and other developments in the village. But if the programme finishes, farmers will only produce for their own consumption.’ (VVC chairman in Songea district)

7-1. Introduction

NAIVS aimed to reduce poverty and enhance household food security, especially that of small-scale farmers and vulnerable households. The benefit-cost analysis of a NAIVS impact study conducted as part of a Public Expenditure Review suggests that it was not profitable for the average farmer because of the inefficiency of input use (URT, 2014e). Existing studies in other countries suggest that since input subsidy programmes vary according to context, each had different results. Several studies suggest that Malawi’s Farm Input Subsidy Programme (FISP) had positive impacts on household real incomes. Chirwa (2010) and Ricker-Gilbert and Jayne (2011) suggest that there were income gains by recipient households. Using an informal rural economy model, Dorward and Chirwa suggest household income gains were found more in poorer beneficiary households in poorer regions (Dorward and Chirwa, 2013). Lunduka et al. (2013) suggest that since better-off households benefitted most from FISP, the effects in reducing poverty were small and increased income inequality. In the case of Ethiopia Louhichi et al. find that using their farm-household model for a small number of smallholder farmers the income effects could be substantial such as more than 50 plus percent, although the overall impacts on farm incomes were limited; less than 1 percent (Louhichi et al., 2016).

As to the cost benefit analysis of the programme level, there has been keen debate on whether positive benefits have been over-estimated or conversely, estimated as being negative, which depended mostly on the different nitrogen response rates used between their analysis (Jayne et al., 2013; Dorward and Chirwa, 2015; Jayne et al., 2015). In Zambia’s case, while Mason and Smale (2013) suggest that there was a small gain in economic well-being for smallholders, financial benefit-cost analysis of the input subsidy programme was well below one – which means that cost outweighs benefit (Mason et al., 2013). In Nigeria, Awotide et al. (2013) suggest that the seed voucher system had a positive statistically significant impact on total annual household income and consumption expenditure.

To my knowledge, this chapter provides the first study on the impact of NAIVS on poverty, assets and other livelihood outcomes. This chapter attempts to trace livelihood outcomes from the programme’s impact on maize yields which was discussed in the previous chapter. In this chapter, I look at how NAIVS changed poverty, assets and farmers’ livelihoods and gender aspect of poverty using panel survey results and qualitative information. Firstly, I will examine

the impact of voucher receipt of NAIVS on income poverty, household assets and children's educational attainment, as well as the impact of receiving more than three years of vouchers - the 'graduates'. Secondly, I look at the effects of NAIVS on livelihood outcomes, such as food security, crop production and the main activities of household heads. Thirdly, I look at the gender aspects of changing livelihoods brought about by subsidy.

7-2. Impact on income poverty and household assets

Poverty can be measured in different ways: objective or subjective poverty, relative or absolute poverty, utility or capabilities, income or non-income poverty. This section looks at the impact of the input voucher programme on income poverty and household assets in Ruvuma.

7-2-1. Poverty measurement

Sen explains the capability approach to welfare. 'The *capability* of a person reflects the alternative combinations of functionings the person can achieve, and from which he or she can choose one collection' (Sen, 1993: 31). The approach is based on a view of living as a combination of various 'doings and beings', with quality of life to be assessed in terms of the capability to achieve valuable functionings' (ibid.). Sen (1982; 1985) further argues that in different societies groups of people or even individuals have different choices, preferences and values concerning the same functions and capabilities. However, given that my research focuses on one region in Tanzania, where people share similar values and socio-economic characteristics, I will not address the issue of the different values ascribed to these capabilities. Ravallion (1998) also suggests that the capabilities which Sen and others have suggested to measure welfare can be determined by the 'utility' function.

However, measuring poverty in terms of money gives rise to several concerns, especially how we could transfer utility to money. Ravallion (1998) suggests that the 'poverty line can be interpreted as a point on the consumer's expenditure function, giving the minimum cost to a household of attaining a given level of utility at the prevailing prices and for given household characteristics' (p.3). The utility function represents consumer preferences over consumption bundles. The poverty line is then calculated by measuring the distribution of real expenditure or equivalent expenditures to acquire the bundles of goods necessary to attain a given poverty level of utility. However, the homotheticity of preference, which means that the ratio of goods demanded by consumers will depend only on relative prices and not on income or scale, is rarely accepted (Deaton and Muellbauer, 1980). Thus, in order to analyse the impact of the subsidy programme on poverty, I have chosen to use the absolute income poverty line based on household real consumption expenditures.

The dominant way of measuring the poverty line is based on the nutritional requirement for people to achieve certain activity levels (Deaton, 1997; Ravallion, 1998; Houghton and

Khandker, 2009) and has been examined in practice in many places. This nutritional requirement, however, varies according to age, weight and occupation. It is most popularly set at 2,100 calorie per adult per day in other countries, although in Tanzania, it is set as 2,200 calorie (URT, 2002: 78).

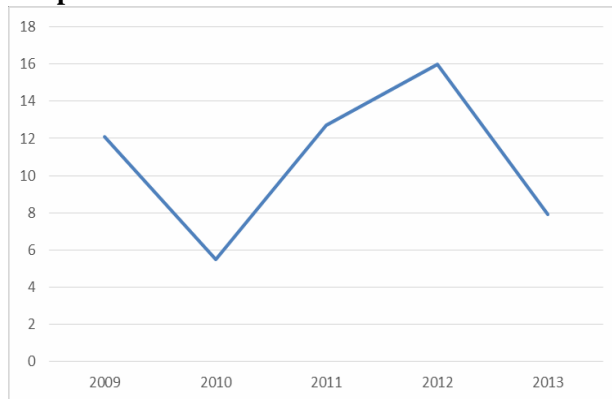
Since Tanzanian Household Budget Surveys conducted in recent years do not provide regional poverty estimates (URT, 2009a; URT, 2014b), we cannot control regional time-variant conditions when comparing poverty indices from different surveys. Considering the price differences among regions, I would not use the estimates of Household Budget Surveys to compare between the poverty estimates of Round 3 and 4 of my panel.

Alternatively, methods for setting the poverty line using the survey data itself are Cost of Basic Needs (CBN) or Food Energy Intake (FEI). The former first estimates the cost for acquiring enough food for adequate nutrition – usually 2,100 calorie per person per day – and adds on the cost for other essentials such as clothing and shelter. When price information is lacking, the alternative is the latter, which plots household expenditure per capita against food consumption to determine the household expenditure level at which a household acquire enough food (Houghton and Khandker, 2009: 39). The CBN is preferable to the FEI in national household surveys where there are rural / urban differences in nutritional preferences, prices, household members' activities and so on (Ravallion, 1998; Houghton and Khandker, 2009). However, in my research for Ruvuma there is not so much rural/urban difference in preferences, I would also consider to be able to apply FEI.

I corrected the unit of measurement for the extreme outliers of the amounts consumed per adult equivalent, the median prices of non-durable goods and frequently purchased services, if their values were more than 20 times the respective median amount, as in most cases they had been miscoded for the unit of consumption. While Pan and Christiaensen (2010) utilised regional median price to calculate the purchased price of non-durable goods and frequently purchased services, I checked the unit price of each item carefully and was thus able to use the reported unit price of each household for these items.

For the first analysis I used the same methodology as the Household Budget Survey, excluding the same non-food items from the calculation for total household consumption. For some frequent purchased services such as the wages or other costs of houseboys/girls, barber and beauty shops and expenses in hotels, some households have a high expenditure per adult equivalent, which I leave for later analysis of the share of whole consumption expenditure of these households. I used food CPI to adjust the time difference between the time of Household Budget Survey 2007 and the Round 3: the ratio of 196.0 (March 2009) to 147.6 (June 2007) = 1.3279 (NBS, 2010). Inflation rate over the period from 2009 to 2013 is as high as about 64 per cent, and annual rates in 2009, 2011 and 2012 were over 12 per cent, while in 2010 it was 5.5 per cent⁵¹ (Graph 10).

Graph 10: Annual inflation rate from 2009 to 2013 in Tanzania (%)



Source: NBS (2010); NBS (2012); NBS (2014)

For the poverty line calculation I used the food poverty line⁵² and basic needs poverty line⁵³ for rural areas. I did not use the Fisher index⁵⁴ (Deaton and Tarrozi, 1999), since the Household Budget Survey 2007 does not have a regional Fisher index as it produces only the ones for three areas, namely: Dar es Salaam, other urban and rural (URT, 2009a). Pan and Christiaensen (2010) used the median for the number of guest visiting days, but I used the actual number of guest days. They used the threshold age of becoming adult as 19, but in my own survey I used 17 referring to the threshold in one variable of the Poverty Score Card which are composed of variables which link to the poverty indices (Shreiner, 2013). They also used the mean of the average weight of the age/sex group of the sample households for calculations, whereas I used the actual average weight of the household.

The population of Ruvuma is concentrated in Mbinga (36.9 per cent) and Tunduru (22.3 per cent) districts, where cash crops (coffee and cashew nuts) are cultivated, while the maize-producing districts Songea and Namtumbo, have the rest 40 per cent of the total regional population. If the farmers used inputs for other cash crops, as we saw in the last chapter, the impact on income poverty would be mixed, for they could raise income from the increase of cash crop production and might have benefitted from purchasing maize with a lowered maize price

⁵¹ 2 CPI series are combined (base, September 2009=100).

⁵² The food consumption pattern reported by the poorest 50 per cent of the population is used as the basis for the food poverty line. The median quantity consumed per adult equivalent per day is tabulated for all food items whose consumption is recorded in the survey. The quantities of each item consumed are then adjusted by a constant factor so that the sum of their calorific values equal 2,200 calories per day, the minimum necessary for an adult. These quantities are then priced using median unit prices calculated from the survey data. The sum of these values gives the cost of meeting the minimum adult calorific requirement with a food consumption pattern typical of the poorest 50 per cent of the population.

⁵³ The share of expenditure on non-food items in the poorest 25 per cent of the population is calculated, whose fraction is used to increase the food poverty line to allow for non-food consumption. This is to make allowance for the fact that individuals need more than just food to live.

⁵⁴ It is used to adjust for price variation both over time and across different geographical areas, by using the price and quantity information from the surveys themselves. It can be thought of as representing a sort of 'average' consumption pattern between the two populations being compared.

due to increased maize production.

In Round 3 data which I obtained from the World Bank the data for non-durable goods and frequently-purchased services for poverty estimates according to the methodology of HBSs is recorded for only 76 households. If we make a panel sample, only 41 households (32 recipient households plus 9 non-recipient households in Round 4) had non-durable goods consumption data in Round 3. As these numbers are so small compared to the number of the total panel sample (309 households), I only attempt to calculate the food poverty line to compare with the national food poverty line.

Using the original panel sample (637 households) Pan and Christiaensen report that the median real total consumption per adult equivalent is 165,000 TZS (Pan and Christiaensen, 2010: 36), while the equivalent of my panel sample is calculated as 119,000 TZS, for which I used the adult equivalence scale employed by Household Budget Surveys in Tanzania (URT, 2009a: 82) (Appendix 17). Meanwhile, the mean total household consumption per adult equivalent is 164,000 TZS. I followed the methodologies of the Household Budget Survey 2007 to calculate the total household consumption, by omitting outliers⁵⁵. The way of detailed data cleaning is given in case required. I proceed with my analysis using this mean total household consumption per adult equivalent data.

The poverty headcount ratios using the survey data itself based on the Cost of Basic Needs (CBN) or Food Energy Intake (FEI) methods are shown in Table 37.

Table 37: Basic needs poverty headcount ratio using CBN (lower level) and FEI methods

Variable	Observation	CBN	FEI
Round 3	309	0.52	0.41
Round 4	309	0.56	0.38

Source: Christiaensen and Pan (2009a); Author's data

These methods give different results. However, the ratio based on CBN in Round 4 looks very high compared to the one for rural areas reported by the Household Budget Survey (HBS) 2011/12 (33.3 per cent) and considering that there was 7.1 per cent decrease of food poverty headcount ratio in rural areas from 2007 to 2011/12 reported by HBSs (URT, 2009a; URT, 2014b), a 4 per cent increase in poverty during the period is rather implausible. For this reason, I have taken the estimate based on the FEI method to look at the impact of subsidy on poverty.

⁵⁵ I followed the methodologies taken by the Tanzania Household Budget Survey 2007 Technical notes URT (2009a) *Household Budget Survey 2007* Dar es Salaam: MoFEA and NBS: MoFEA, NBS. I revised outliers of consumer unit prices of food more than 20 times village median prices, and so on.

7-2-2. Assets

To capture poverty dynamics and economic mobility of the households, to measure assets is suggested as better measurement by several researchers (Baulch and Hodinott, 2000; Zimmerman and Carter, 2003; Carter and Barrett, 2006). They suggest that flow measurement, i.e. income or expenditures, tends to have considerable measurement errors. Stock of assets controls largely the structural position of the people in the society and their ability to avoid poverty and move upwards in economic mobility. Thus I also look at the impact of voucher receipt on assets in order to look at the impact on poverty.

Several studies of the Malawi programme suggest that FISP had no positive impact on household asset holdings (Holden and Lunduka, 2010; Ricker-Gilbert, 2011). Holden and Lunduka find that 'welfare has improved on a broad scale' (Holden and Lunduka, 2010: 20), but that subsidy receipt had no direct impact on asset accumulation. In Zambia and Nigeria, the beneficiary households tended to have fewer assets, though the impact of the subsidies on assets was not studied (Alene and Manyong, 2007; Mason et al., 2013).

Based on the assets in the analytical framework I will now trace the general trend of the household assets of my panel sample households during the periods between Round 3 and 4. Among these assets, tables, radios, bicycles/motorbikes and motor vehicles and house roofs are suggested to be strongly correlated to poverty indices according to the Poverty Score Card for Tanzania (Shreiner, 2013). The Poverty Score Card uses ten proxy variables to measure poverty, which are closely correlated to poverty indices measured by household consumption data (Shreiner, 2006; Shreiner, 2010).

I added beds and mobile phones, since many informants in the interviews suggested that they bought beds when they increased maize production with subsidised inputs, and mobile phones are important to get information on input and output markets. I observed that there is now mobile phone coverage in most villages (87 per cent in Round 4) whereas in Round 3 about 30 per cent of the villages did not have coverage (Christiaensen and Pan, 2009a).

Regarding capability, I looked at the impacts of input subsidies on various welfare indicators including primary school enrolment. I found the subsidies had a positive significant impact on primary enrolment as shown in the next section.

7-2-3. Impact of voucher receipt on income poverty and assets

In this section, I will analyse how NAIVS changed poverty of recipient households. In interviews and farmer group discussions, most of the recipient farmers informed me that their lives had been much improved through the increased maize/rice production following receipt of vouchers. They could increase food security, send children to school, improve their houses by for example, converting a mud house to a bricked one, or a thatched house to a terraced/corrugated iron

sheet/cement one, and they could buy household furniture, such as beds, sheets and mattresses, bicycles, motor bikes, cars etc.

‘Because the vouchers were plentiful, we were able to build new houses, and buy beds and mattresses, and were able to cultivate a few [beans] near the households.’ (A farmer in farmer group discussion in Songea.)

‘We get better shelter and buy mattresses and beds. There are fewer health problems, we can pay school fees and buy motorcycles.’ (Village meeting in Songea district.)

‘The voucher programme improved the living of farmers. They bought bicycles, piki-piki (Swahili term for ‘motor-cycles’), houses, and TVs.’ (VEO in Songea district.)

Another poor farmer in Tunduru stated that ‘what I normally do is to divide one bag of the fertiliser – half on the maize field and half on the rice field’, thus increasing maize and rice production from two bags each per acre to four bags and eight bags, respectively. ‘Due to increased production, I was able to build a brick house like my neighbours - before that I had a mud house.’

On quantitative information, as with the maize yield discussed in the last chapter, I am using fixed-effects panel data strategy with the following specification:

$$Y_{it} = \delta * t_i + \alpha_{di} * d_i + \beta_i (t_i * d_i) + X_{it} + \epsilon_{it} \dots \dots \dots (1)$$

The only difference from equation (1) in page 110 in the last chapter is Y_{it} , which here is the outcome of income poverty reduction or assets variables, represented by poverty headcount ratio and number/category of assets, of individual household i in time t , that is, round 3 or 4, respectively. And the difference in outcome between matched recipient households and non-recipient households and in round 4 or round 3 is explained by each household’s time dummy, treatment dummy, intersection term and covariates in rounds 4 or 3, respectively. I include graduates – three-year voucher recipients – as one of the treatment variables.

For covariates I include the indirect impact of the input subsidy, which Dorward and Chirwa suggest lowered maize prices and increased agricultural wages (Dorward and Chirwa, 2013), on which they and Jayne et al. are now debating how to account these indirect impacts (Jayne et al., 2013; Dorward and Chirwa, 2015; Jayne et al., 2015). I will use my panel data for these variables. I also include here the real price of Urea, as representative of input price, since Urea represents about two-thirds of all fertilisers used by panel households.

Table 38: Descriptive statistics

	Round 3						Round 4					
	Value at <i>i</i> th Percentile in Distribution*						Value at <i>i</i> th Percentile in Distribution*					
	10th	25th	50th	75th	90th	Mean	10th	25th	50th	75th	90th	Mean
Dependent variables												
Poverty headcount (1=food poor, 0=not poor)	0.0	0.0	0.0	0.9	1.2	0.4	0.0	0.0	0.0	1.0	1.0	0.3
Voucher receipt in any year (1=received, 0=not)	0.0	1.0	1.0	1.0	1.0	0.8	0.0	1.0	1.0	1.0	1.0	0.8
Voucher receipt in 2011/12 (1=received, 0=not)	0.0	0.0	0.0	1.0	1.0	0.5	0.0	0.0	0.0	1.0	1.0	0.5
Graduates (1=voucher received in more than 3 years, 0=not)	0.0	0.0	0.0	1.0	1.0	0.4	0.0	0.0	0.0	1.0	1.0	0.4
Whether household owns Radio (1=yes, 0=not)	0.0	0.8	0.8	1.2	1.2	0.8	0.0	0.0	1.0	1.0	1.0	0.7
Number of Tables	0.0	1.0	1.6	2.0	2.4	1.6	1.0	1.0	2.0	2.0	2.0	1.6
Whether household has Modern House roof (1=yes, 0=no)	0.0	0.0	0.6	1.5	1.5	0.9	0.0	0.0	1.0	1.0	1.0	0.7
Number of Bicycle, Vehicles, etc.	0.0	0.0	0.9	1.6	2.0	1.0	0.0	0.0	1.0	1.0	2.0	0.8
Number of Beds	0.0	0.8	1.0	1.6	2.4	1.2	1.0	2.0	3.0	4.0	6.0	3.5
Number of Mobile phones	0.0	0.0	0.0	1.0	2.0	0.6	0.0	0.0	1.0	2.0	2.0	0.9
Not sending children to primary school (not sending=1, sending=0)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Explanatory variables												
Log of age of household head	3.4	3.6	3.8	4.1	4.4	3.9	3.5	3.6	4.0	4.2	4.5	3.9
Gender of household head (1=male, 0=female)	0.8	0.8	1.0	1.2	1.9	1.0	0.8	0.8	1.0	1.2	1.9	1.2
Education category of household head (completed standard 5=1, not=0)	0.0	0.8	1.0	1.2	1.9	0.9	0.0	0.8	1.0	1.2	1.9	0.9
Quality of parcels (Poor=1, Average=2, Good=3)	0.4	0.5	0.6	0.9	1.2	0.8	0.8	1.2	1.6	2.0	2.4	1.7

	Round 3						Round 4					
	Value at <i>i</i> th Percentile in Distribution*						Value at <i>i</i> th Percentile in Distribution*					
	10th	25th	50th	75th	90th	Mean	10th	25th	50th	75th	90th	Mean
Total real non-farm income (in Thousand TZS)	0.0	1.1	5.1	6.2	7.1	4.2	0.0	0.0	0.0	4.6	6.5	2.2
Access of parcels to irrigation facilities (1=yes, 0=no)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.3
Whether household members or relatives are in elected positions in the villages (1=yes, 0=no)	0.0	0.0	0.8	1.2	1.2	0.7	0.0	0.0	0.8	1.0	1.2	0.6
Access to saving and credit organisation (SACCO) (1=have access, 0=not have access)	0.0	0.0	0.0	0.0	1.2	0.3	0.0	0.0	0.0	1.0	1.0	0.3
Whether household members/relatives are VVC members (1=yes, 0=no)	0.0	0.0	0.0	0.0	1.0	0.2	0.0	0.0	0.0	0.0	0.0	0.1
Village variables												
Access to all-weather road (1=yes, 0=no)	0.0	0.0	0.8	1.0	1.2	0.6	0.0	1.0	1.0	1.0	1.0	0.9
Log of distance to town (kg)	2.4	2.8	3.6	4.1	4.7	3.3	2.2	3.3	3.7	4.2	4.8	3.5
Whether village has input sales points (1=yes, 0=no)	0.0	0.0	0.0	0.0	1.0	0.1	0.0	0.0	0.0	0.0	1.2	0.2
Log of number of maize buyers visited to village	0.0	1.8	2.4	3.3	3.4	2.3	0.0	0.0	0.0	2.4	2.4	0.9
Whether village has mobile phone network (1=yes, 0=no)	0.0	0.8	1.0	1.2	1.9	1.0	0.0	0.8	1.0	1.2	1.2	0.9
Log of real Urea price in village (Thousand TZS)	0.0	0.0	3.7	4.8	5.5	2.6	0.0	0.0	3.2	3.9	4.3	2.3
Log of real labour cost for land preparation per day in the village (Thousand TZS)	0.0	7.4	8.1	8.5	9.4	6.4	0.0	7.0	7.7	8.2	9.0	6.0
Log of maize sales real prices by household (Thousand TZS)	0.0	0.0	0.0	5.4	6.2	2.2	0.0	0.0	0.1	0.2	0.4	0.2

Note: * It represents percentiles counting from the smallest in value of each variable. The values are not adjusted by sample weight.

Source: Christiaensen and Pan (2009a); Author's data (village variables are from village survey)

The descriptive statistics of the mean values of variables of *i*th percentiles (percentiles counting from the smallest value in distribution) is shown in Table 38. In general income poverty reduced a little, and several assets and social infrastructure were increased. Real total non-farm incomes reduced by almost half, which might reflect their focus on crop production induced by the programme. Within household assets, the average number of improved beds and mattresses increased three times and the number of mobile phones also increased while the number of radios decreased. This seems to indicate a shift from radio to mobile phone as a means of information/communication. Within explanatory variables, the average quality of parcels improved, which was probably due to the programme. Access to all weather road was increased, meanwhile unexpectedly maize buyers visits to the villages decreased, although there was increased maize production without export ban, with increased mobile phone communication, and maize prices recovered somehow in the season, the latter will be analysed in Chapter 8-3. The real Urea prices and real labour cost for land preparation reduced during the period, and are different from those discussed in Chapter 8, as the values in the table are not adjusted by sample weights. The real maize sales prices received by households reduced greatly, which might have been due to the increased maize production by the programme, which was partly facilitated by the increased access to irrigation facilities.

The propensity score matching and respective regression results are shown from Appendices 18 to 23. The difference-in-difference estimate results suggest that neither voucher receipt in 2011/12 nor in any year of the programme had any impact on the poverty headcount ratio (Appendices 19 and 21). While the voucher recipients in any year of the programme were in general better-off, the recipients in 2011/12 were poorer, though this is weakly significant. Households whose heads had a higher education attainment and access to credit and saving associations (SACCO) and male-headed households were better-off. Households which had bigger non-farm income, higher quality parcels and more land for cultivation and resided in villages with access to input sales points were also better-off. Also this corroborates with poverty gap results: the reduction of average poverty gap among recipient households was smaller than the one of non-recipient households (9.5 per cent and 15 per cent, respectively). However, as the data for household consumption might be susceptible to reporting errors, I look at the impact on household assets.

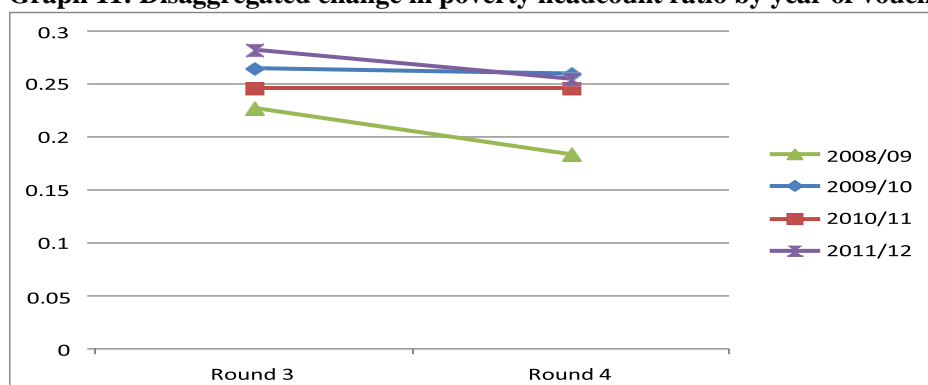
The difference-in-difference estimate results suggest that the voucher receipt in any year did not have a significant impact on household assets, except a weakly negative significant impact on having a modern house roof (Appendices 22 and 23), the latter is though, reasonably due to reporting error, but which suggests that voucher recipients already had a modern house roof before the programme, which means that they were originally better-off. However, this does not corroborate the information from many recipient farmers that they improved their roof through increased maize production by using subsidised inputs. The latter group were probably among a

few who could improve house roofs through subsidy. Meanwhile, membership of SACCO and residence in the villages where maize prices were higher had a significant positive impact on having a modern roof.

Possession of other household goods, including radios, reveals a similar picture: A bigger non-farm income had a strongly significant positive impact on possessing household assets, except modern roofs. The residence of households in the villages where maize prices were high had a small but statistically significant positive impact on having more tables. This suggests that maize sales were among the funds used for buying tables. Although during the period the matched households in general increased their ownership of mobile phones and beds, recipient households already had more of these assets than non-recipient households before the programme. Household heads with greater education attainment and access to credit who lived in the villages closer to town were more likely to have more mobile phones. Living in villages with higher labour costs for land preparation had a positive significant impact on having more beds, as wages might be one of the non-farm income to buy them.

I now disaggregate voucher receipt experience by year of voucher receipt. There are studies that demonstrate that early adopters were originally wealthier and used improved inputs before the subsidy programme (Pan and Christiaensen, 2010; Mathenge et al., 2014). Graph 11 shows that recipients in the pilot year were originally better-off than other groups and further reduced poverty in Round 4, and the recipient in 2011/12 were poorest and reduced poverty less than the former, while the poverty status of other recipients remained constant. This was because, as seen in Chapter 5, in the pilot year leaders selected the better-off households who had previously used inputs. The greater reduction in poverty of this group may be due to the higher number of years during which vouchers were received, which is seen in Table 39. The recipients in the pilot year had a higher ratio of receiving vouchers over all four years than the recipients in any year of the programme; conversely, the recipients in later years tended to receive vouchers for only one year compared to the recipients in the pilot year. It may indicate that these were the households who could afford to pay top-up and had the social power to be selected for vouchers by the village leaders throughout the period of the programme. If this were the case, receiving vouchers over a longer period seemed to reduce poverty. I will therefore examine this point.

Graph 11: Disaggregated change in poverty headcount ratio by year of voucher receipt



Source: Christiaensen and Pan (2009a); Author's data

Table 39: Number of years of voucher receipt of recipients in pilot year and in four years

Number of years	Recipients in pilot year	Ratio to total	Recipients in any year	Ratio to total
One year	33	0.33	86	0.43
Two years	23	0.23	51	0.26
Three years	16	0.16	35	0.18
Four years	28	0.28	28	0.14
Total	100		200	

Source: Christiaensen and Pan (2009a); Author's data

The propensity score matching results for graduates are shown in Appendix 24. However, difference-in-difference estimate results suggest that the fact of being graduates (voucher recipients in more than three years) does not show a statistically significant impact on either poverty headcount ratio or household assets. This might be due to that the sample size of graduates is small, which could not make precise estimate (Appendices 25 and 26). Acknowledging this limitation, if I aim to analyse on covariates, non-farm income had a significant impact on poverty reduction and on improving all household assets except for modern house roofs. This suggests that if households had a bigger non-farm income, they could move out of poverty. Higher education attainment by household heads reduced poverty, which is strongly statistically significant. Graduate households were more likely to have had radios, modern house roofs and more beds than other households before the programme. Generally, panel households increased the number of mobile phones and beds they owned during the period, as seen above. Reasonably, membership of SACCO had a statistically positive impact on having a modern house roof and more mobile phones. Interestingly, households in villages with less access to the mobile phone network were more likely to have a modern roof.

The difference-in-difference estimate results suggest that again, being graduates had no significant impact on livestock keeping, whose results might be affected by the small sample size (Appendix 27). From before NAIVS graduates tended to keep more cows and goats than other households, which is statistically significant. Households having access to irrigation facilities and

belonging to SACCO, and in villages where mobile phone network is available have positive significant impact on number of goats kept. Meanwhile, interestingly, household members or relatives being VVC members have negative significant impact on number of goats. And households with bigger total non-farm income have positive significant impact on number of poultry kept, and more elderly-headed households tend to have more pigs. With the acknowledged data limitation I could conclude from here that graduates and wealthier households tended to have more numbers of livestock since before the programme.

Difference-in-difference estimate results suggest that being graduates neither has a statistically significant impact on not sending children to primary school with the same acknowledged data limitation (Appendix 28). Households with elderly-heads had a weakly significant positive impact on sending children to primary school. This means that they were less poor which might be due to the bigger household size, thus they could afford to pay some of the costs associated with school.

7-3. Effects of NAIVS on livelihoods

We have seen that although the panel households in general reduced poverty during the two survey rounds, receiving vouchers did not have a significant impact either on reducing poverty or on improving the household assets of the recipient households. In this section, I will analyse how NAIVS changed the farmers' livelihoods. 'Livelihoods' are defined as 'capability, assets (including both material and social resources) and activities for a means of living' (Chambers and Cornwall, 1992). Since the programme aims to increase maize and rice production, I will look here at the change in food security and household activities through quantitative and qualitative information. Finally, I will look at the gender aspect of change in livelihoods, since the programme designed to target female-headed households.

7-3-1. Effect of NAIVS on crop production and household food security

At the national level, the FAO et al. (2015) report that although Tanzania has made economic growth since 1990, the proportion of undernourished people increased up to around 2010, and reduced after then up to 2013, which partly might be attributable to the effect of NAIVS. As for Ruvuma URT and WFP (2010) report that it has a high prevalence of borderline food consumption (25.1 per cent), where food insecurity is associated with lack of access to livestock and low income. Although a later report (WFP and World Bank, 2012) suggests an improvement in dietary intake in the southern region of the country, still the southern region has the second highest ratio (12.0 per cent in 2010/11) of borderline food consumption. The FAO defines food security as: 'when all people at all times have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life' (FAO et

al., 2015), which changed only slightly from the one defined in the World Summit on Food Security in 2009 (World summit on food security, 2009). I did not collect data on food preferences in my field research, thus in this section I only analyse the change in diet and dietary consumption.

From the qualitative information, the informants mentioned the positive impact of the programme on food security as following:

‘Food becomes available, there is no shortage of food.’ (Village meeting in Songea district.)

‘They will have enough food each year with increased production, and they will be able to contribute to other developmental activities in the village.’ (VVC chairmen, Songea district.)

One farmer in Tunduru mentioned that they ate only cassava and had one to two meals per day before, but that now they eat maize and rice and can eat three meals per day.

Meanwhile, these positive evaluations may be partly confirmation bias as some of the problems mentioned in the last chapter, such as ineffectiveness due to the late delivery of vouchers, increase of input prices, etc. were also heard. At a village meeting in Songea district, informants mentioned that since the inception of the programme production had increased but the price of maize had decreased; thus food availability had improved, but maize-surplus farmers had no more cash than previously. In remote villages in Mbinga, village leaders mentioned that the programme had had little impact, since few vouchers had been allocated to the village and the inputs and vouchers had been delivered late. I will now look in detail at the change in crop production and household food security of the farmer households through NAIVS, by using mixed methods.

As we saw in Chapter 6, maize production per capita in Ruvuma increased by about 80 percent from 2008/09, the year NAIVS started to 2011/12. Even with the population increase of 11 per cent (NBS, 2013c; NBS, 2013e; NBS, 2013b; NBS, 2013d; NBS, 2013a), regional maize production per capita increased by about the same rate after NAIVS was introduced (Table 40). Songea district was the biggest maize producer before NAIVS started, producing three times more maize per capita as the regional average. This production further increased since NAIVS started full operation of the programme, doubling in 2011/12. The second largest producer was Namtumbo district; however, its increase ratio after the programme was lower due to being allocated fewer vouchers.

This increase in maize production coincided with the increase of fertiliser consumption since NAIVS started in Songea district, the main maize producer in the region, of Urea by 210 per cent, of DAP by more than 550 per cent (Table 41). Thus we could assume that the programme increased maize production.

Table 40: Maize production per capita in Ruvuma region by district (tons per capita)

	2007/08 (1)	Ratio to region average in 2007/08	2008/09	2009/10	2010/11	2011/12 (2)	Ratio to region average in 2011/12	Increase ratio (2):(1)
Regional average	173	-	205	339	369	369	-	1.80
Songea Municipal	48	0.28	42	63	74	77	0.21	1.84
Songea District	505	2.92	492	960	1,022	964	2.61	1.96
Mbinga	113	0.65	163	292	326	321	0.87	1.97
Namtumbo	246	1.42	365	374	409	448	1.22	1.23
Tunduru	80	0.46	73	152	164	186	0.51	2.55

Source: Ruvuma RS (2012a), NBS (2013a), NBS (2013b), NBS (2013c), NBS (2013d), NBS (2013e)

Table 41: Fertiliser consumption in Songea district (Kilo tonnes)

	2007/08	2008/09	2009/10	2010/11	2011/12	Increase rate from 2008/9 to 2011/12 (%)
UREA	2.50	2.40	3.73	6.57	7.45	210.4
Minjingu		1.64	1.84	1.97	1.85	12.8
DAP	0.34	0.46	0.67	2.23	2.97	552.7
CAN			1.38	1.72	1.82	
NPK		0.80	0.02	0.03	0.07	-91.3
SA	1.32	1.39	1.42	1.43	1.47	5.8

Source: Author adapted from Songea DC (2013)

Many informants suggested that the voucher programme improved their household food security. In the farmer group discussion, poor female heads of household reported that before receiving subsidised inputs they had to buy maize in the lean period from February to April. Even when they received only Urea through vouchers, however, they increased their maize harvest so that the programme improved their household security. They could increase the number of meals from twice to three times per day and no longer had to buy maize every year in the lean period.

On the other hand information from key informants on the food security situation varies a little within the region.

According to the Round 4 village survey, from January to March, in the lean period, villagers still faced food shortages in 60 to 80 per cent of the villages and villagers in 50 to 70 per cent of the villages had to buy food. In two thirds of the surveyed villages the majority of the households used money to buy food from February to April. The longest period for the majority of households to buy food was found in Songea district where people bought food from December to March. In villages in Mbinga, on the other hand, the majority of households bought food only in March. Although the Songea district is the biggest maize producer, because maize is a food as well as cash crop and therefore brings in less cash with reducing sales prices, there is more food insecurity in rural areas in the lean period than there is in Mbinga where they have income from coffee.

The manager of a farmer association in Songea district mentioned that the NAIVS was not

helping poor farmers, in part because the small amount of packaged subsidised inputs was not enough for farmers to sustain their livelihoods and that food security is very poor in the region, especially in the planting season. However, this contradicts the information from the Agricultural Extension Officer in Mbinga, who said that ‘the programme changed from food production to business so it increased farmers’ incomes.’ Also an agricultural officer in Songea Municipality suggested that ‘there is no food insecurity in the municipal council’, and an agricultural officer in the RAS suggested that the ‘programme is important for improving food security’. These different comments about the food security situation may be due to geographical difference within the region, where there are some poor rural areas of food insecurity in the lean period, while in general the programme increased food security. If this were true, the positive evaluation on food security might only be applied to fertile accessible areas or to wealthier farmers where they produce cash crops.

In order to see the effect of NAIVS on household food security, I will first look at crop production and sales by panel households (Table 42). Maize and rice production increased, with maize production increasing more than that of rice. Contrary to the above quotes about lack of farmers’ inability to have crop sales, the sales ratios of both maize and rice to production amount of the households also increased during the period by 24 to 32 per cent, respectively. However, the real unit sales value decreased for maize by 30 per cent, and for rice by 50 per cent. These decreases in maize and rice prices might be due to the increased supply from subsidy in the area, or the fact that the maize/rice prices in Round 3 were high because of the food and input price crisis in 2008. For the latter, though, I deflated by CPIs reported by the National Bureau of Statistics (NBS) for the values in the table. Thus it should not have affected the real price. I will look in more detail at maize prices in the next chapter.

The average real total crop sales value increased by 36 per cent during the period. Among the crops, coffee accounted for more than half in sales values, followed by maize, even with adjusted sample weight due to its big income effect, their ratios to total sales values dropped in Round 4, when rice and cashew increased their ratio in total sales.

Table 42: Crop production amount, real crop sales values and sales ratio to total production amount in the previous season (kg, thousand TZS)

Crop	Round 3							Round 4							Ratio in increase in production (R4/R3)	Real increase ratio of sales value (R4/R3)	Difference in sales ratio to production (R4-R3)
	Average production	Standard deviation	Average real sales (thousand Tsh.)	Standard deviation	Ratio to total sales value (%)	Average sales ratio to production amount (%)	Standard deviation	Average production	Standard deviation	Average real sales (thousand Tsh.)	Standard deviation	Ratio to total sales value (%)	Average sales ratio to production amount (%)	Standard deviation			
Maize	1,084	1,925	94.0	302.9	20	14	0.2	1,958	3,093	181.0	547.5	27	46	0.3	1.8	1.9	32
Beans	313	2,845	18.7	63.8	4	26	0.3	170	380	44.1	153.9	7	57	0.2	0.5	2.4	32
Coffee	235	643	245.1	1,030.3	51	98	0.1	220	524	292.5	876.5	44	99	0.1	0.9	1.2	1
Banana	105	433	9.0	32.4	2	22	0.3	120	321	11.3	88.7	2	56	0.3	1.1	1.3	34
Millet	66	330	8.9	66.2	2	47	0.5	24	172	3.0	20.0	0	87	0.2	0.4	0.3	40
Sorghum	3	32	0.7	12.6	0	0	0.4	0	0	0.0	0.0	0	0	-	0.0	0.0	0
Wheat	15	72	3.4	22.2	1	25	0.4	21	87	1.9	12.2	0	0	0.2	1.4	0.6	-25
Rice	174	513	21.3	83.8	4	30	0.3	207	588	41.8	147.9	6	53	0.3	1.2	2.0	24
Cassava	354	1,006	5.7	71.2	1	29	0.2	289	910	3.5	16.2	1	58	0.3	0.8	0.6	29
Yams	3	23	0.3	5.0	0	7	0.2	16	187	0.5	5.6	0	69	0.4	5.7	1.7	62
Sweet potatoes	36	211	1.0	12.1	0	7	0.3	68	339	5.7	68.0	1	55	0.2	1.9	5.4	48
Irish potatoes	2	18	0.0	0.2	0	0	0.0	5	63	0.8	13.2	0	0	0.4	2.6	64.6	0
Groundnuts	81	421	16.5	113.4	3	15	0.4	30	271	17.9	190.7	3	72	0.3	0.4	1.1	57
Onions	3	18	0.9	9.4	0	0	0.4	18	218	3.0	34.8	0	75	0.1	7.0	3.3	75
Tomatoes	28	205	4.4	37.4	1	33	0.4	60	371	4.0	26.7	1	74	0.2	2.2	0.9	41
Other vegetables			0.0	0.2	0	35	0.5	55	249	1.3	7.7	0	68	0.3	-	124.9	33
Sunflower	21	95	11.1	58.5	2	51	-	10	39	15.3	239.5	2	81	0.3	0.5	1.4	30
Peas	0	4	0.1	1.3	0	0	-	21	83	3.0	14.4	0	0	0.2	80.9	39.3	0
Castor oil	0	6	0.0	0.0	0	51	0.5	3	50	1.7	29.4	0	59	-	7.8	-	8
Sugar cane			0.5	6.6	0	100	0.3	26	322	6.0	41.3	1	67	0.3	-	11.2	-33
Trees	92	1,399	1.0	17.5	0	0	0.2	2	43	3.5	40.5	1	68	0.2	0.0	3.4	68
Papaya	9	92	0.0	0.3	0	39	0.0	27	445	0.1	1.7	0	94	0.1	3.2	9.0	54
Other fruit	114	573	0.3	2.5	0	11	0.4	25	224	2.4	31.9	0	69	0.3	0.2	8.5	59
Tobacco	14	123	12.2	104.5	3	0	0.5	17	180	22.9	249.9	3	0	0.0	1.2	1.9	0
Cashew	38	145	16.4	66.0	3	8	0.0	76	302	49.4	231.7	7	91	0.1	2.0	3.0	83
Simsim	9	56	5.2	37.8	1	100	0.5	29	222	13.1	72.1	2	63	0.2	3.2	2.5	-37
Paprika	5	94	0.0	0.0	0	83	0.3	0	0	0.0	0.0	0	80	-	0.0	-	-3
Other product1	16	82	3.5	24.5	1	64	-	22	171	4.0	30.7	1	100	0.1	1.4	1.1	36
Other product2	2	16	0.0	0.5	0	0	-			0.0	0.0	-	97	-	0.0	0.0	97
Total			480.3							733.5							

Note: Adjusted sampling weight by district. Increase ratio is deflated by average food CPIs of the harvest period (June – August) of each year (100=average February to April, 2013)

Source: Christiaensen and Pan (2009a); Author's data

I will now look at the consumption and purchase of crops by panel households. Table 43 shows the real crop consumer prices deflated by the food CPI reported by NBS⁵⁶, and the purchase ratio during the period of 2008/9 and 2012/13 of the panel households, respectively, which is reported by the method of seven-day recalling prior to the survey. It shows that the total daily calorie intake per adult eater equivalent dropped slightly during the two survey periods, while the diet became a little more diversified, that is less maize-based, and was shifted partly to cassava, probably due to its price falling substantially. About 45 per cent of the total calorie intake came from maize in Round 3. WFP (2012) suggested that the calorie intake from maize in Ruvuma was the highest in the country, and the region was reported as having the country's lowest diet diversity. However, maize's share of total consumed calories decreased in Round 4, despite its reduced real unit consumer prices of grain, cob and flour. Meanwhile, reduction of maize consumption was supplemented by increased cassava consumption to double of its share, up to about 19 per cent of total calories, which was due to the lowering price of cassava flour relative to that of maize flour. Other items which increased their ratio in calorie consumption, although the share of these items among total calorie consumption was relatively small, were goat/sheep meat, soda/soft drinks, local beer, fish, fruits, tomatoes, etc., which mostly increased purchase ratio during the period. These items mostly increased the unit prices, thus this increased consumption was due mostly to the preferences for a diversified diet allowed by increased incomes resulting from increased crop sales among other income during the period.

The real unit consumer price of maize flour reduced only a little (4 per cent), while its real unit sales price dropped by 30 per cent, as seen above. The average maize grains real consumer unit price dropped from 850 to 260 TZS per kg, but the sample number of this data in Round 3 is so small (8 compared to 54 in round 4), thus the data might not be comparable. This suggests that maize surplus farmers did not gain much in Ruvuma, while maize net-buyers benefitted due to a small reduction in maize real consumer prices. In general, in Ruvuma rice is a cash crop, whose ratio to total calorie intake is about three per cent. The rice unit consumer price increased by about 15 per cent, while its consumed calories retained almost the same share among the total calories consumed.

The purchase ratio of maize and rice dropped during the period, to a third and about two-thirds of Round 3 respectively, which might be due to the increased production from subsidy. Cassava and beans also decreased their purchase ratio to about 60 per cent and by a third, respectively. It looks as if reducing food insecurity, through increased crop production and a small reduction in maize flour consumer prices along with the shift to more affordable cassava consumption have allowed panel households to diversify their diet by purchasing other products. It is however, also for these reasons that panel households are relatively better-off, as mentioned

⁵⁶ Combined two CPI series.

earlier.

Table 43: Real consumer prices of food items, calories taken from food items per adult equivalent eater in the last 7 days (TZS, calorie)

Food items	Round 3				Round 4				Ratio of unit price R4:R3	Ratio of calorie per eater R4:R3
	Mean real consumer unit price (TZS/kg)	Mean calories per eater	Ratio to total calorie (%)	Mean purchase ratio (%)	Mean real consumer unit price (TZS/kg)	Mean calorie per eater	Ratio to total calorie (%)	Mean purchase ratio (%)		
Banana	382	503	2.2	7.7	498	191	0.9	6.1	1.30	0.4
Maize (grains)	850	1,556	6.8	2.8	260	998	4.5	0.3	0.31	0.6
Maize (cobs)	-	197	0.9	2.3	-	31	0.1	0.5	-	0.2
Maize (flour)	597	10,336	45.2	13.1	572	9,756	43.6	4.2	0.96	0.9
Beans (dry)	1,163	1,769	7.7	23.3	1,083	1,434	6.4	14.8	0.93	0.8
Rice	1,307	859	3.8	27.7	1,503	901	4.0	19.1	1.15	1.0
Millet/sorghum	-	0	0.0	0.6	-	17	0.1	-	-	-
Bread	2,021	38	0.2	9.2	1,387	20	0.1	14.2	0.69	0.5
Sweet potatoes	314	196	0.9	7.4	386	112	0.5	2.8	1.23	0.6
Casava (fresh)	185	919	4.0	5.7	460	585	2.6	5.2	2.49	0.6
Cassava (dry/flour)	691	2,646	11.6	5.0	206	4,392	19.6	2.9	0.30	1.7
Irish potatoes	382	85	0.4	5.5	498	75	0.3	8.2	1.30	0.9
Beef	2,957	90	0.4	23.3	3,655	100	0.4	18.2	1.24	1.1
Pork	2,270	83	0.4	23.0	2,450	81	0.4	27.8	1.08	1.0
Goat/sheep meat	2,551	38	0.2	8.7	3,183	69	0.3	12.4	1.25	1.8
Other meat	3,740	7	0.0	1.9	4,510	4	0.0	0.6	1.21	0.6
Chicken	2,407	70	0.3	7.1	6,573	31	0.1	3.1	2.73	0.4
Fresh fish	1,307	34	0.2	8.7	2,463	37	0.2	7.7	1.88	1.1
Dry/smoked fish	2,050	245	1.1	47.9	3,117	153	0.7	34.5	1.52	0.6
Eggs	-	4	0.0	3.2	-	22	0.1	1.9	-	-
Fresh milk	550	91	0.4	5.6	738	65	0.3	6.5	1.34	0.7
Cooking oil	2,280	1,066	4.7	68.4	2,539	831	3.7	83.2	1.11	0.8
Margarine, butter, etc.	-	0	0.0	0.6	-	1	0.0	-	-	-
Fruits	313	76	0.3	10.3	330	133	0.6	9.5	1.05	1.8
Onions	2,117	27	0.1	52.2	1,295	37	0.2	77.7	0.61	1.4
Tomatoes	1,324	40	0.2	55.8	1,184	59	0.3	73.0	0.89	1.5
Cabbages	-	0	0.0	1.6	852	0	-	1.9	-	-
Peas	1,007	28	0.1	1.1	-	3	0.0	-	-	0.1
Other vegetables	316		0.0	7.7	1,199	-	-	21.7	3.80	-
Groundnuts	1,010		0.0	8.1	3,235	-	-	4.5	3.20	-
Sugar	1,532	541	2.4	59.5	2,091	443	2.0	49.5	1.36	0.8
Coffee	832		0.0	3.6	5,200	-	-	0.3	6.25	-
Tea	7,938		0.0	53.5	1,663	-	-	24.5	0.21	-
Salt	1,408	18	0.1	90.3	829	17	0.1	89.3	0.59	0.9
Soda/soft drinks/juice	1,273	75	0.3	6.8	1,248	148	0.7	12.0	0.98	2.0
Beer local	324	1,146	5.0	24.8	314	1,619	7.2	21.3	0.97	1.4
Beer commercial	1,170	108	0.5	3.6	1,932	19	0.1	3.1	1.65	0.2
Cigarettes	3,120			8.7	-		-	9.1	-	-
Other tobacco	2,448			3.2	1,820		-	6.5	0.74	-
Restaurant	-			2.9	1,950		-	1.0	-	-
Restaurant on drinks	-			1.3	-		-	0.0	-	-
Spices	1,333	1	0.0	1.0	1,899	-	-	4.2	1.42	-
Snack	-	-	-	-	77		-	-	-	-
Others	-	-	-	-	949		-	-	-	-
Total calories		22,891				22,386				
Total calories per day		3,270				3,198				

Note: Adjusted sampling weight by district. Consumer unit prices are real unit prices deflated by CPI for food items during the two survey periods

Source: Christiaensen and Pan (2009a); Author's data

The Difference-in-Difference estimates show that there were statistically significant positive impacts of voucher receipt either in 2011/12 or in any one year of the programme, on total calorie consumed at the time of the survey if we do not control the village variables, whose impacts though disappear when we control the village variables (Appendices 29 and 30).

This was not the case of being graduates (Appendix 31). However, the corresponding models for receipt in 2011/12 and in any year have negative coefficients on both time and voucher receipt, meaning that the matched panel households decreased their average calorie consumed per eater during the period and voucher recipients in these years had lower total calorie consumed than non-recipients, considering both rounds. Considering that input use supposed to bring the increase in maize production, the crop shares almost half of their total calorie consumption, the latter result on voucher receipt might be the enumeration or reporting error. And these did not control the village variables, some of which were considered in matching the households. Thus we would suggest that the no-significant impact from regression results of controlling village variables would be more plausible.

On Appendices 29 ~31 there were unexpected results on access to all weather road such as negative coefficients for access to all weather road (in both cases of voucher receipt in 2011/12 and in any year), whether village has permanent input sales points (in case of receipt in 2011/12 and of graduates), and log of number of maize buyers in the villages (in the case of graduates) with total calorie consumption. The latter case would not be explained given the expected higher maize price with increased maize buyers, and since most farmers in Ruvuma are maize net-sellers. Other variables affecting the calorie consumption were that the households headed by elderly had positive impact on calorie consumed of the households. The reason for this would be elderly-headed households are supported by bigger number of farmers in the households, or they tend not to sell their products. The reasonable results were that the households headed by ones with higher education, cultivating lands with better soil quality, and earning bigger non-farm income had positive impact on calorie consumption of the households.

Thus we could suggest that the panel farmer households increased maize and rice production partly due to the programme, which increased household food security by diversification of food consumption. This might be due to the fact that panel households were relatively better-off so the majority of them were the maize-surplus households who increased their maize sales. Meanwhile, from the Round 4 village survey we find that food insecurity still exists in the lean period in some areas, especially in rural areas in Songea district. Qualitative information also suggest that food insecurity happened when there was irregular rainfall, and particularly affected vulnerable households with female heads and sick or disabled heads. This suggests that the programme benefits did not reach them.

7-3-2. Main activities of household heads

Among the diverse livelihood groups classified in the country, WFP (2010) reports Ruvuma is dominated by ‘big subsistence farmers’, who cultivate more than 2 ha. of land and are almost entirely dependent on agriculture, thus spending at least half their production for self-consumption. The subsequent report by WFP (2012) suggests that lack of livestock is associated with the incidence of food insecurity in Ruvuma.

Table 44 shows the sectors of the main activities of household heads from Rounds 3 and 4 of the panel survey. Although there were many ‘non-reporting-households’ in Round 4 (15 per cent), which is probably due to recording errors, it seems that they were tending to diversify their sectors from agriculture. Out of the reporting households, about 77 per cent were engaged in agriculture, which is almost the same as the national average (URT, 2014d: 28), and about 5 per cent in both rounds were engaged in industry and the service sectors.

Table 44: Sectors of main activity of household heads (Ratio to total sample households, %)

Sector	Round 3	Round 4
Agriculture	89.9	66.3
Other	1.6	1.6
Industry	1.3	0.6
Service	4.2	4.5
Others	–	3.9
Not	2.9	15.2
Total	97.1	92.2

Source: Christiaensen and Pan (2009a); Author’s data

7-3-3. Case studies demonstrating the impact of vouchers on livelihoods

In the traditional context of the study area, the elderly are invariably respected by villagers and thus have local power in this sense; however, here, I refer to the robustness of the young, that is, being active and mobile, and physically able to farm, with the propensity to access new agricultural technology and to have more entrepreneurship, and obtain trials. The following stories are taken from interviews with two rice farmers in the same village. Both of them seem to belong to better-off households who received vouchers, but they relate contrasting stories. The first case concerns the rice-farming household headed by a young man, who reported having increased his assets by increasing rice production. Although this farmer harvests rice, his story demonstrates how a young head of household who has entrepreneurship has succeeded in increasing rice income from receiving vouchers, in combination with belonging to the cow-owning and power-tiller groups. The second story is from an elderly head of household who is ward chairman of a political party, but is not healthy, and did not follow the guidance for input use, and whose rice harvest was therefore reported to have fluctuated during the period. In the first case, the impact of receiving vouchers was enhanced by other complementary inputs and supportive investment to achieve rice intensification. The second head of household decreased his rice harvest and

income from rice sales, but had cashew nuts and other crop productions from which he raised his income, and maintained his political role, for which he might have to invest time.

Case story A

A young farmer, married seven years ago in village A, started with one acre and mixed crops of maize and rice, from which he sold maize in the village. In 2008 he inherited his father's land, and from 2010/11 he started to cultivate up to three acres in total. He received vouchers for rice in 2010/11 and 2011/12. With these he increased the area under rice cultivation from one to two acres on which he applied subsidised inputs and from which his rice harvest increased from five bags to 22 bags. The following year this increased to 29 bags, by applying inputs to one acre only. He received advice on input use from Village Agricultural Extension Officer (VAEO), VVC members and Village Executive Officer (VEO). He sold three bags of rice in 2009/10 for 225,000 TZS. The top-up amount for vouchers in 2010/11 was 63,000 TZS and in 2011/12 he thought that the price would remain the same, but it went up to 121,000 TZS. He had to sell two bags of maize and three chickens to get subsidised inputs but in 2011/12 he sold 24 bags of rice for 408,000 TZS with five bags left for his own consumption.

He demonstrates active entrepreneurship, which has allowed him to increase his assets: he belongs to one farmers' group of cow-owners and another for power tillers. Since he is an original member of the former, he obtained a cow for milk. The breeding was successful, and from 21 cows the group got 12 calves which were given to other people. The latter group had already bought the power tiller and shared it.

Since the programme started he has not faced any food security problems. He obtained a cow from the cow-owners' group (in 2011), added ten chickens (in 2010), bought a bicycle (in 2011), a radio (in 2010), and furniture, bed and mattresses (in 2012). After he inherited land, he did not cultivate it for some years as being still young and without subsidy it was difficult to start cultivation. He is expecting to get vouchers this year, as well, for this is his third year. He processed rice and hired a car to bring it to town to sell in December, achieving higher prices than in the village. From this year's sales he was expecting to buy a water pump (with 600,000 TZS) and inputs for one acre.

Case story B

In the same village a farmer, who is Ward chairman of a political party, owns twelve acres (three for rice, two for maize and cassava, respectively, and five for cashew nuts). He lives with his wife and two children. His daughter now (at the time of interview) is acting VEO. He obtained vouchers in three consecutive years. With the use of subsidised inputs his harvest increased from seven to ten bags per acre in 2009/10. However, it reduced to eight bags per acre in 2010/11, during which he reported that he was using only urea, whose performance was not good. In the

following year, even with voucher receipt, his harvest further decreased to only five bags per acre, which he reported was due to the irregular rainfall. However, he reduced his rice sales from 1,660,000 TZS for 19 bags in 2010/11 to 800,000 TZS for ten bags in 2011/12. Around five bags were consumed at home, supplemented by other crops for food.

He used his subsidised inputs by spreading fertilisers to all three acres, rather than one only, and hired labour to cultivate and weed the rice. The price of cashew nuts has increased from 505 TZS per kg. in 1999 to 1,200 TZS per kg in 2011. Since he is not expecting to get more vouchers as he has already received them three times, he is going to buy commercial inputs, two bags of urea and five kg of improved seeds from a local agro-dealer. He is expecting to achieve higher production than last year. He mentioned that if he could get loans, he is willing to buy two bags of DAP, two bags of Urea and ten kg of improved seeds.

7-3-4. Gender aspects of changes in livelihoods through subsidy

Studies find that women play a considerable role in agricultural activities in developing countries (Gladwin, 2002; Boserup, 2007; World Bank et al., 2009). A FAO report using aggregate data suggests that women make up 43 per cent of the agricultural labour force in developing countries in general (SOFA team and Doss, 2011). The report also suggests that since women and men normally work together in the field, it is difficult to estimate women's contribution to food production, but female-headed households have smaller farms and use less modern inputs, thus have lower productivity. Meanwhile, studies suggest that women and men have different roles in agricultural activities. Historically, African women worked with the hoe in agriculture to produce food crops to feed the family (Bryceson, 1995). Although recent political change, neo-liberal market policies and development have brought some educated women options for non-agricultural activities such as diversifying into small trading activities in East Africa, most rural women still cultivate food crops with the hoe to feed their families. Men tend to cultivate cash crops to obtain cash, while women tend to cultivate food crops in order to give nutrition to children, which is regarded as women's role in most societies. However, women have also other roles such as doing the housework, working in their husbands' plots as family labour, raising cash through non-farm activities or cash crop cultivation (World Bank et al., 2009; Holmes and Jones, 2013).

During fieldwork in Tanzania, I observed intra-household gender roles, and the dual or triple roles of women. The two families with whom I stayed for four months while I was in Dar es Salaam both belong to the local elite, where both husbands had been government bureaucrats, and both wives had regular outside work. They had migrated from a rural area in their younger days and are Christian and Muslim, respectively. Although the wives had 'house-girls' who stayed at home and assisted them with the housework, before going to and after coming back from work the wives manage all the household work, including taking care of children. The men, on the other hand, after coming back home, just sat in the room waiting to be served. These house-girls were

both teenagers, and had been brought by neighbours or relatives from their home towns. They were not educated and had found it difficult to make a living. They were given free board and lodging and some additional salary. There are two classes of women here, the one owns a more privileged position than the other, having better education, bigger economic and social power.

One wife mentioned that ‘without women, men can’t do anything at home. Only women can manage the houses, not the husbands.’ These wives had enough income to have a house-girl to assist them at home, and lived in an urban area where there are some machines and infrastructure to help with the household work, but despite this - and although I did not conduct a time-use survey to examine the gender difference of time use for ‘work’ (Whitehead, 1999) - I observed that there was a considerable difference between women’s and men’s work time per day.

In the Ruvuma and Mbeya regions which I visited for my fieldwork, I observed the same when I visited friends’ houses where the wives were school teacher, politician, or council officer. In the villages, I often observed that women were working in the crop fields. In the interviews, male heads sometimes informed me that wives also help with the farming while doing housework. In the afternoon, I saw many men in the bar drinking the local brew while women were working in the field or at home. I saw often only women working in the field, such as cropping beans in Mbinga. Women have dual duties in the field and at home. The panel households in Ruvuma also showed the dual roles of rural women, whereby women reported agriculture as the first activity, and the majority reported household work as the second activity. This intra-household gender difference was due to the patriarchal culture in sub-Saharan Africa in which women are recognised as the ‘possession of men or whole community’ and ‘submissive’ (National Organisation for Legal Assistance, 2009).

The patriarchal system leads to gender inequity in land ownership in Africa and in Tanzania. Given that agriculture provides 82 per cent of the occupation of the rural population in Tanzania, land is essential for their food security. Several authors have reported that women have less access to land, especially in Africa (Whitehead and Bloom, 1992; World Bank, 2007; Holmes and Jones, 2013), which made their position vulnerable when it came to possessing the output even from the land they were cultivating. Without adequate documentation, people in Africa sometimes face their land becoming titled by outsiders. In Africa there were land reform movements in the 1990s, when new land laws were enacted in Uganda, Tanzania, Zanzibar, Mozambique, Zambia, Eritrea, Namibia and South Africa. Several women’s groups have been active in these land reforms in Africa, including Tanzania. In Tanzania, the 1999 Land Act and Village Land Act shifted land administration to village level, where each community is now in charge of registration, adjudication, land titling and disputes. The reform was made to prevent the appropriation of land by outsiders, to settle land disputes within communities and to promote the operation of the land market (Tripp, 2004). Even though these Acts recognise ‘the right of all persons, including women,

to own property, including land, as found in international human rights standards' (National Organisation for Legal Assistance, 2009), the reforms did not provide sufficient attention to gender (Izumi, 1999), and there was 'silence of laws' regarding the rights of widows to share the properties of deceased husbands, which is still decided by the customary laws (Peterman, 2011).

Recently, land disputes in rural areas have increased in Tanzania because of gaps in current legislation and policies, and people's lack of information about their rights (Mugabi, 2013). A female Tanzanian friend, who was born in the Kagera region, a remote western part of Tanzania, told me that 'women can't inherit land'. Thus when I told her about my data which reports that some women owned land, she suggested that even if women reported that they have land, 'they don't actually 'own' land, only 'use' their husband's land in customary practices even now'. Even though the Land Act overrides the customary law if this denies women the right to use, transfer and own land, common practice has not changed due to the increasing scarcity of land because of population pressure, and its increased commercialisation (Tripp, 2004).

Land ownership confers the right to make decisions about the output of the land as well as to sell or transfer it. Less access to land ownership makes female-headed households more vulnerable. Whitehead and Bloom (1992) suggest that sometimes women have their own farm as independent farmers so the output from these fields is owned by them. But as land is becoming more scarce, accelerating rural differentiation and increased requirement for cash income so that men migrated for urban wage labour or trade, women often are engaged in subsistence agriculture in the field of men as 'family labour'. Women have less cash for more intensified production by having plough, buying seeds and fertilizers, thus resulting in low productivity. 'Planners (of the programme) have unwittingly created a formidable barrier to women's access to new inputs' (ibid: 51). Women use fewer modern seeds and other agricultural technologies (Peterman, 2010).

Recognising the gender difference in power in the society, which leads to female-headed, especially widow-headed, households being poorer and more vulnerable and having less access to agricultural extension and other agriculture-related services, recent input subsidy programmes in sub-Saharan Africa have targeted female-headed households as a priority. Fisher and Kandiwa (2014) found that the programme in Malawi reduced the gap in the adoption of modern seeds between male-headed and female-headed households. On the contrary, others find that female-headed households were found less likely to benefit from subsidies in Malawi (Ricker-Gilbert et al., 2011; Chibwana et al., 2014), although there was less bias in the use of fertilisers between male-controlled and female-controlled plots (Chirwa et al., 2011b). Since it started as a response to a food and input price crisis, NAIVS also aims to prioritise female-headed households as beneficiaries. I will look below at their changing livelihoods since NAIVS started.

Throughout the survey rounds, the heads of some panel households changed due to the migration of household heads and change in the marital status. From Round 3 to 4 panel households have an increasing ratio of female-headed households, the share increasing from 8 to

10 per cent. Female-headed households were composed of ‘widows’ followed by ‘married’ (48 per cent and 32 per cent, respectively) in Round 3, while in Round 4, 63 per cent gave their marital status as ‘widow’. Most of the ‘married’ female-headed households in Round 3 had changed to male-headed, meaning that more than half of the husbands had been away in the Round 3 period. During the period, 60 per cent of the households becoming female-headed were headed by widows. In a patrilineal society, it is difficult for them to inherit land from their late husbands.

However, the panel data suggests that even those female-headed households which were smaller in size than the average household reported that they owned land, and female-headed households even shared a slightly higher ratio of inheriting land to other households. Dancer informs us that the practice of giving land to daughters has been observed in some areas, although the widow has little control over dispositions or the right to inherit family or clan land (Dancer, 2015). This merits further investigation. While the average size of land owned by male-headed households decreased during the period from Round 3 to Round 4, that of female-headed households increased by half. The size of the cultivated land of female-headed households increased to more than double that reported in Round 3, while that of male-headed households reduced a little same during that period (Table 45). This increase of assets by female-headed households could be due to change towards households headed by more income earners, even as widows, and their prioritised access to voucher receipt, as shown below.

Table 45: Size of land owned and cultivated of the panel households in Round 3 and 4 (ha.)

	Round 3		Round 4	
	Male-headed	Female-headed	Male-headed	Female-headed
Land owned	7.0	1.9	6.2	2.8
Land cultivated	2.7	1.1	2.6	2.4
Bought / received land in last 4 years	1.8	1.0	3.9	1.0
Sold/gave land in last 4 years	1.7	0.4	2.0	0.0
Rent-in land	0.7	0.6	0.9	0.8
Rent-out land	0.9	0.8	0.8	0.4

Source: Christiaensen and Pan (2009a); Author’s data

During the two rounds, both household size and the number of farmers in the households increased for both male-headed and female-headed households (Table 46). Both are bigger in the former than in the latter, which means that female-headed households have less human capital. However, the increase ratio during the period of both household size and number of farmers in the household was bigger in female-headed households than in male-headed ones. As for household mobility, of all the Round 4 panel households about 75 per cent of household members moved out of the house, either marrying or attempting to live on their own. Opposed to the conventional wisdom of men migrating out for work, the ratio of out-migration of female members was higher than the one of male members, whose reason for migration was probably due to marriage.

Table 46: Average household size and number of farmers of panel households

	Round 3		Round 4	
	Household members	Farmers	Household members	Farmers
Male-headed households	6.5	3.0	7.7	4.2
Female-headed households	5.7	2.0	6.0	3.3
All households	6.4	2.9	7.5	4.1

Source: Christiaensen and Pan (2009a); Author's data

On the ownership of land, about three quarters of the parcels of the panel households were owned by one household member. For the rest a quarter of the parcels were reported that they shared among all the household members. It was the traditional custom of the country, as Nyerere mentioned '(t)he property which is important to the family, and thus to the individual members of it, is held in common' (Nyerere, 1967: 9). It was found that household heads and wives have about the same share of ownership among household members, namely about 15 per cent of the parcels. I can't observe here any intra-household gender difference. More than half the parcels were distributed to the children and ten per cent was owned by grandchildren of the household head, which showed decreasing size of land ownership per generation unless the children buy more plots later. On cultivation, more than 80 per cent of the parcels were cultivated by more than two household members, indicating that in most cases almost all household members above five years old participated. I cannot see again any intra-household gender difference in cultivating other household members' land.

In Round 4, compared to male-headed households, most of the female-headed households (94 per cent) focused on maize as the first crop, with cassava and beans as the second crop, due to the fact that they focus more on household food security, as has been observed in other countries (World Bank, 2007; World Bank et al., 2009). Table 47 shows disaggregated data on the size of crop plot area by gender of household heads. From Round 3 to 4, while male-headed households decreased their plot area a little, female-headed households increased the plot area by 20 per cent, though their size is still about 60 per cent of the male-headed households. The same tendency of change during the period was found in maize, rice and cashew, while beans and coffee – the cash crops was the opposite: male-headed households increased their plot sizes while the female-headed households decreased them. Female-headed households increased their maize plot areas with a larger ratio than other crops to more than 60 per cent of all the plot area. This shows, firstly, that all the panel households increased their maize plot areas probably due to the programme. Secondly, due to their more vulnerable position female-headed households are more concerned with household food security and thus increased their food crop area, as has been observed in other countries (World Bank, 2007; World Bank et al., 2009). Their focus on maize cropping also gives reason that input subsidies for maize is prioritised to female-headed households, who cultivated less land than male-headed households. Their continued focus on food cropping might

also be due to the fact that, as observed earlier in the panel data analysis, they did not have enough household members to cultivate cash crops, which normally require more labour than food crops, or that they did not get access to knowledge or support for cash cropping because they did not have enough capital, except for increased household income as shown below.

Table 47: Average size of main crop plot area per household by gender of household heads (ha.)

Variable	Female-headed households			Male-headed households		
	Round 3	Round 4	Increase ratio (%)	Round 3	Round 4	Increase ratio (%)
Maize	0.77	0.99	28.8	1.33	1.40	5.3
Rice	0.05	0.13	147.1	0.18	0.16	-11.0
Beans	0.35	0.29	-18.5	0.45	0.45	1.0
Coffee	0.08	0.08	-8.2	0.30	0.35	16.8
Cashew	0.07	0.11	58.8	0.65	0.39	-40.4
Tobacco	0.00	0.00	-	0.04	0.00	-100.0
Total	1.32	1.58	19.4	2.95	2.76	-6.4

Source: Christiaensen and Pan (2009a); Author's data

I will now show the change of household income between male-headed and female-headed households (Table 48 and Graph 12). Total household income consists of total non-farm income (wages from regular or temporary jobs, net income from non-farm business, pensions, State or NGOs' assistance, gifts, remittances, with in kind being valued in cash), sales from processed food products (beer, milling, oil, prepared food), sales of livestock, sales from animal products (milk, cheese, honey, meat, eggs), crop sales, land sales/rent-out in the past four years. Female-headed households increased by a little bigger rate the real total household income; female-headed households increased by 47 per cent while male-headed households by 45 per cent. The total crop sales, being the first share of all the items, increased its share for male-headed households by 16 percentage point, less so for female-headed households (8 percentage point). This made the crop sales share the biggest part of the household income, even for the female-headed households, who had the highest share in non-farm income in Round 3. Meanwhile, as Graph 12 shows, female-headed households maintained all the non-farm income during the time male-headed panel households reduced, although their shares to the total household income for both groups decreased. Female-headed households increased the share of processed food products and livestock sales by 7 percentage point and 6 percentage point, respectively.

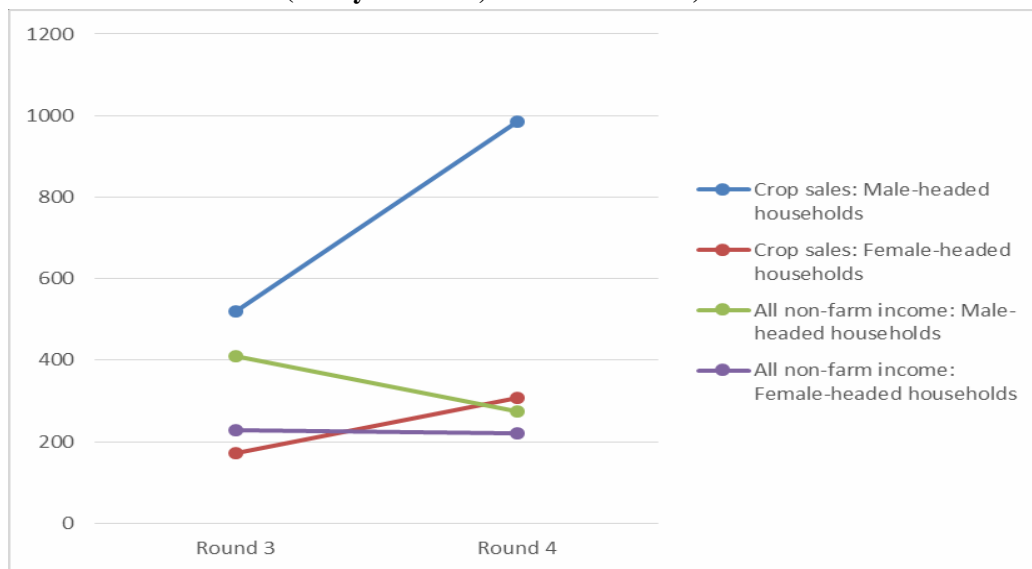
Table 48: Real annual farm / non-farm income of male-headed / female-headed households (base year=2009, in thousand TZS, %)

	Round 3				Round 4			
	Male-headed households	Ratio to total	Female-headed households	Ratio to total	Male-headed households	Ratio to total	Female-headed households	Ratio to total
All non-farm income	409.8	0.42	229	0.52	275.2	0.19	221.6	0.34
Processed food products	17.9	0.02	0	0.00	73.7	0.05	46.0	0.07
Livestock sales	60.2	0.06	19	0.04	99.7	0.07	62.6	0.10
Animal product sales	31.6	0.03	21.8	0.05	150.1	0.11	16.5	0.03
Crop sales	519.5	0.53	173	0.39	985.3	0.69	308.2	0.47
Land sales	47.4	0.05	0.2	0.00	36.3	0.03	0.0	0.00
Land rented out	2.7	0.00	0	0.00	2.5	0.00	2.0	0.00
Total household income	1,089		442.8		1,584		654.9	

Note: Deflated by annual average CPI of all items. Amounts of land sales and land rent out were for the past four years.

Source: Christiaensen and Pan (2009a); Author's data; NBS (2010); NBS (2014)

Graph 12: Real annual total crop sales value and all non-farm income disaggregated by gender of heads of households (base year=2009, in thousand TZS)



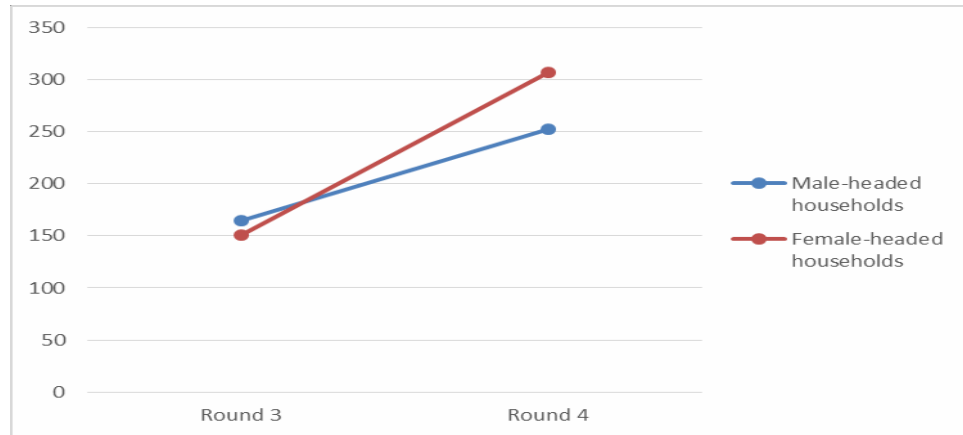
Note: Deflated by annual average CPI of all items.

Source: Christiaensen and Pan (2009a); Author's data; NBS (2010); NBS (2014)

Among the total increase of crop sales, coffee, maize, and rice increased; the latter two was probably due to the increased production by subsidy. Meanwhile, male-headed panel households focused less on maize. They have a greater share of cash crops such as coffee, due to the fact that households in Mbinga account for half the parcels. Another reason was due to, as seen below, female-headed households had higher probability to receive vouchers than male-headed households. Since female-headed households had a higher share of food cropping, they had smaller increase in crop sales. Meanwhile, the female-headed households had constant real non-farm income while male-headed households decreased it, the reason for which I don't have information, which suggests female-heads had constant regular income from employment and other activities, which made them increase total household consumption per adult equivalent by more than male-headed households (Graph 13). This is rather contradictory to the finding that agricultural wages have increased. Among the total household consumption the ratio of the

amount of food consumption of the female-headed households was 41 per cent, which is more than twice the ratio of the male-headed households.

Graph 13: Real total annual household consumption per adult equivalent (Base year=2009, Thousand TZS)



Note: Deflated by CPI of all items averaged February – April of each year

Source: Christiaensen and Pan (2009a); Author's data; NBS (2010); NBS (2014)

In qualitative interviews with widowed heads of household, most reported that they could not receive vouchers. The reasons for this were that they were not able to pay top-up, or they could not contribute to village activities physically or financially, which were the criteria for eligibility applied in the village. Even when they were selected for vouchers and went to the village office to buy inputs, they were repeatedly told by village leaders to come back on the next day until they gave up. This discriminatory behaviour by village leaders was due to the fact that the widows were 'powerless'. The same stories were also heard from elderly male farmers.

Meanwhile, in other villages informants reported that widowed heads of household received only Urea from subsidy, for 'they were treated specially'. In village H, an informant mentioned that an agro-dealer told female-headed farming households 'if you pay 15,000 TZS I can give you one bag of Urea,' while asking them to sign vouchers for all types of inputs including the ones for seeds and first application fertiliser. As mentioned in Chapter 6, the top-up amounts for one bag of Urea fluctuated, but increased up to 44,000 ~ 50,000 TZS. Since the widow heads do not have the capacity to pay top-up for a full set, they were given the choice of only receiving Urea, but sometimes signed for vouchers for the full set, indicating frauds by village leaders. Intra-household mutual help through receiving vouchers was also observed. One widow in a village in Mbinga was unable to pay top-up, so her son received the voucher instead of her and gave her maize out of his production. Her intra-household power might have increased because she brought vouchers to her son.

The difficulty experienced by female-headed households in receiving vouchers does not corroborate with my panel data. Panel data shows that even though the female-headed households

represent a small ratio (10.4 per cent) of all the panel households, they were prioritised to receive vouchers. 72 per cent of all the female-headed households received vouchers in four years while the ratio of male-headed recipient households was 65 per cent. Also in 2011/12, the surveyed season, 42 per cent of female-headed households received vouchers compared to 30 per cent of male-headed households. All the female-headed voucher-recipient households received Urea with vouchers. They also tended to receive more maize seed vouchers than male-headed households, 28 per cent and 16 per cent, respectively. However, other than subsidised inputs, only one female-headed household out of seven purchased commercial hybrid seeds. It looks more difficult for them to purchase hybrid seeds than the male counterparts.

The prioritised access of female-headed households to vouchers was made on the sample bias toward ‘female elites’ – being elected for positions in the villages - of the panel sample. Table 49 shows the gender-disaggregated ratio of female-headed and male-headed panel households with household members having been elected in the villages. As seen in Chapter 5, about 60 per cent of the panel households have members elected in the villages. Nearly half the female-headed panel households reported having members in elected positions, which suggests that they are relatively ‘elite’ households. Here, again, given that such a high percentage are ‘elite’, there may be some errors in reporting or definition of ‘being elected’ for some positions. Higher ratios of female household heads than of male household heads are in the positions of VEO and VVC members. VEO, who are government bureaucrats designated by the DED (District Executive Director), come from outside the village for a couple of years and thus tend to have their houses in town, where they stay in the holidays. There were some female VEOs in my survey villages, though I was able to meet only one. A high ratio of female heads of household working in public services and government was also found in the activity sector in panel data. Meanwhile, the higher ratio of VVC members reflects the gender-sensitive design of the programme, which plans a VVC composed of six members, half of whom are women and half men. For the initial sampling for the panel survey, they made ‘household random sampling within a village’ (Sarris, 2004), although, in a practical sense, the sample households tended to be selected from more accessible households in the villages, which made them relatively better-off and likely to have a higher ratio of village leaders. The relatively high percentage of ‘elites’ among female-headed panel households allowed them to be prioritised in the distribution of vouchers.

Table 49: Ratio of households with members in elected positions in the villages in Round 4 (%)

	village chairman	Kitongoji chair	10 cell leader	Member of village council	VEO	VVC	None	Any position
Male-headed households	9.4	17.4	22.1	26.1	1.4	2.5	38.0	61.0
Female-headed households	3.2	3.2	16.1	22.6	3.2	6.5	58.1	45.0
All households	8.8	16.0	21.5	25.7	1.6	2.9	40.1	59.0

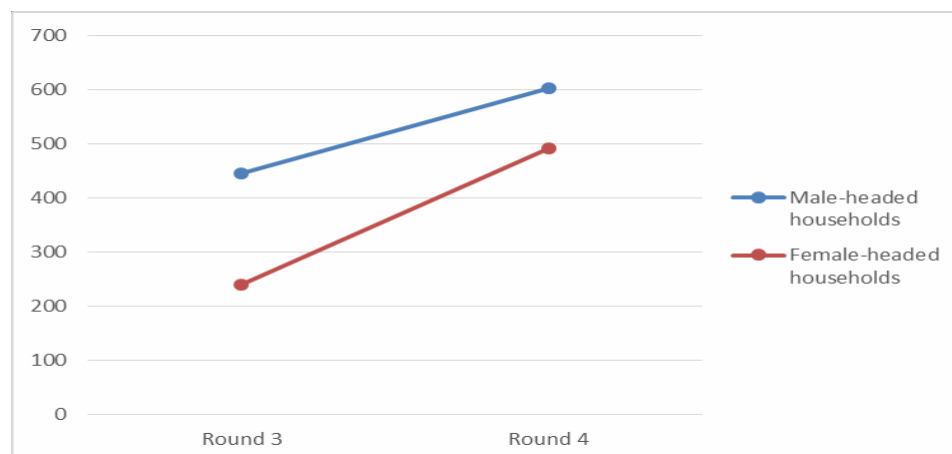
Note: Kitongoji: Hamlet; 10 cell: neighbouring household group; VEO: Village Executive Officer

Source: Christiaensen and Pan (2009a); Author’s data

The panel data shows that female-headed households have less access than the average ratio of all the households to the extension services, 20 per cent for the former and 38 per cent for the latter, whose tendency in other parts of the world is suggested by existing studies (World Bank et al., 2009; Holmes and Jones, 2013). The ratio of receiving extension services for maize of total female-headed households (10 per cent) is less than that of male-headed households (15 per cent). We could not compare the change of ratio of access to credit as the questionnaires are different on these questions. However, we can see that the ratio of belonging to savings and credit associations (SACCOs) of female-headed households has been constantly slightly higher (33 per cent in Round 3 and 24 per cent in Round 4) than that of male-headed households (30 per cent and 19 per cent, respectively). However, the average amount of borrowed money among all the panel households has been unchangingly three times as much as that borrowed by female-headed households. Despite membership, female-headed households could get less credit than male-headed households, which is probably due to their smaller land and crop income.

Even with this inferior position in access to extension services and credit, because of the increase of input use availed from access to subsidy, female-headed households achieved higher increase in maize yields compared to male-headed households during the period (Graph 14). This may be due to the higher rate of receiving vouchers by female-headed households.

Graph 14: Average maize yields of panel households by gender (kg/acre)



Source: Christiaensen and Pan (2009a); Author's data

Thus, unlike the findings from qualitative interviews that the female-headed households had difficulty in accessing input vouchers, the panel study results show that female-headed households were prioritised to have access to vouchers. This was probably due to their average total household income being originally almost the same as male-headed households (Graph 13), which enabled them to pay top-up despite the fact of their having access to even smaller amounts of credit than male-headed households. It suggests that they were originally better-off female-headed

households who have constant non-farm income while the land owned and cultivated was smaller in size than male-headed households. Thus they increased their maize yield with a higher ratio than male-headed households due to subsidy receipt, which made their income higher than the male-headed households in Round 4 (Graph 13).

Since no gender disaggregated representative sampling was originally included in the panel design, the female-headed panel households represented a better-off segment of female-headed households in general. Thus, given the programme priority to target female-headed households if they can pay top-up, they were prioritised to be eligible for vouchers. However, as the panel results and informants suggested, widow-headed households in general had difficulty in accessing knowledge through extension, had smaller land, less credit, a smaller cash income than male-headed households, because they focussed on food crops and less family labour, and were thus less able to contribute to village activities. All these conditions made it difficult for them to get access to input vouchers, which is the general picture of female-headed households in the region. Studies suggest that for household food security, it is better for subsidy programmes to target women in the sense that if women raise more crops, they tend to improve the nutrition of their children while men have less propensity to do so (World Bank et al., 2009; Holmes and Jones, 2013). Furthermore, given their vulnerable situation, women should not only be well-targeted by input subsidy programmes but also given prioritised access to land, extension and credit.

7-4. Conclusion

In the villages, many informants mentioned that the programme did have a positive impact on their livelihood, such as the purchase of household assets, renovation of houses and ability to send children to school. Meanwhile, others informed that the programme had only small effects, due to the ineffectiveness caused by its late delivery, the low quality of inputs or illegitimate use of vouchers. The panel data shows that in general income poverty reduced a little, several household assets and social infrastructure such as access to road and mobile phone network were increased, while non-farm income was reduced, which might reflect the concentration of their activities on crop production, which was induced by the programme's provision of inputs. Maize sales prices were reduced, which was probably due to the increased maize production induced by the programme.

However, the regression results suggest there was no statistically significant impact of voucher receipt on income poverty, household assets, or on sending children to primary school. This was the same among graduates of the programme – who received more than three years of vouchers, although this result might be affected by small sample size, not leading to precise estimates. Given the differences between qualitative and quantitative results, there must be

confirmation bias in qualitative information and reporting errors in quantitative data, as in the case of impact on maize yields seen in Chapter 6; however, I would say the error might have been bigger in the qualitative information. This comes from the complex implementation of voucher management as seen in Chapter 4, elite capture, late delivery, receipt of only Urea, resale of vouchers, etc., which meant the programme had no impact on the poverty and assets of the recipients.

The panel households increased maize and rice production and their sales ratio, and average total crop sales value was increased, among which the share of coffee sales was more than half, followed by maize, rice and cashew nuts. Meanwhile, the unit sales value of maize and rice was decreased from Round 3 to 4. The panel households could purchase more diversified food because of increased crop production, increased crop sales, and reduced maize consumer prices, but also by shifting their consumption from maize to cassava whose unit sales value decreased more than the one of maize. Maize consumer price reduced a little, while its sales price reduced by 30 per cent, which benefit maize poor net-buyers. Thus the programme seemed to bring them food security with diversification of food consumption.

However, there were also mixed findings on the impact of voucher receipt on household food security: the difference-in-difference model does not show that there was a statistically significant impact of voucher receipt on calorie consumption of the households. There was general increase of main crop production and sales of the panel households during the period – thus general food availability was increased, which corresponds to the information from the interviews with many informants in the field that the programme improved their household food security through increased production, but which might not necessarily have been attributed to the programme. The reason for the contradictory findings is correlated with the complex voucher management and confirmation bias in qualitative data.

Although a few female heads of household who received vouchers were able to improve their food security, there are some villages where food is insecure in the lean period even in the top maize producer in the region, Songea district. This is especially the case for vulnerable households, such as those headed by elderly people or females.

The female-headed panel households had less land and fewer opportunities to have extension services, earned less crop sales income and had less credit. Even so, the female-headed panel households showed that they had a higher rate of receiving vouchers than the average of male-headed households. They increased maize yields and total household consumption per adult equivalent more than the male-headed households. However, this favourable situation of female-headed households is probably due to the sampling, who has more various capitals (natural, physical and political) than other vulnerable female-headed households. As many female heads of households I met in the villages could not get input vouchers, in general female- or widow-headed households have less access to inputs and thus less income, leading to food insecurity,

which would reflect the average situation of these households. The subsidy programme should keep targeting these vulnerable households as a priority.

Chapter 8. Indirect impacts of NAIVS on the wider economy

If the input prices go high we sell it to the shops... and if the prices go down, we sell among ourselves. Now we are getting the benefits of this voucher system because it keeps the maize price low. (A farmer in a Group Discussion in Songea)

8-1. Introduction

In Chapter 3, I presented the theory of change I use to study the impacts of subsidies on poverty and farmers' livelihoods. The NAIVS programme aims to achieve national food security through increased maize or rice production. Also the theory of change is based on the assumption that the real maize price would be lowered following input subsidy. We saw in Chapter 7 that, according to the panel data, maize production increased by 80 per cent, while maize real producer unit prices dropped by 30 per cent. These are measured by recalling prices in the last agricultural season, which is supposed to be sold mostly in the harvest period. , Meanwhile, real consumer prices dropped by very little, namely 4 per cent, which are also measured in both years by 7-day recalling in the lean season of the same agricultural season. The drop in the producer price might be attributable to the increased maize supply in the region; however, the real consumer price has not dropped as much.

Existing studies on Malawi's experience suggest that Farm Input Subsidy Programme (FISP) increased maize production and thus improved national food security (SOAS et al., 2008; Dorward et al., 2010), although there were critiques that this was due to the favourable weather and economic conditions in those years. Using Computable General Equilibrium (CGE) and Partial Equilibrium models, several studies show that FISP should lead to falls in the price of maize in the absence of interventions or macro-economic or other changes affecting maize prices. Buffie and Atolia (2009) estimate long-run falls in food prices of 2-5 per cent, with short-run falls of 9 per cent in Malawi. Chirwa and Dorward (2013) suggest that real maize prices in Malawi fell by 8-40 per cent. Using market and district-level panel data, the study by Gilbert et al. (2013b) estimates that in Malawi and Zambia, where a large-scale input subsidy programme has been implemented since the early 2000s, doubling the size of the programme would reduce real maize prices by 1.2-2.5 per cent and 1.8-2.8 per cent respectively, through increased maize production.

Increase of real agricultural wages relative to maize price in Malawi and Ghana was found after the introduction of input subsidy by Chirwa and Dorward (2013) and Filipinski and Taylor (2011). With increased use of improved inputs, more labour is required for such tasks as weeding, which thus is expected to raise local agricultural wages in a relatively closed labour economy. Dorward and Chirwa (2013) find that there was increased real wage since the introduction of Farm Input Subsidy Programme (FISP) in Malawi.

The input subsidy programmes are expected to raise the input demand with the increased awareness on the effects of inputs, if they target to the poor farmers who did not use inputs, and the prices are affordable. Economic theory suggests if their need for inputs would thus increase, it would increase the input prices by creating competition between agro-dealers. However, farmers sometimes purchase less commercial inputs than otherwise they would have in the absence of the programme – ‘crowding out’. Studies suggest that ‘crowding-out’ of inputs were less when the subsidy programmes target to poor farmers and where the commercial demand was low (Xu et al., 2009a; Ricker-Gilbert, 2011; Mason and Jayne, 2013). Liverpool-Tasie (2012b) finds that the voucher programme increased the link between farmers and input suppliers, thus increasing private input demands in Nigeria. There has been keen debate on the amount of ‘crowding out’ of subsidy programmes (Jayne et al., 2013; Dorward and Chirwa, 2015; Jayne et al., 2015). As to the international input market prices, on the other hand, Hernandez and Torero (2013) used panel data from Urea-producing countries to show that the concentration of production by fertiliser companies made global fertiliser prices high, which reduced fertiliser use and affected farmers’ income in developing countries. However, as mentioned in 4-4-1, the scale of the programme in terms of Urea was medium - 42 per cent of the requirement without displacement-, but with substantial fraud, missing vouchers, leakage to wealthier farmers and subsequent possible displacement, this ratio could be reduced to even about half – a quarter, or a little less of the requirement, thus the indirect impact of the programme onto maize and input prices and agricultural wages would be expected to some extent. Also as the programme targeted the promising regions in the country, we could expect the indirect impact of the programme onto national food security.

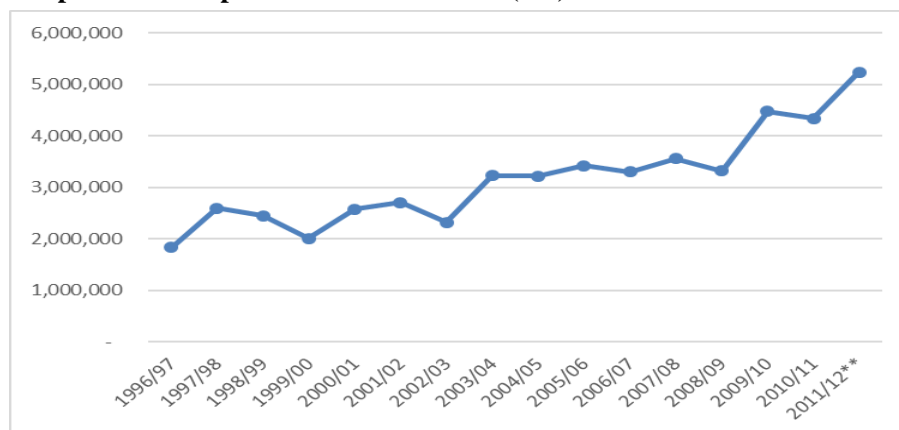
On this discussion in this chapter I provide empirical evidence of the panel data as well as data from national-level government and private sector and local governments, to look at the programme’s contribution to national food security and its indirect impacts on maize wholesale prices, local agricultural wages, input prices and private sector development in the region.

8-2. Contribution to national food security

Data from the Ministry of Agriculture, Food Security and Cooperatives (MAFC) indicates that from 2000/01 to 2011/12 maize production in Tanzania increased twofold, with bigger increases in the years in which subsidy programmes began, namely 2003/04 and 2009/10 (Graph 15) (MAFC, 2012). Food has not been in such short supply in recent years, although the trade position of maize in Tanzania has changed year by year (URT, 2013d). However, there was a report that undernourishment worsened up to 2010, since when it has improved (FAO et al., 2015). Famine Early Warning System Network (FEWS Net) monitoring reports also reveal that food insecurity alarms were observed almost every year in some parts of the country (2015). Meanwhile, for national food security reasons the country has intervened in the maize trade, for example, by the

frequent placing of export bans in recent years (Table 50). However, many criticised this ban, pointing out that it ‘can reduce the welfare of producers as well as consumers’ (World Bank, 2009a). The program document cautioned that an export ban should be a temporary measure to avoid facing the influence from the world high food prices, otherwise low maize prices would damage the profitability from input use from NAIVS, thus hampering the efficiency of NAIVS expenditure. It suggests that the expected increased maize production would reduce maize prices. However, due to high regional maize demand from neighbouring countries, the regional maize price would stay high. This, accompanied by lift of export ban and elimination of trade barriers (road blocks, weigh bridges, non-transparent taxation, non-tariff barriers, etc.), would make profit from using improved inputs (ibid.: 30). It was therefore expected that the ban would be lifted as NAIVS promoted increased production.

Graph 15: Maize production in Tanzania (ton)



Note: The data for the year 2011/12 is estimated. Source: MAFC (2012)

Table 50: Recent chronology of export bans in Tanzania

Date	Event
Jan. 2007	Export ban lifted
Jan. 2008	Export ban reintroduced
May 2008	Export ban lifted
Jan. 2009	Export ban reintroduced
Oct. 2010 (or Apr	Export ban lifted
May 2011	Export ban reintroduced
Jan. 2012	Export ban lifted

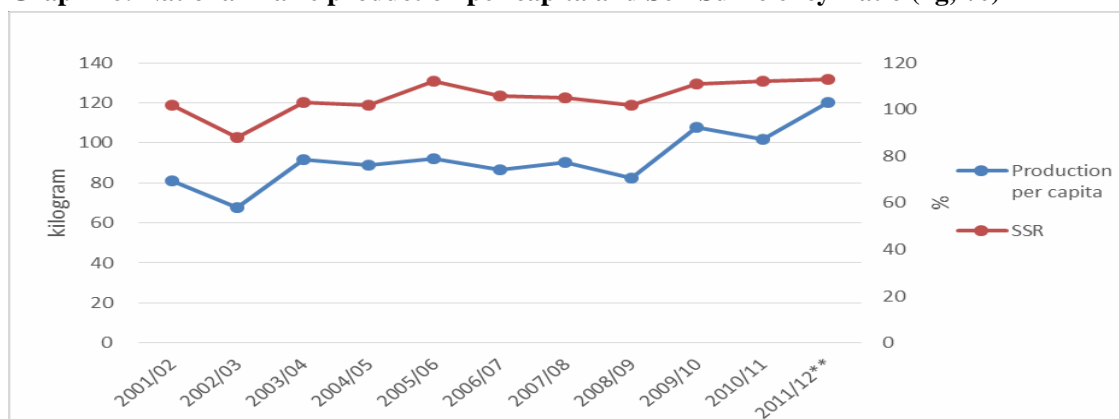
Note: *As cited in the source.

Sources: Author modified from World Bank (2009b); MAFAP (2013)

Graph 16 shows the data of maize production per capita and the Self Sufficiency Rate (SSR) reported by MAFC. It shows that from 2001/02 to 2011/12, national maize production per capita increased by about a quarter. It further shows that with the introduction of each subsidy programme, maize production per capita increased in 2002/03 as well as in 2008/09. During the first subsidy programme (2003/04-2007/08), maize production remained constant. Since the NAIVS was introduced, maize production per capita has continued to increase. Since the NAIVS

started full operation in 2009/10, SSR has also remained high, above 100 per cent. The SSR is measured by comparing national production to the requirements for food and other uses such as seed, feed, losses and trade (URT, 2012a). It seems that national food security has improved due to the programme. The panel data results also show the increase of maize yields of both recipient and non-recipient households as seen in the Chapter 6, which contributes national food security.

Graph 16: National maize production per capita and Self Sufficiency Ratio (kg, %)



Note: Population data from 2002/03 to 2011/12 were interpolated by annual increase reported by World Bank (2015). Data for 2011/12 was the production forecast for the season. SSR follows a simple food adequacy principle whereby production is related to requirement encompassing consumption and other uses based on requirement parameters (URT, 2012a).

Source: MAFC (2012); URT (2006b); URT (2014a); World Bank (2015a)

However, as reported by FAO et al. (2015) and FEWS Net (2012; 2015) and the village panel results, there was still a high level of food insecurity in some areas in the country. Also, as we saw in Chapter 6, in Ruvuma village panel survey results in Round 4 show that in two-thirds of the villages surveyed, the majority of the households used money to buy foods in the lean period, i.e. February to April, partly due to the irregular rain. Thus although national maize production increased to satisfy the demand at national level, food insecurity continued in certain areas in the country because of weather such as irregular rainfall, market conditions, lack of infrastructure and transport facilities, as well as exporting due to the demand from other countries.

8-3. Maize prices

In the villages, farmers complained about unstable maize market prices season by season and year by year. Several informants mentioned that ‘there is no market for maize, so we have to face price fluctuation and sell at lower prices without knowing the real price in other places.’ Another reason for price fluctuations, mentioned by several informants, was the frequent export bans mentioned above. In this section, I will look at the change in maize prices in relation to NAIVS under the frequent imposition of export bans.

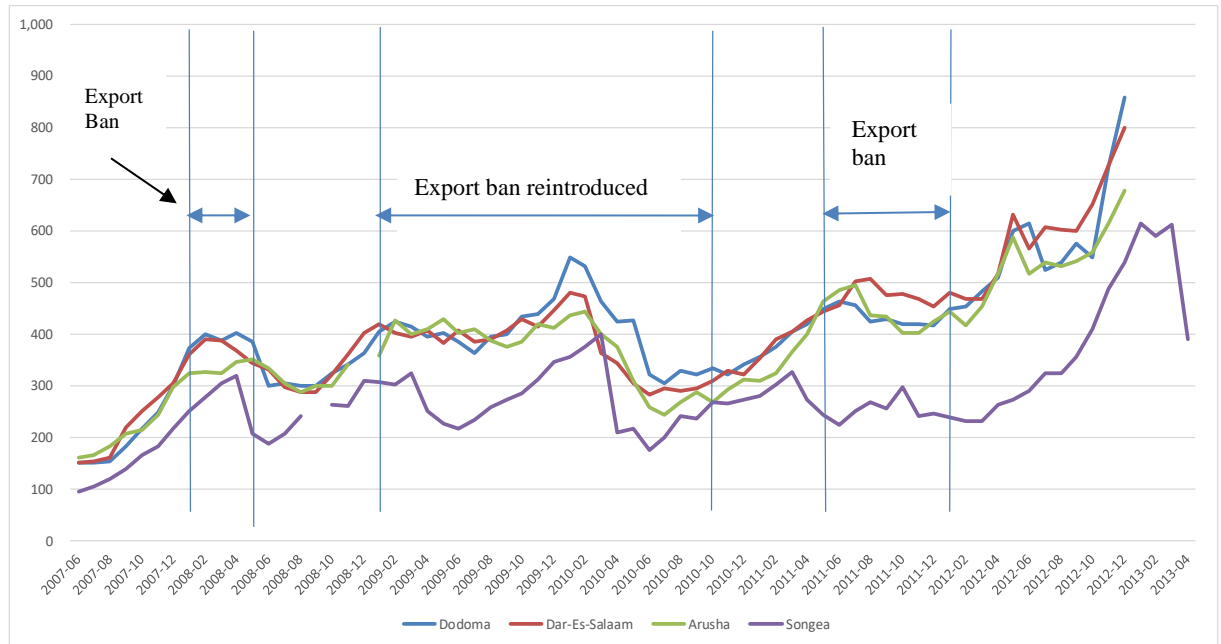
Several informants, including the manager of National Food Reserve Agency (NFRA),

and several studies reported that the surplus of maize in Ruvuma is taken to Arusha, Dar es Salaam and Dodoma (Famine Early Warning Systems Network, 2010; Barreiro-Hurle, 2012b) (Refer to Figure 1). I will therefore look at the change in maize real wholesale prices in these towns and Songea. Graph 17 shows that the real wholesale maize price in Songea Town was constantly lower than that in the other markets, which is due to the costs of management and transport. If we see in detail, we can see that the export bans were placed in most cases when the real prices were about to become high, which met the stated objective of food security. The data shows that the export ban in 2008 was placed during the international food price hikes, and was lifted in May 2008, and was reintroduced in January 2009, which approximately corresponds to the time at which NAIVS started (pilot was placed since September 2008), and when the international maize prices were expected to continue to be high. However, the export ban was still in place even after maize prices dropped in all the towns from January to October 2010. With the export ban, maize prices remained constant up to the sales season in 2010, that is, the election season⁵⁷. We may assume that the export ban was continued not only to assure food security but also to benefit urban consumers with lower maize prices. As Chinsinga suggests in the case of Malawi, maize in Tanzania is a 'political crop' (Chinsinga, 2012b). Meanwhile, since April 2011, the price in Songea district has dropped and was stagnant until March 2012, even during the export ban and up to after two months of lift of export ban, whereas prices in other consumer markets have increased. This is probably due to the price distortion at each sales point, considering the costs and import and export parity prices. This distortion was due to policy interventions which favoured urban consumers (Westlake, 1987).

This hit the maize-surplus farmers in Ruvuma heavily, as many informants reported: 'farmers waited for a long time to sell maize in the villages, to the point that in the end they did not want to sell it. The maize was rotten, since the middlemen bought from them at a very low price'. A farmer in village A in Songea district also mentioned that 'the price of maize last year (2011) was 250 TZS per kg, while this year (2012) it has increased up to 500 TZS per kg.' Several informants believed that the lower price was due to the export ban. A farmer in group discussion in Songea district thought that 'the (maize) prices go up and down, and most times when you hear the borders are closed and no maize should be taken outside, you find that the prices are low.' Because of this experience, farmers did not buy inputs in the 2011/12 planting season, which reduced maize production, and the NFRA failed to buy maize until January/February in 2012, when the price went up. A NFRA officer informed me that the export bans were removed in January 2012 because of maize farmers' complaints about low prices in 2011, and because good weather was expected in 2012. After the lift of the export ban, the government bought 89 per cent of the maize produced (Ruvuma RS, 2012a) priced at 350 TZS per kg. It did so in part because of

⁵⁷ The election was held in October 2010.

Graph 17: Monthly average real maize wholesale prices in major consumer towns (Dodoma, Dar es Salaam, and Arusha) and Songea town (TZS per kg)



Source: URT (2013b); NBS (2012); NBS (2010); NBS (2014)

a shortage of maize in other parts of the country, according to the Monitoring Report of the FEWS Net (2012), which warned of a shortfall of rain in the long rain season (March– April) in 2012, and because of high demand from Kenya, Rwanda, Burundi and Democratic Republic of Congo, which made maize prices high compared to the previous five years. Thus in 2012 the private sector, including the buyers from Kenya, bought maize at 300 TZS per kg, which went up during the year to 500 TZS per kg. Actually, when I visited the Farmers’ Association Cooperative in Songea town (SODECO) on 28 November 2012, the price board showed their unit maize purchase price was 510 TZS per kg. NFRA Songea officer reported that their unit maize purchase price from farmers increased very little between 2005/06 and 2010/11, namely to, 190TZS, 210 TZS, 230 TZS, 260 TZS, 294 TZS, 300 TZS each year, after which in 2011/12 it jumped to 350 TZS. Graph 18 shows that lean season prices were higher than the ones in the previous crop sales seasons, especially in Songea district, which corroborates information from wealthier farmers: ‘we sell maize from December to January when the prices become high’. In Songea town there are two places for farmers to sell maize: SODECO and NFRA. While SODECO pays farmers on the spot, NFRA pays farmers one or two months later. According to the manager of SODECO, they pay farmers more than NFRA; e.g. in the 2012/13 season, NFRA started to buy maize at 350 TZS per kg, while SODECO bought at from 370 to 380 TZS per kg. Normally, farmers have to bring maize by themselves to SODECO. Without means of transportation and lacking capital, however, poor farmers sell to the middlemen who visit the village. Many villagers complained about the ‘unstable market’ which results from this fluctuation in prices and the recent drop in maize prices has not

much benefited maize producers. The Manager of SODECO suggested that ‘we need a market where farmers can sell maize at more stabilised prices’. He said that the MAFC organised a meeting to set up the zonal⁵⁸ board for mixed crops, inviting farmers’ representatives and agro-dealers, but that there has been no further development on this.

The drop in maize prices is corroborated by several studies reporting that export bans have caused lower maize prices for maize farmers in surplus areas, such as in Ruvuma, compared to these major consumer markets (Dodoma, Dar es Salaam, and Arusha) (Barreiro-Hurle, 2012a; Angelucci F. et al., 2013; MAFAP, 2013). In their study, Diao et al. (2013) suggest that export bans have a modest effect on price indices at country level, while there was a negative effect on maize surplus areas by lowering maize prices by about 7–26 per cent, which negatively affects the maize-surplus farmers while it benefits the maize-deficit poor farmers.

With long period of placement of export bans since NAIVS started (September 2008), real maize prices have been declining generally in Ruvuma. Thus it is difficult to differentiate the effects of lowering maize prices either from the export ban or NAIVS. Table 51 above shows that a comparison of the crop sales prices in Dar es Salaam and Songea district during these three years. Since there was no export ban in both harvest seasons in 2008 and 2012, we can compare findings without its effect. During the period the real maize price in Dar es Salaam increased by 15 per cent, while the one in Ruvuma dropped by 8 per cent. The decrease in maize consumer price also corroborates the finding from my panel data in Ruvuma, which suggest a reduction of 4 per cent during the period. This benefits maize net-buyers. This corroborates the words at the beginning of the chapter spoken by a poor farmer in a group discussion in Songea district: ‘now we are getting the benefits of this voucher system because it keeps the maize price low (to buy maize).’ In Dar es Salaam, with the last lifting of the export ban the price increased to a higher level than when NAIVS started. This was probably due to the fact that there were other sources and buyers of maize in Dar es Salaam, including import and export. This corroborates the findings of Dabalén and Paul (2015) from 20 markets in Kenya and Tanzania, that the export ban increased the wholesale maize price by 17 per cent in Dar es Salaam, while in maize surplus areas producer prices did not increase and therefore did not benefit maize-producers.

8-4. Impact on agricultural wages

In this section I analyse real agricultural wages relative to maize prices in Ruvuma region. I found that only a few panel households used hired labour, although a village survey suggests that labour is highly needed from December to January, when maize is planted in the region. Nearly three-quarters of the villages report in Round 4 (corresponding to the season 2012/13) that the agricultural daily wage increased greatly compared to the 2007/08 season which was surveyed

⁵⁸ In the plan of MAFC there were seven zones in the country (interview with manager of SODECO).

in Round 3 (Christiaensen and Pan, 2009b). 85 per cent of the villages report that wages increased by much or a little. In 2012 (Round 4), 41 per cent of the total labour cost was used for land preparation, followed by 25 per cent for harvesting and 20 per cent for weeding. Since there is no data for the labour costs of harvesting in 2008 (Round 3), and given that the use of improved inputs requires more labour for weeding, I compare the change of total labour costs of land preparation and weeding during the period (Table 52).

Table 51: Total real daily labour costs for land preparation and weeding in 2008 and 2012 (TZS)

	Land preparation		Ratio of increase	Weeding		Ratio of increase	Total		Ratio of increase
	2008	2012		2008	2012		2008	2012	
Songea	5,291	4,926	0.9	2,778	2,956	1.1	8,069	7,882	1.0
Tunduru	2,778	4,433	1.6	3,333	4,039	1.2	6,111	8,473	1.4
Mbinga	3,935	3,448	0.9	2,778	2,956	1.1	6,713	6,404	1.0
Namtumbo	6,944	8,506	1.2	5,000	5,172	1.0	11,944	13,678	1.1
Total	3,935	4,269	1.1	3,333	3,448	1.0	32,837	36,437	1.1

Source: Author's calculation from Christiaensen and Pan (2009b); Author's data

The biggest increases in the total real daily labour costs for land preparation as well as for weeding were found in Tunduru. There was a ten per cent increase in the cost of weeding in Songea and Mbinga. Meanwhile, together with the cost of land preparation, a greater increase was found in Tunduru and Namtumbo, in which the cost of land preparation increased by 20 per cent. Meanwhile, the total labour cost in Songea and Mbinga remained constant. Despite differences between districts, the average real wage for labour in the region increased by 10 per cent during the period.

I have used the panel data shown in Tables 53 and 54, that is, on the maize prices and the daily labour cost, to examine real wages relative to maize prices. These reveal that the real total labour cost relative to maize prices increased by 12 per cent during the two survey periods (Table 52). This increase could be attributed to the introduction of subsidy, which contains the hybrid seeds which requires more labour demand especially for weeding and harvesting due to increased production. The real increase in agricultural wages benefits the labour-surplus food-deficit poor farmer households and improve food security. The real increase in agricultural wages was found by several studies of Malawi (SOAS et al., 2008; Dorward et al., 2010; Chirwa et al., 2011a).

8-5. Input prices

As previously mentioned, in order to solve the problem of market distortion made by previous 'government-procured and distributed' input subsidies, NAIVS uses the private sector to procure and deliver inputs to the villages. Under NAIVS, input market prices and top-up prices were set in principle by competition between agro-dealers in each village. Meanwhile, I observed that in NAIVS the district government suggested the prices to be sold at in each village ('bei elekezi'=Swahili term for 'suggested price'), which aimed to protect farmers from bargains driven

by agro-dealers taking advantage of the given demand. I have to note that this is not in accordance with the programme design: 'the Government does not intervene in...setting prices of agricultural inputs', in order to promote private sector development (World Bank, 2009a). Meanwhile, several informants reported that some agro-dealers did not sell at these suggested prices. In some villages, when agro-dealers set higher prices than 'bei elekezi', it seemed that there was also space for negotiation between the VVC/village government and agro-dealers on setting the prices. However, due to imperfect market conditions there was a power imbalance between the two parties where agro-dealers won in most cases. This could be seen in the remarks made by a Ward Agricultural Extension Officer in Songea district: 'negotiation with agro-dealers is difficult. Up to two years ago all agro-dealers charged the same input prices, which made it difficult to discuss with them, since there was no difference between their prices. While last year (2011/12) they set whatever prices they wanted, since they were not sure whether they could work with vouchers when they brought inputs to villages, and also since there were only a few agro-dealers in the village. It was then again difficult to discuss with them, since they said that they were in difficult situation'.

On the other hand, I heard that in some villages the VVC assigned each farmer to go to a pre-determined agro-dealer, so that agro-dealers would not lose any inputs brought to the villages. Here there was no free market where villagers could choose a better option for buying inputs. Villagers suspected collusion between the VVC and agro-dealers, whereby farmers sometimes had to buy inputs at higher prices under this 'non-free' market.

In this section I will use the data from local government and an input supplier company as well as the results from the panel village survey. Acknowledging that the first two data will not be precisely the prices the farmers had to pay, I will analyse the general trend of input prices before and after NAIVS started. Firstly, I will analyse the real market prices and their increase ratio in Songea and Tunduru towns (Tables 53 and 54). The data is developed from two different series of data. The one for 2007/08 and 2008/09 are the statistics of input market prices⁵⁹ in each district in corresponding years reported by Ruvuma RS office, while the data for later years are input market prices reported by each district government.

The real prices of Urea and DAP increased between the two survey years, i.e. 2007/08 and 2011/12. With an increase of about 60 per cent, the price of DAP rose much more than that of Urea, which increased by 22 per cent in both towns. All the input prices decreased after the input price crisis ended in 2009/10, especially Urea. After that, the price of Urea increased by about 60-75 per cent until 2011/12, seemingly rising every year. The price of DAP also increased by about 15-25 per cent during the period. In comparison, the price of MRP decreased by 8 per cent.

Table 52: Real input market prices and their increase ratio in Songea town (%)

	2007/08	2008/09	2009/10	2010/11	2011/12	Increase ratio from 2007/08 to 2008/09	Increase ratio from 2008/09 to 2011/12	Increase ratio from 2009/10 to 2011/12	Increase ratio from 2007/08 to 2011/12
UREA	41,176	50,521	31,683	-	50,382	0.23	0.00	0.59	0.22
MRP (powder)	-	-	30,693	-	28,244	-	-	-0.08	-
MRP (particles)	-	36,667	30,693	-	30,534	-	-0.17	-0.01	-
DAP	35,294	94,792	45,545	-	57,252	1.69	-0.40	0.26	0.62
Maize hybrid seeds	-	-	31,683	-	34,351	-	-	0.08	-

Source: Calculation from Ruvuma RS (2012g); Songea district (2012b); Songea district (2012c); NBS(2012); NBS(2010)

Table 53: Real input market prices and their increase ratio in Tunduru town (%)

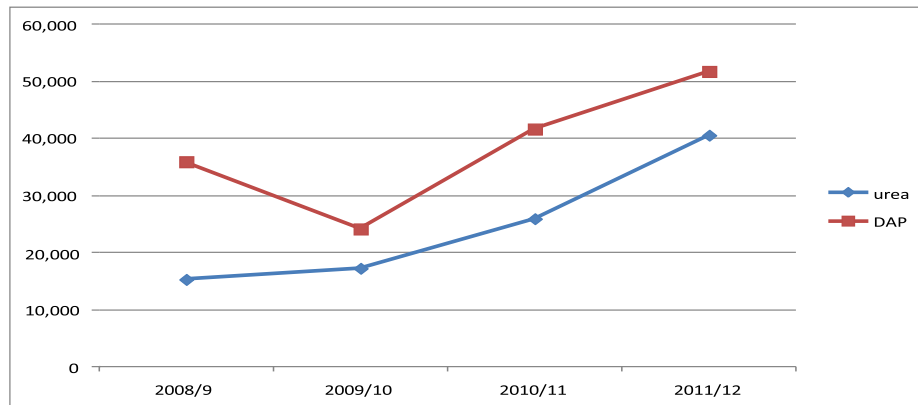
	2007/08	2008/09	2009/10	2010/11	2011/12	Increase ratio from 2007/08 to 2008/09	Increase ratio from 2008/09 to 2011/12	Increase ratio from 2009/10 to 2011/12	Increase ratio from 2007/08 to 2011/12
UREA	44,706	62,500	31,188	38,636	54,580	0.40	-0.13	0.75	0.22
MRP (powder)	-	-	-	14,091	12,595	-	-	-	-
MRP (particles)	-	40,625	-	16,818	14,885	-	-0.63	-	-
DAP	38,824	101,042	54,455	58,182	61,832	1.60	-0.39	0.14	0.59
Maize hybrid Seeds	-	-	32,178	23,636	24,046	-	-	-0.25	-
Rice seeds	-	-	22,277	28,182	23,664	-	-	0.06	-

Source: Calculation from Ruvuma RS (2012g); Tunduru DC (2012a); Tunduru DC (2012b); Tunduru DC (2012c); NBS(2012); NBS(2010)

Considering that most inputs were imported, in order to examine the trend of import prices, I will use the Free on Board (F.O.B.) price data obtained from the Tanzania Fertilizer Company (TFC), an input-supplying company that shares about 25-30 per cent⁶⁰ of the Urea market in the country. The above trend of input prices in Songea and Tunduru towns corroborates the import price data of Urea and DAP given by the TFC (Graph 19) (TFC, 2012). The real import price of Urea, converted into Tanzanian shillings at the exchange rate reported by the Bank of Tanzania, increased by 90 per cent from December 2009 (corresponding to the 2009/10 agricultural season) by November 2011 (2011/12 season), and that of DAP increased by 74 per cent, which is higher than the increase seen in markets in Ruvuma (Table 55).

⁵⁹ The document reports the data 'with subsidy' and 'without subsidy'. I take the price 'without subsidy' as market price data here.

Graph 18: Annual average real F.O.B. prices of Urea and DAP (base year=2008, in TZS per 50 kg)



Note: The price of Urea is from Yuzhny (port in Russia), and the price of DAP is from Tampa (port in U.S.A.). The prices are adjusted by a combination of two CPI series.

Source: Calculation from NBS (2010), NBS (2012), TFC (2012), Bank of Tanzania (2015)

Table 54: Annual average real F.O.B. prices of Urea and DAP and real increase ratio (base year=2008, %)

	2008/09	2009/10	2010/11	2011/12	Real increase ratio from 2008/9 to 2011/12	Real increase ratio from 2009/10 to 2011/12
urea	15,313	17,262	25,958	40,581	93.4	90.5
DAP	35,958	24,151	41,660	51,758	5.1	73.6

Note: The price of Urea is from Yuzhny (port in Russia), and the price of DAP is from Tampa (port in U.S.A.). Source: Calculation from NBS (2010), NBS (2012), TFC(2012), Bank of Tanzania(2015)

Table 55: Management and transport costs after F.O.B. (US dollars, per ton)

C.I.F.	Ex-warehouse	Margin	Transport	Total
120	60	50	50-70	280-300

Source: Information from TFC (Dec. 2012)

Given the difference in the prices seen above in the markets in Ruvuma in 2009/10, TFC did not seem to be the major source in the region in the year, while the prices of Urea are almost in line with the market prices in Songea and Tunduru towns, thus TFC might be the major supplier.

The officer of TFC informed me that the cost for management after F.O.B. and transport per ton, i.e. Cost, Insurance and Freight (C.I.F.), was 120 US dollars (equivalent to 189,480 TZS⁶¹); the management cost for after warehouse was 60 US dollars (equivalent to 94,740 TZS); the margin for TFC was 50 US dollars (equivalent to 78,950 TZS); and the transport cost to the regions was around 50-70 US dollars (equivalent to 78,950 TZS-110,530 TZS) depending on the location of the regions (Table 56). In total, 280-300 US dollars per ton (equivalent to 442,120 TZS-473,700 TZS) was incurred on top of F.O.B. prices, which would be the input prices at the capital

⁶⁰ Information from the manager of TFC in Dar es Salaam (December 2012).

cities in the regions, to which the additional cost for transport and management by agro-dealers is added to make the input prices at the village levels. Thus the cost per 50 kg would be 14-15 US dollars (22,106 TZS-23,685 TZS). This cost would be as much as 56 per cent of the F.O.B price of Urea per ton in 2011/12, and the total price plus cost at the regional capital would be 62,687-64,266 TZS. With the additional cost required to bring inputs to the villages, this price would almost match the Urea price reported by the informants in the villages (67,250 TZS in 2011/12, Table 57).

Table 56: Average input market prices and real rates of increase from village survey (TZS)

	Round 3	Round 4	Real rate of increase
urea	51,829	67,250	0.23
DAP	80,567	83,681	0.03
Total	132,396	150,931	0.11

Note: Average reported price among villages⁶². Deflated by CPIs of all items. Source: Christiaensen and Pan (2009b); Author's data; NBS (2010); NBS (2012)

Table 57 suggests that the village survey data also shows the increase of real input prices. This corroborates many villagers' claims that there were big increases in fertiliser prices during the survey period. Meanwhile, the prices of seeds were reported not to have changed much. Several informants (a local government officer and agro-dealers) mentioned that the increasing input prices were due to exchange rate; increase in fuel prices, which increased transportation cost; rise in international input prices; and the bargaining by the agro-dealers under the secured demand because of NAIVS. Hernandez and Torero (2013) suggest the relative concentration of the producer countries where few companies were producing fertilisers made higher the input prices in recent years, which might be also the cause of Tanzanian case, as several multinational companies supply fertilisers, such as Yara Tanzania Ltd. High input prices also seemed to relate to the lack of capacity of small agro-dealers in some years. The VEO in Village G in Songea district mentioned that 'last year there was a shortage of inputs in the district, as some agro-dealers were so small that they could not buy many inputs. This made the input price high.'

Next I analyse the subsidy price of inputs – face value of vouchers - during the period, which was designed to be about half market prices, plus a 'remoteness premium' that varies by the average distance of each district from the port (for Urea and DAP) or point of production (for MRP and seed) (World Bank, 2009a: 41). These are determined by the projected market prices of the year at the time before the budget of the year is approved, and thus are supposed to change

⁶¹ Exchange rate 1 US dollar = 1,579 TZS as of 20 December, 2012 (Bank of Tanzania, 2015).

⁶² The questions in the questionnaire were different in two surveys: in Round 3 they asked the price in the survey year, while in Round 4 they asked the price in the previous year.

every year. After the pilot programme, which corresponded to the input price crisis in 2008/09, the programme revised the voucher package (World Bank, 2009a). One large revision was the reduction of the amount of Urea in the package from two bags (100 kg) to one (50 kg). This revision aimed to reduce the top-up amount for farmers but also to increase the number of recipient every year. After the pilot programme, which corresponded to the input price crisis in 2008/09, the programme revised the voucher package (World Bank, 2009a). One large revision was the reduction of the amount of Urea in the package from two bags (100 kg) to one (50 kg). This revision aimed to reduce the top-up amount for farmers but also to increase the number of recipient farmers within the determined programme budget. This reduced the face value of the voucher for packaged Urea by 50 per cent. However, informants from the Farmers' Association in Songea and several farmers suggested that one bag of Urea per acre of maized cultivation is not sufficient. Actually, several wealthier farmers who were well-informed on agronomic techniques informed me that they were using two bags of Urea per acre, by adding another bag of Urea themselves.

Another revision made to the programme was the introduction of a 'free market' in subsidised phosphate fertilizer. In 2008/09, probably due to the especially escalated price of DAP because of the international input price hikes, and that MRP has come to be produced in the country, different face values for phosphate fertilisers were applied: 30,000 TZS for MRP, and 47,000 TZS for DAP, although during the year 80 per cent of phosphate fertilisers were MRP, the rest being DAP. After the price of DAP went down in late 2008, the programme document developed in May 2009 suggests that 'farmers could choose the type of phosphate fertilizer based on the market prices and location-specific technical efficiency of each one' (World Bank, 2009a: 40). The programme thereafter issued only one face value of phosphate fertiliser, which has dropped since 2009/10, after which different face values of voucher for MRP and DAP were no longer set. However, as Tables 53 and 54 show above, the prices of these two inputs in towns differed substantially, thus the top-up rate for DAP was higher than that for MRP, which made it difficult for farmers to take DAP. This arrangement was probably due to the fact that MRP was produced nationally and the Tanzanian government wanted to promote its use among farmers⁶³. Despite the government's intention, informants suggested that MRP was not so technically popular because 'it was difficult to apply', and 'DAP was more effective to grow maize than MRP'.

However, due to the different prices as we saw in Tables 53 and 54, more than a third of the panel households received MRP combined with Urea and maize seeds compared to only about 10 per cent who obtained DAP with other inputs.

Another revision made, indicated by the data from RS, was that since 2009/10 OPV maize seed vouchers have no longer been distributed, although I heard in few villages in Mbinga and Tunduru that farmers bought OPV seeds with vouchers. This means that voucher management

practice in the field might have been flexible so that if OPV seeds were better suited to the location and the agro-dealers brought them to the village, farmers could buy them subsidised by the face value of a maize hybrid seeds voucher. The reduction of types of inputs of voucher package could have also been due to the high transaction cost of managing different types of input with different face values.

The average face values of vouchers in the voucher package in Ruvuma according to the data from RS are shown in Table 58. I acknowledge though the limitation of using government data of input prices which could vary much depending on the agro-dealers due to undeveloped market especially in rural areas in the region. For the price adjustment in different times, I use the average Consumer Price Index (CPI) for all items for the months when normally the vouchers arrived and the farmers paid top- up, that is, November to February in the following year. Since there is no regional CPI in Tanzania, I recognise the limitation of applying national-level CPI to the prices in such remote rural areas as villages in Ruvuma. Average real face values of vouchers for inputs reduced from 2008/09 to later years, due mainly to the reduction of the subsidised Urea amount in the voucher package since 2009/10, but the value also decreased further thereafter. Urea had the biggest drop, by about 60 per cent from 2008/09 to 2009/10 and a further 24 per cent from 2009/10 to 2011/12. Phosphate fertiliser decreased its face value by 14 per cent during the same period. Meanwhile, the face value of the maize seeds remained almost constant. Thus the face value of the whole voucher package decreased from 2009/10. This occurred under the increase of the real market prices of each input of whole voucher package, as seen above. That would have made farmers face increased real top-up amounts to get these subsidised packages.

Due to the effects of input price hikes in 2008, different face values were applied for the same inputs supplied in different times, in 2008/09 and 2009/10, which accommodated the different procurement costs by input supplier companies. However, it seems that the ‘remoteness premium’, varying the prices depending on the distance from the port in each district, was not applied. This suggests that this ‘premium’ disappeared and farmers in remote areas incurred the cost of remoteness as part of ‘top-up’. Rather, district government determined ‘suggested prices’ for each village, including the price of inputs as well as management costs, such as transport, storage, guards, etc. for agro-dealers. Also the project document suggests that ‘in 2008/09 the face value of a voucher for a 50-kilogram bag of Urea varied between TZS 24,000 for locations near Dar es Salaam and TZS 27,000 for more remote areas. For DAP the face value ranged from TZS 45,000 to TZS 48,000’ (World Bank, 2009a: 41). However, the RS data suggest that the face value for Urea in 2008/09 was 24,000 TZS (nominal. Table 58 shows the real price of two bags (100 kg)), which does not seem to be in line with the plan

⁶³ Information from manager of TFC Dar es salaam (December, 2012).

Table 57: Average real face values of vouchers in Ruvuma

	2008/9	2009/10	2010/11	2011/12	% change from 2008/9 to 2009/10	% change from 2008/9 to 2011/12	% change from 2009/10 to 2011/12
Urea	50,000	19,970	20,000	15,267	-60.1	-69.5	-23.6
Phosphate fertiliser	36,121	24,752	23,636	21,374	-31.5	-40.8	-13.6
Maize seeds	15,315	16,832	18,182	15,267	9.9	-0.3	-9.3
Rice seeds	-	10,891	10,909	15,267	-	-	40.2
Package with Maize seeds	96,013	61,658	61,818	51,908	-35.8	-45.9	-15.8
Package with Rice seeds	-	55,804	54,545	51,908	-	-	-7.0

Note: Deflated by CPI for all items (base: average of Mar. – Apr. 2009). Average of different values among districts taking into account differences in distribution of hybrid maize seeds, OPV, MRP and DAP in 2008/09, and the fluctuating face value of Urea in 2009/10.

Sources: Author, adapted from Ruvuma RS (2012b) Ruvuma RS (2012d), Ruvuma RS (2012e), Ruvuma RS (2012c), Ruvuma RS (2012a).

above, since Ruvuma is a very remote area from the port. For DAP it was 47,000 TZS, which is almost in line with what the document suggested. Considering that farmers in Ruvuma received Urea most, either in full package or only Urea or with another input, the programme did not benefit the farmers in the region, at least in the pilot year.

Now I will use the data of input market prices in Songea and Tunduru towns reported by district governments (Tables 59 and 60). Market data has been available since 2007/08, thus I can compare market prices before the programme with the top-up prices after the programme was introduced, in order to see the change in payment for inputs by voucher-recipients before and after the introduction of NAIVS. For phosphate fertiliser, only the market price of DAP in 2007/08 is available, although the rate of farmers who took up DAP with subsidy was small. Meanwhile the data of top-up prices of MRP in Tunduru seems problematic. The data tells us that in 2008/09 even voucher-recipient farmers had to face increased payments for Urea and DAP than the previous year, due to international high input prices. After the crisis ended and the programme was revised, in 2009/10 the top-up prices for Urea and DAP decreased substantially. The drop in the top-up amount for Urea was due to halving the subsidised amount of Urea since 2009/10. Since then, the input prices have increased again, especially that of Urea, these increasing by 170 per cent and 250 per cent in these towns, respectively. A lower increase was found in DAP, with 73 per cent and 36 per cent in Songea and Tunduru, and in MRP, with 54 per cent. This made the top-up amount for the fertiliser package double between 2009/10 and 2011/12, corroborating farmers' complaints about the increased price of fertilisers since the year 2010/11⁶⁴. Although the top-up for seeds showed a modest increase in Songea and decreased in Tunduru, the top-up amount for the full package increased by about 85 per cent in Songea town, and by a little less, i.e. 60 – 70 per cent in Tunduru town during the period.

Table 58: Real top-up prices and market price and increase ratio in Songea town (%)

	2007/08 market price	2008/09	2009/10	2010/11	2011/12	Increase ratio from 2007/08 to 2008/09	Increase ratio from 2008/09 to 2009/10	Increase ratio from 2008/09 to 2011/12	Increase ratio from 2009/10 to 2011/12
UREA	41,176	50,769	12,457	-	33,588	0.23	-0.75	-0.34	1.70
MRP	-	5,417	5,941	-	9,160	-	0.10	0.69	0.54
DAP	35,294	45,617	20,792	-	35,878	0.29	-0.54	-0.21	0.73
UREA + MRP	-	56,185	18,398	-	42,748	-	-0.67	-0.24	1.32
UREA + DAP	76,471	96,385	33,250	-	69,466	0.26	-0.66	-0.28	1.09
Maize hybrid seed	-	-	14,851	-	19,084	-	-	-	0.28
Urea+MRP+Maize	-	-	33,250	-	61,832	-	-	-	0.86
Urea+DAP+Maize	-	-	48,101	-	88,550	-	-	-	0.84

Note: Data from 2008/09 to 2011/12 are top-up prices. Deflated by CPI for all items (base: average of Mar.–Apr. 2009).

Source: NBS (2010); NBS (2012); Ruvuma RS (2012g); Songea district (2012a), Songea district (2012b); Songea district (2012c)

Table 59: Real top-up prices and market prices and real increase ratio in Tunduru town (%)

	2007/08 market price	2008/09	2009/10	2010/11	2011/12	Increase ratio from 2007/08 to 2008/09	Increase ratio from 2008/09 to 2009/10	Increase ratio from 2008/09 to 2011/12	Increase ratio from 2009/10 to 2011/12
UREA	44,706	75,000	11,386	18,636	39,313	0.68	-0.85	-0.48	2.45
MRP	-	9,375	-24,752	-6,818	-6,489		-3.64	-1.69	-0.74
DAP	38,824	51,923	29,703	34,545	40,458	0.34	-0.43	-0.22	0.36
UREA+MRP	-	84,375	-13,366	11,818	32,824		-1.16	-0.61	-3.46
UREA+DAP	83,529	126,923	41,089	53,182	79,771	0.52	-0.68	-0.37	0.94
Maize hybrid seeds	-	-	15,347	5,455	8,779				-0.43
Rice seeds	-	-	11,386	17,273	8,397				-0.26
Urea+DAP+maize	-	-	56,436	58,636	88,550				0.57
Urea+DAP+rice	-	-	52,475	70,455	88,168				0.68

Note: Data from 2008/09 to 2011/12 are top-up prices. Deflated by CPI for all items (base: average of Mar.–Apr. 2009).

Source: NBS (2010); NBS (2012); Tunduru DC (2012a), Tunduru DC (2012b); Tunduru DC (2012c)

As seen above, though the programme tried to mitigate the crisis of input prices in 2008/09, farmers faced higher payment for fertilisers in that year even with subsidy compared to the previous year. In 2009/10, the top-up payment for fertilisers decreased greatly with the decrease of their market prices to the previous level. However, since then the top-up payment in real terms has increased to more than double, especially that of Urea which has increased by 170-250 per cent, i.e. up to three to four times the real top-up price in 2009/10 during the period.

This corroborates claims made by many farmers of increases in the prices of fertilisers, which meant they were unable to pay the top-up and gave up even when they were selected or shared the package fifty-fifty with another farmer. This is reflected in the revision of the programme which removed the beneficiary selection criteria targeting small-scale farmers (MAFC, 2011). Also the face values of inputs did not change despite the increase of input

⁶⁴ Interview with key informants in Songea and Tunduru districts.

prices in later years of the programme; this might have been due to constraints on the programme budget, which had already been planned. Even with an increased demand for inputs in the country through NAIVS, given that most of the inputs were imported, input prices were vulnerable to price fluctuation on the international market. Data on top-up prices reveals the programme was increasingly out of the reach of poor farmers.

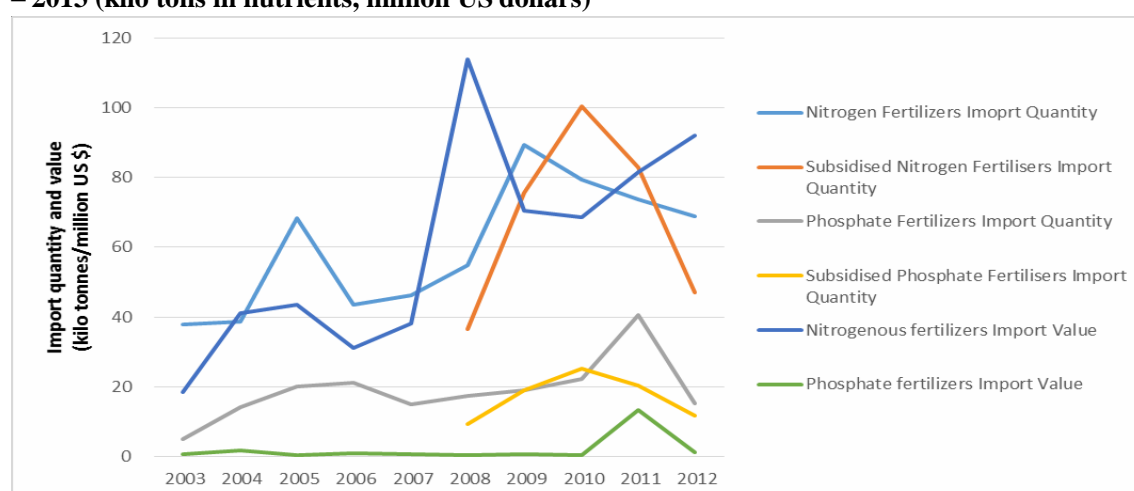
8-6. Private sector development

Private sector development is a new characteristic of market-smart subsidy which differs from the previous subsidy programmes in which government purchased and distributed the subsidised inputs (URT, 2014e). The new subsidy aims to reduce market distortion by introducing a free-market supply and demand system, and by promoting competition among agro-dealers. Though agro-dealers were criticised for colluding on prices in the region, they played an essential part in implementing NAIVS. They brought the inputs to the villages, where mostly there had been no input sales points previously. With raised awareness of the inputs through NAIVS, the farmers' demand for inputs was raised, even when paying commercial prices. Graph 20 was developed by combining the data of import quantity and value of nitrogen and phosphate fertilisers from FAOSTAT (2015) and the fertiliser amount provided by NAIVS from URT (2014e). The average ratio of types of subsidized phosphate fertilizer (DAP and MRP) actually taken by farmers is calculated from the panel data as shown in Table 8 in the section 4-4-6, which is 1: 3, respectively. These shares in 2008/09 and 2012/13, however, might not reflect the reality because of the pilot year arrangement and the introduction of new phosphate fertilizer (Minjingu Mazao) in the latter years. The Graph shows that in some years the subsidised amount exceeded the imported quantity of the fertiliser in the year: which might have been because the subsidised fertiliser was used from the one imported in previous year or the reporting error of the two series, if the URT data reflects the true amount of subsidised fertilisers in each year, the error of FAOSTAT might have suffered from missing data, or if the all of the officially claimed amount of subsidised fertiliser was not actually issued for vouchers in the end due to the lack of fertiliser amount. Acknowledging this, even with fluctuation year by year, subsidized nitrogen and phosphate fertilisers amounts share as much as 92 per cent and 79 per cent of total import amount per year on average. This suggests that the scale of the programme in the national input market was quite high, different from the one (about 42 per cent) estimated from the data of number of Urea vouchers, so that the high impact of the programme onto the wider market could be expected if this were true.

The data shows that nitrogen fertilisers import amount was decreasing since NAIVS started. The import amount of nitrogen fertilisers jumped in 2009, and thereafter gradually decreased to around the same level as in 2005, the highest amount before NAIVS. At the same time, however, import value increased. This suggests that there was displacement of commercial inputs, as suggested by Jayne and Rashid (2013: 556), but the decrease in import quantity seemed

to be affected by the increase in the unit value since 2011/12, as we saw in the previous section. Meanwhile, the import quantity of phosphate fertiliser remained almost constant, with a big increase in 2011, then a decrease in 2012. This was probably due to the change in government policy towards promoting MRP. MRP is produced nationally, but was not so popular among farmers. Thus they increased import of DAP or other phosphate fertilisers from 2011. Then the import amount was decreased in 2012 when the new type⁶⁵ of Minjingu was introduced. In all, import value of these fertilisers increased since 2009 compared to the period prior to the introduction of NAIVS, then decreased in 2012.

Graph 19: Import quantity and value of nitrogen and phosphate fertilisers in Tanzania in 2003 – 2013 (kilo tons in nutrients, million US dollars)



Source: Author, developed from FAOSTAT (2015); URT (2014e); Author's data.

In order to encourage more private agents to become agro-dealers for inputs, extensive training activities for prospective as well as ongoing agro-dealers were conducted by the Citizen Network for Foreign Affairs (CNFA) as part of the NAIVS programme. During 2010/11 and 2011/12, the number of trained agro-dealers in Ruvuma rose to 268. Among those trained, 66 per cent (as many as 177 dealers) entered NAIVS business (URT, 2014e). Although increasing the number of agro-dealers was effective, there were many reports from informants that after being assigned to the input subsidy business, many new small agro-dealers did not have enough capacity to do business with NAIVS. After they were given loans to buy inputs by TFC or NMB, they therefore ran away with the money without providing the full amount of inputs which are supposed to deliver or, in some cases, any inputs at all to the villages. The manager in TFC Songea office, who said that one of the TFC's roles was to monitor input business including NAIVS in the area, suggested that 'such small agro-dealers who became agro-dealers and ran away after getting credit money had known that they could take advantage of the opportunity to obtain loans or make

⁶⁵ Information from several informants. The new type is called 'Minjingu Mazao' ('Minjingu for crop' in Swahili), which improved the application easier and in its content – including nitrogen.

money out of NAIVS business'. Since there were so many such cases, especially up to 2010/11 when the biggest number of vouchers were distributed, the system of assigning agro-dealers was changed from 2012/13. Under the new system, input supplier companies who were assigned by MAFC in each region would assign their agro-dealers and be responsible for them. In 2013 1,600 agro-dealers were assigned as agents of seed and fertiliser companies in the country.

The number of agro-dealers dealing with vouchers increased up to 2010/11 and reduced in 2011/12. In Songea district, in 2008/09 there were 75 agro-dealers, in 2009/10 there were 92, in 2010/11 there were 104, and in 2011/12 among 145 agro-dealers 59 were selected to deal in vouchers. Meanwhile, while NAIVS increased the amount of temporal storage for inputs in villages only for four or five months, permanent input sales points have not increased so much in the villages. Village survey results in Round 4 suggest that only five villages had permanent access points for inputs. Highest access was found in Songea district with three-quarters of the villages having access, while in Tunduru 15 per cent of the villages had input points. Villages in Mbinga and Namtumbo reported that they still did not have permanent sales points for agricultural inputs in Round 4. The reason for this lack of permanent sales points seems to lie with the thin profits and high management costs of the input business.

On the other hand, in every district there was a big agro-dealer who covered a major part of the district. For example, one big agro-dealer dealt with about 65 per cent of the input business in a district, and about 20 per cent of the vouchers distributed in the region. Several small agro-dealers mentioned that the district government favoured their friends, who are big agro-dealers, thus the small agro-dealers could not have permission to do input business. In the pilot year, the system of delivery of subsidised inputs was different: farmers had to come to town to visit the stores of the agro-dealers to collect the inputs; since 2009, however, the agro-dealers have had to bring inputs to the villages, put up stalls and employ guards there, which has made it costly, especially for small-scale agro-dealers. Furthermore, competition with other agro-dealers did not allow them to make a big profit.

One small agro-dealer in Tunduru mentioned that the 'assignment of agro-dealers for NAIVS by the district government was not fair'. Due to this favouritism, some small agro-dealers have left the business with NAIVS. Other reasons for their giving up NAIVS business were the competition between agro-dealers and the low input prices suggested by the district governments. According to the district government officers, these prices are calculated by including input prices and other managerial costs, such as transport cost to each village, cost for guard and storage, etc. However, small agro-dealers mentioned that they were too low, so that small-scale agro-dealers in Mbinga and Tunduru suggested that 'the district government does not know the cost of business'. Another difficulty reported by agro-dealers in staying in the input subsidy business was the late redemption made by NMB. They made redemption from after 15-30 days (one agro-dealer), or in April-May, August, or sometimes, even, not until the following season (a big agro-

dealer). Several agro-dealers mentioned that ‘they wanted to get extra money from us for asking them to pay us sooner’.

Agro-dealers suggested that input business with NAIVS gives them a small profit. Big agro-dealers, however, could benefit from doing big business even with a small profit per unit, because of the scale of economy. Thus when I asked them whether they wanted to continue the input business even after the subsidy ended, big agro-dealers said they did, as there was increasing demand for inputs in the villages. Meanwhile, the small agro-dealers would not be able to do so for the business brings them too thin a profit.

I heard in some villages, especially in remote villages in Mbinga, that there was only one agro-dealer to provide each input. Furthermore, in these villages I often heard that there was collusion between the agro-dealers and leaders at village as well as at ward or higher levels. Thus I observed that generally if there was competition, the farmers made fewer complaints of collusion. Although still I heard in one village in Songea district where they had three or four agro-dealers that the quality of inputs was not good, they could identify which agro-dealers’ inputs were not performing well, so that in the following year they would not select these agro-dealers. Thus competition is important for good private sector development.

Although many cases of fraud were reported, the number of input agro-dealers in the region has increased through the NAIVS programme. Several informants including agricultural officers and agro-dealers mentioned that there was increased input demand since NAIVS was introduced. Although there were already big agro-dealers who covered most business in the districts, training has brought many new agro-dealers into the input business and they have expressed their intention to continue because of this increased demand. This increase in agro-dealers who will continue the input business will bring competition between agro-dealers which will lower the prices and provide better services and access to and use of inputs by farmers more easily. Their training includes giving advice to farmers on input use. In this way NAIVS has provided a positive impact on private sector development.

8-7. Conclusion

Because of the medium proportion of the subsidised fertiliser amount to total requirement (42 per cent, Author’s calculation), we could expect the impact of the programme onto wider economy, such as national food security, maize and input prices, local agricultural wages, and private sector development. Thus I looked at these impacts.

Because of increased maize production, NAIVS seemed to gradually improve national food security, which was accompanied by the frequent placement of export bans. Comparing the periods without the imposition of export bans between June and December in 2008 and in 2012, real maize prices seem to have lowered in Ruvuma, which would benefit poor maize-buyers.

While the price increased a little in Dar es Salaam. These different price movements were probably due to the facts that the two markets were fragmented, thus had different buyers in both places including exporting, and that Dar es Salaam had other sources of maize supply than Ruvuma, including imports. Meanwhile, real agricultural wage rates relative to maize prices in Ruvuma increased by 12 per cent from 2008 to 2012, which was partly due to the increased demand for labour because of using improved inputs. This would have benefitted poor labour-surplus farmers.

However, with the increase of real input import prices in recent years and the face value of vouchers remaining constant at the same time, the real top-up amount of the voucher package has increased, especially that for Urea since 2010/11. This made it increasingly difficult for poor maize farmers to pay the top-up amount necessary to receive subsidy, as well as to purchase commercial inputs. Even with increased demand in the country, input prices could not be lowered since most of the inputs relied on imports, which made the input market in the country vulnerable to the fluctuation of the world input market prices.

Meanwhile, although several cases of misbehaviour, fraud and collusion with village leaders and farmers were reported, the private sector played an important part in the programme in the delivery of inputs to the villages and to farmers. I found that vouchers were delivered with inputs even to very remote villages in Ruvuma. With ascertained increased demand by NAIVS for inputs in the villages, agro-dealers made profits, even though they reported these were small. Big agro-dealers could cover whole regions by using their own means of transport and wait for late redemption by NMB, while some small agro-dealers had to give up due to competition and lack of financial resources to facilitate the business with NAIVS. However, even small- to medium-scale agro-dealers, as well as big ones, intended to continue the input business in the region after NAIVS ends, since they knew that there was increased demand and had established links between themselves and farmers for the input business. This would promote the private sector and increase competition. Thus I could say that the input private sector development in the region was to some extent achieved through NAIVS. However, the increased input demand was hampered by the increased price of Urea in recent years, which caused a decrease in import quantity, namely its consumption at national and regional level.

Chapter 9. Discussion

In this chapter, I will discuss my findings. Firstly, I will analyse how the programme's implementation and impact have differed from the theory of change described in Chapter 3, and the fact that political influence has brought to the forefront of my discussion the analytical framework for social relations. Secondly, and taking this shift into consideration, I will answer the research sub-questions, mainly as regards the period from 2008 to 2012 and, for some sub-questions, by looking at the earlier rounds of panel surveys. Thirdly, I will summarise these findings in order to answer the research question.

9-1. Theory of change which best reflects the reality and analytical framework for social relations

As we have seen previously in Chapter 4 to Chapter 8, there was a substantial difference between the original design and rules of NAIVS and its actual implementation: leakage to wealthier farmers; missing vouchers; late delivery of inputs and vouchers; and farmers not taking the whole input package, or reselling vouchers or sharing them with other farmers. These realities of implementation, due to socio-economic, administrative and political factors, caused the programme to be relatively ineffective and inefficient and thus the idealised theory of change described in Chapter 3 could not be realised.

The theory of change which best reflects the reality is found in Figure 7. Leakage to non-intended beneficiaries, frauds and illicit behaviours were all prevalent, reducing the programme's efficiency. However, the panel results did not show any displacement of previously-purchased commercial inputs. Despite the bad weather, regional government data suggest an increase in maize yields, and production and data from the Ministry of Agriculture, Food Security and Cooperatives show an increase in national food security since NAIVS started. However, the observed impact on maize yields could not be attributed to the programme because of spill-over effects which brought a higher increase ratio in input use among non-recipient households than it did among recipient households, such as those found in Ruvuma.

The panel data analysis suggests that input use had no statistically significant impact on the maize yields, household food security or poverty of recipient households. This might be due to the ineffectiveness and inefficiencies of the programme, caused by the things mentioned above. The qualitative information, however, reveals improvements in maize yields and food security, and a drop in poverty levels, which might be due to confirmation bias.

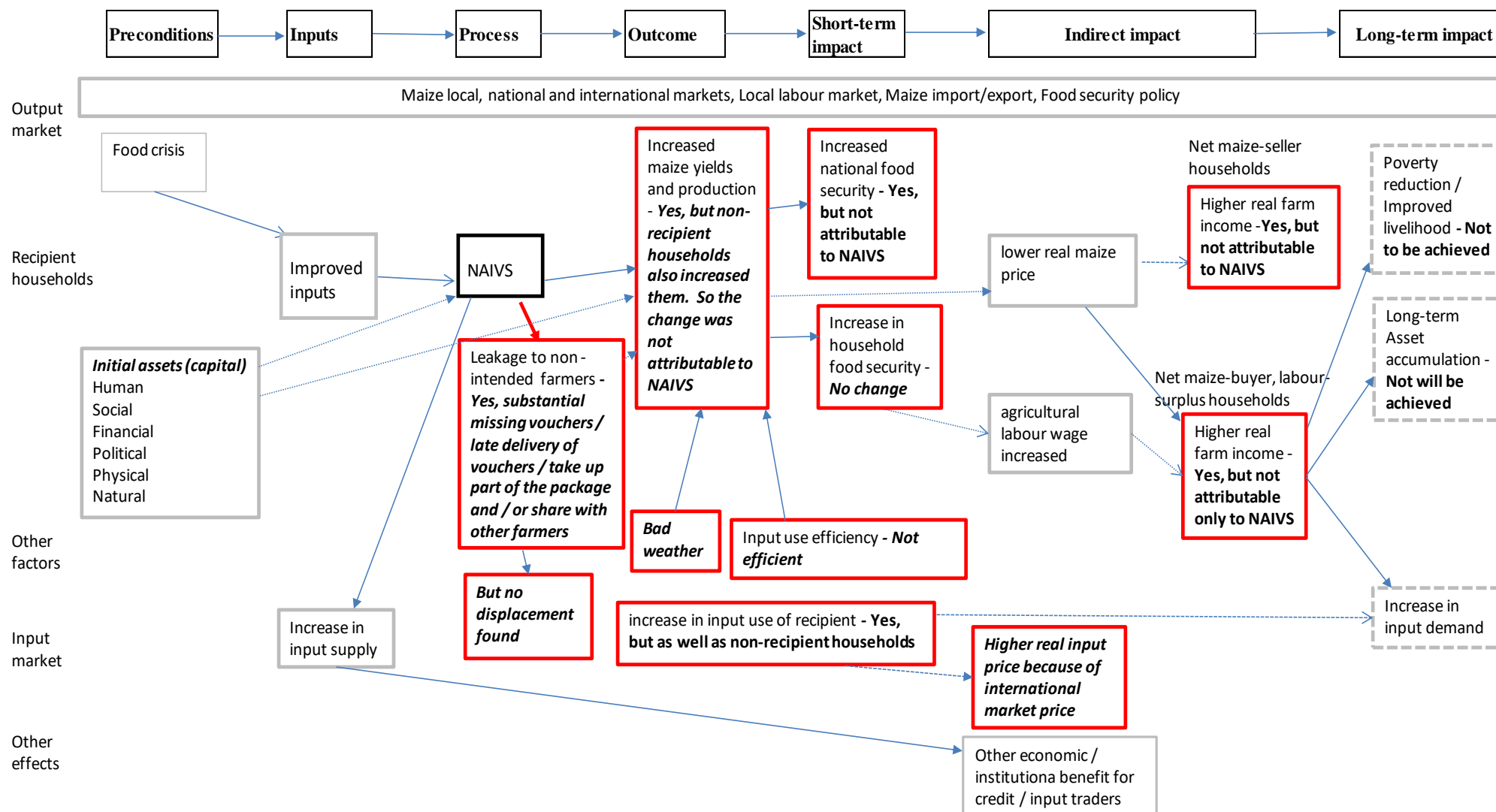


Figure 7. Theory of change which best reflects the reality

Note: This figure is adapted from Figure 2 (page 29); text in italics in the red boxes has been added.

Source: Author's development

NAIVS increased input supply. Despite the leakage to wealthier farmers, we could not find any displacement of previously-purchased commercial inputs in the panel data. As mentioned above, increase in input use / demand was found among non-recipient farmers as well as recipients. Because of this increased demand and the rise of international input market prices, we found the input price was higher during the research period, which made it difficult for poor farmers to obtain inputs.

We found that most panel farmers were maize net-sellers who reduced the purchase ratio of maize. As maize is the primary calorie-intake food, and other main crop purchase ratios were also reduced as farmers may have used inputs for other crops, we found that despite the lower maize prices, the panel households' net farm income increased. However, as mentioned above, increased income from maize could not be attributed only to the programme. Net maize-buyer, labour-surplus poor farmers benefitted from a lower real maize price and an increased agricultural labour wage arising from increased maize production, which is only partly attributable to NAIVS. Thus long-term impacts such as poverty reduction and long-term asset accumulation may indeed have been realised, but they were brought about not only by NAIVS but also by other initiatives such as Kilimo Kwanza, which is different from the idealised theory of change (Figure 2). Furthermore, if this higher real farm income and increased input use among farmers were sustained, input demand would be increased in the long run.

The same political and social factors which caused the programme to be inefficient also prevented realisation of the idealised theory of change. Here, the analytical framework for social relations can express how the politics, power and special interests of each agency distorted and manipulated the programme activities through, for example, elite capture, leakage of vouchers/inputs to unintended target groups, missing vouchers, frauds/illicit behaviours, bargaining over input prices by input suppliers and agro-dealers, etc. where more power is retained by the higher rungs of the ladder shown in the Figure 3.

9-2. Analysis on Research sub-questions

Research sub-question 1: Who received NAIVS vouchers?

The beneficiary selection criteria sometimes differed from the official criteria of the programme, and varied among villages. The most important criterion was the ability to pay top-up, the crucial element of the programme design, as paying a contribution would supposedly increase the incentive for farmers to use subsidised inputs. However, in many cases this caused problems as small-scale poor farmers – small-scale operation originally being another beneficiary criterion - could not afford to pay the top-up. This has been especially the case since 2010/11 as many farmers claimed the prices of fertilisers have increased. This was due to a price increase on the international market, given that most inputs were imported. Furthermore, the nominal face values

of vouchers did not change, despite the increase in input prices in the later years of the programme. The increase in input prices saw a decrease in the ratio of the vouchers' face value to the input prices, i.e., to less than 50 per cent. Data on top-up prices reveal that the programme was increasingly out of the reach of poor farmers. Thus they gave up participation even when they were selected or shared the package with another farmer in order to reduce the payment due. The difficulty in paying top-up experienced by poor farmers caused a revision to the targeting of the programme from small-scale farmers to middle-scale farmers (MAFC, 2011). However, this shift made the land criterion ambiguous. Originally this was 'less than one hectare of maize or rice cultivation' but in reality, the criterion actually disappeared, at least in Ruvuma, as most farmers cultivated maize over more than one acre.

The three-year exit strategy was not actually implemented in many cases. Many village leaders stated that they selected those households who had not received vouchers, as they wanted to avoid being criticised for 'favouritism' by targeting only a few farmers for the whole three years. This led to a thin distribution of vouchers, leaving more than half of the recipient households with only one or two years' receipt.

Sometimes selected households sold vouchers to other wealthier farmers and agro-dealers or, in a few cases, returned the vouchers because they were unwilling to use inputs and/or could not pay top-up and/or preferred to have money. The reasons given by farmers in the panel survey for not wanting to receive vouchers were that they did not have sufficient cash, or could not obtain sufficient credit, to pay the top-up; and that they did not want to try to obtain credit at all. Qualitative data confirms that vouchers were sold in the pilot year in particular, when many selected farmers did not know the effects of the inputs, and that this phenomenon reduced as more farmers became aware of those effects. Another reason for selling or returning vouchers was the increase in real input prices.

Logit estimate results suggest that the selected and recipient households in the pilot year tended to use improved inputs prior to the programme. This situation was not in line with the programme selection criterion: 'priority is given to farming households [that] have used little or no fertiliser and improved seed with maize or rice over the last five years.' (World Bank, 2009a: 26). As mentioned above, since the pilot year many farmers have sold or returned vouchers. Voucher recipient farmers in that year thus ended up being the farmers who had used inputs previously. Still several informants suggested that in later years, the practice of selling vouchers or subsidised inputs continued to some extent and the benefit of the programme thus ended up going to the wealthier farmer households.

Logit estimate results find that the recipient households in any year of the programme were more likely to be leaders, have previously used inputs, be better-off, and have less off-farm income. It may be inferred that any significant elite capture was evidenced in later years: as the number of distributed vouchers increased and more people learnt about the programme, vouchers

were increasingly captured by the elites. Furthermore, NAIVS led them to focus on maize cropping.

My panel sample households were about 14 per cent more likely to receive vouchers in the pilot year than was the case with the original whole panel sample for rounds 1-3; and my panel samples were found to be 36.7 per cent more likely to receive vouchers in any given year of the programme, which is more than twice the ratio found in respect of the whole panel sample. These biases imply that my panel sample households were the wealthier segment of the whole sample, which affects further analysis of the impact of voucher receipt on maize production and poverty.

Research sub-question 2: Did NAIVS increase the maize yields of recipient households?

MAFC (2012) data shows that from 2001/02 to 2011/12, national maize production per capita increased by about a quarter. They further show that maize production per capita has continued to increase since NAIVS was introduced. Parallel with the growth in production across the whole country, Regional Secretariat (RS) data (2012a) suggest that maize production in Ruvuma Region increased by 137 per cent during the period. Combining this with the slight decrease in average maize plot area of the panel households during the period (1.49 ha. to 1.40 ha.), and considering that maize was continuously cultivated on almost 96 percent of the plot area (1.44 ha. and 1.35 ha.), it can be assumed that maize yields also increased even during the poor weather conditions of the 2011/12 season. This increase in maize yields was in line with the data about increased fertiliser consumption in Songea district since 2008/09, an increase which was probably due to the programme and which partly contributed to the increase in maize yields.

During the period from Round 3 to 4, maize yields all showed a significant increase on average, with a growth rate of more than 30 per cent. Despite the non-recipients' higher rate of growth, the difference between the yields of recipient and non-recipient households widened. This could have been due to the fact that recipient households tended to be wealthier and were thus in a position to deploy other beneficial inputs. It looks as though the recipient households tended to focus on achieving high maize yields, due to NAIVS, which is consistent with the relative intensification of maize cultivation in terms of plot areas.

Turning to the impact of the programme on maize yields, using instrumental variables to control for endogeneity and using propensity score matching, the difference-in-difference estimate results suggest that neither voucher receipt in 2011/12 nor in any other year of the programme had a statistically significant impact on maize yields. These findings seem to contradict the positive impact of NAIVS on maize yields in general, as reported above, which is probably due to leakage to wealthier farmers; a higher increase ratio in the maize yields of non-recipient households than that of recipients; reporting errors in voucher receipt: poor non-

recipients who sold or did not receive vouchers are officially recorded as having reported they received vouchers in the panel survey, so that households which reported themselves as ‘non-recipient in 2011/12’ or ‘never-recipient’ increased their input use and maize yields; or the thin distribution of vouchers to ‘never-recipient’ households. In controlling for the use of improved seeds, male-headed households were found to increase their maize yield by about 50 per cent, which is statistically significant. One of the reasons for this was probably the fact that male heads of household were more likely to have access to training and information on agronomic practices than their female counterparts.

However, much qualitative data confirms that the use of subsidised inputs by recipient farmers had a substantial impact on maize yields. The contradictions between the quantitative and qualitative results may be explained by the effects of other initiatives which were omitted from the regression analysis; or by the fact that as recipient farmers were wealthier, they had other agronomic investment which brought higher yields, the result of which was counted in qualitative information. Alternatively, the qualitative information may have been susceptible to confirmation bias: farmers and leaders made positive comments as they expected the programme would continue if they did so, while it was difficult to build trust, in terms of my quest for precise information, in such a short visit to each village. Although quantitative survey caused fatigue among respondents because of the long questionnaire, and contained errors in reporting and recalling due to the complicated voucher management, because of the possible confirmation bias in the qualitative survey, and of the higher increase ratio of maize yields among non- recipients than recipient households, I would suggest that voucher receipt had no significant impact on maize yields in the region.

Research sub-question 3: Did NAIVS reduce poverty and food security, and increase the assets of recipient households?

Qualitative information suggests that recipient farmers reduced their poverty, becoming able to do such things as buy beds, mattresses and bicycles, send their children to school and change house roofs. Female-headed households, in particular, reported that they had improved food security to the point of not having to buy food in the lean season, increased the number of meals from two to three per day, and could even sell surplus maize. From Round 3 to 4, the matched panel households on average reduced their income poverty a little, and increased several assets such as beds and mobile phones, as well as physical infrastructure such as access to all weather roads. The average of their real total non-farm income was reduced by almost half, while crop sales increased by about 90 per cent, which might reflect the focus on crop production induced by the programme.

However, difference-in-difference with propensity score matching estimates suggests that neither voucher receipt in 2011/12 nor any other year of the programme had any impact on

poverty headcount ratio, which is probably due to the leakage to wealthier farmers, displacement of the commercial purchase of inputs, thin distribution of vouchers, or the bias towards the wealthier farmers of the panel sample households. Furthermore, the reduction of the average poverty gap among recipient households was smaller than that among non-recipient households (9.5 per cent and 15 per cent, respectively). While the voucher recipients in any year of the programme were relatively better-off in terms of income poverty throughout the surveyed years, the recipients in 2011/12 were relatively poorer throughout the surveyed years, which means that the poorer households were selected as the programme went on.

In no year did voucher receipt have a significant impact on household assets, except a weakly negative significant impact on having a modern house roof, and the latter is reasonably a reporting error. This does not corroborate the qualitative data that recipients improved their roof through the increased maize production achieved by using subsidised inputs. Considering the contradictory quantitative evidence and plausible confirmation bias, the subsidy probably allowed only those few to improve their house roofs. A bigger non-farm income had a strongly significant positive impact on possessing household assets, except house roofs. Although during the period the matched households in general increased their ownership of mobile phones and beds, the recipient households already had more of these assets than non-recipient households before the programme, which means that they were originally better-off.

The fact of being graduates (voucher recipients for more than three years) does not show a statistically significant impact on either income poverty or household assets. This might be due to the graduates being a small sample, which applies to all regression analysis on graduates. With this acknowledgement of data limitation, the non-farm income of graduates had a significant positive impact on reducing income poverty and on improving all household assets except for modern house roofs. Nor did graduating from the programme have a significant impact on livestock keeping. Even previous to NAIVS, graduates tended to keep more cows and goats than other households, which is statistically significant. Similarly, graduation had no statistically significant impact on not sending children to primary school. Elderly-headed households had a weakly significant positive impact on sending children to primary school, which implies they were less poor as their households were big, with younger working-age children caring for school-age children, and they could thus afford to pay some of the costs associated with school.

As noted above, since NAIVS started full operation, national food security has improved, partly due to the programme. However, there were mixed findings on food security in Ruvuma. Contradicting the improved food security reported by qualitative data, the panel village survey results find that villagers still faced food shortages in most - 60 to 80 per cent - of the villages and that villagers in the majority - from 50 to 70 per cent - of the villages had to buy food in the lean period. Informants suggest that the volume of the packages' subsidised inputs is too small for farmers to have any income from sales. Meanwhile, the panel data shows a general trend of

increased crop sales: the average sales ratio to total production of maize and rice increased by 24 and 32 per cent, respectively, and the average real total crop sales increased by 36 per cent during the period, although it should be remembered that the panel households were relatively better-off. In general, the programme increased food security; the contradiction as regards food security in Ruvuma might be due to the geographical differences in food security in the region: there are some poor areas where food is insecure in the lean period because of soil quality, low rainfall and lack of infrastructure and transport facilities.

Total household calorie consumption was slightly reduced, but diversified. The probable reason for reduced calorie consumption was that previous calorie consumption had focused on maize, which has the most calories per kg of the main crops, but that with diversification, calorific consumption was reduced but nutritionally diversified, which is better in nutritional terms. The diversification was made possible by purchases made with an increase in income available from crop sales which was partly brought about by the programme. Households reduced their maize consumption and increased their consumption of cassava, whose real unit consumer price reduced more than that of maize. The real maize unit sales price dropped by 30 per cent, which suggests that maize surplus farmers did not gain much in Ruvuma, while maize net-buyers benefitted a little due to a small reduction in maize real consumer prices. The purchase ratio of maize and rice dropped during the period, to a third and about two-thirds of Round 3 respectively, which might be due to the increased production brought about by subsidy.

Turning to programme impact, the difference-in-difference estimates suggest that voucher receipt had no statistically significant impact on calorie consumption at the time of the survey. This means that non-recipients also improved their food security, as seen in the increase of their crop production.

Research sub-question 4: Did receipt of NAIVS input vouchers have any gender impacts?

During fieldwork, I noticed women's triple roles (childcare, housework and outside work)⁶⁶ and found women's work time per day was considerably longer than that of men. Furthermore, in a patriarchal society such as Tanzania widows are not allowed to inherit the land of deceased husbands. Although they own smaller plots of land than male-headed households, surprisingly, the female-headed panel households increased the size of the land owned and for cultivation, while the area of land owned by panel households in general decreased or remained constant, on average, from Round 3 to Round 4, respectively. This means that land rights were also given to widows in Ruvuma. This might be due to a small sample size, or these panel female heads of household may have been wealthier, with regular non-farm income such as from regular employment; they were also more likely to belong to village elites. The panel sample might therefore not be representative

of average female-headed households. Because they have other income, such as from petty trade, etc., female-headed households tend to focus on food cropping with less land than male-headed households.

Qualitative information suggests that female-headed households found it difficult to get vouchers. Even when they were selected for vouchers, either they faced discrimination from village leaders and, being 'powerless', ended up not getting any inputs (which was also the experience of elderly male-headed households); or they were forced to be a part of the manipulation of voucher management.

The female-headed households on the panel were more likely to receive vouchers, with 72 per cent receiving vouchers while the average of male-headed households was 65 per cent. This was probably because they were prioritised to receive vouchers and were relatively better-off, tending to have regular non-farm income from, for example, public services and government employment. As nearly half these households had elected household members in the village, they were relatively powerful. The original panel sampling were better-off; this seems to be particularly the case for female-headed panel households. The female-headed households tended to increase maize yields and household consumption expenditures by more than the male-headed households.

However, this contradicted other panel results and qualitative information, which was probably partly because the panel female-headed households were 'female-elites'. Widow-headed households in general had difficulty in benefitting from the programme, as they were unable to pay top-up or meet the requirements for contributing to village activities. With more difficulty in accessing extension services, and with less land, less credit, less family labour and a smaller cash income than male-headed households because they focussed on food crops, widow-headed households were less able to contribute to village activities. All these conditions made it difficult for them to get access to input vouchers, which is the general picture of female-headed households in the region.

Research sub-question 5: Did NAIVS lower maize prices and increase agricultural wages?

For the purpose of food security, the Tanzanian government and several local governments have put frequent export bans in place in recent years, which have lowered maize prices. With the long period of export bans since the pilot for NAIVS started (September 2008), data show that real maize prices have been declining generally in Ruvuma. Excluding the effects of the export ban, when we compare the harvest seasons in 2008 and 2012, the real maize price in Dar es Salaam increased by 15 per cent whereas that in Ruvuma dropped by 8 per cent. This decrease in the maize consumer price also corroborates the finding from my panel data in Ruvuma, which suggests a reduction of 4 per cent during the period. This benefits poor maize net-buyers, many of whom

are small-scale farmers.

Meanwhile, as several studies suggest that export bans have caused lower maize prices which have affected maize farmers in surplus areas, such as Ruvuma Region, the low maize prices hit maize- surplus farmers in Ruvuma, especially in the harvest season in 2011. It was when the real wholesale prices recorded in Songea town were the lowest in the last five years. Many informants believed that the lower maize price was due to the export ban. Without means of transportation and lacking capital, poor farmers sell their maize at a low price to the middlemen who visit the village. Many villagers complained about the ‘unstable market’ which results from this fluctuation in prices, and the recent drop in maize prices has not much benefited maize producers.

As for agricultural wages, nearly three-quarters of the panel villages report that the agricultural daily wage increased greatly compared to the 2007/08 season which was surveyed in Round 3 (Christiaensen and Pan, 2009b). Panel village data suggest that despite differences between districts, the average real wage for labour in the region increased by 10 per cent during the period and that the real wages relative to maize prices increased by 12 per cent. Given the medium scale (estimated as 42 per cent of requirement) of the programme, these increases could be attributed to the increased labour demand which stemmed from the introduction of subsidy. This increase in wages helped poor labour-surplus farmers.

Research sub-question 6: Was the private sector promoted by NAIVS?

In order to solve the problem of market distortion caused by previous input subsidies which were procured and distributed by governments, NAIVS uses the private sector to procure inputs and deliver them to storage facilities in the villages. Under NAIVS, input market prices and top-up prices were set, in principle, by competition between agro-dealers in each village. However, the practice was found to be different to some extent in Ruvuma. Firstly, the district government suggested the sale prices for each village (*‘bei elekezi’*= Swahili term for ‘suggested price’), claiming that this would protect farmers from bargains driven by agro-dealers who were taking advantage of the given demand. This was not in accordance with the programme design of using the free market. Despite this policy ordinance, I heard farmers in some villages claiming that the ‘bargained price’ set by agro-dealers was more than these suggested prices. This situation varied depending on the fluctuation in input market prices, and the extent of competition among agro-dealers and their certainty of being involved in the voucher business in that year: if they knew they would not be involved, they would charge a higher price to compensate for the costs and risks

⁶⁶ This is different from the ‘triple burden’ of racial oppression, sexual domination and class, suggested by feminist scholars.

claiming that this would protect farmers from bargains driven by agro-dealers who were taking advantage of the given demand. This was not in accordance with the programme design of using the free market. Despite this policy ordinance, I heard farmers in some villages claiming that the 'bargained price' set by agro-dealers was more than these suggested prices. This situation varied depending on the fluctuation in input market prices, and the extent of competition among agro-dealers and their certainty of being involved in the voucher business in that year: if they knew they would not be involved, they would charge a higher price to compensate for the costs and risks which followed an uncertain volume of sales. In some villages, it seemed that there was also space for negotiation between the VVC/village government and agro-dealers on setting the prices. However, due to imperfect market conditions there was a power imbalance between the two parties and agro-dealers won in most cases.

Secondly, I heard that in some villages the VVC assigned each farmer to a pre-determined agro-dealer, so that agro-dealers would not lose any of the inputs brought to the villages. Here, again, there was no free market in which villagers could choose a better option for buying inputs. Villagers suspected collusion between the VVC and agro-dealers whereby farmers sometimes had to buy inputs at higher prices.

Agro-dealers suggested that the input business with NAIVS gave them a small profit. Small agro-dealers have struggled to continue this business because of the competition between agro-dealers and the thinness of the margin between suggested prices and the costs for transportation, putting up stalls and employing guards. Furthermore, several agro-dealers claimed there had been late redemption by the National Microfinance Bank, which also made it difficult for small dealers to sustain their business.

Although many cases of fraud were reported and there were already big agro-dealers who covered most of the districts in the input business, training through NAIVS has brought in many new agro-dealers. If these dealers are still in business with NAIVS, they have expressed their intention to continue even after the programme finishes, because of the increased demand. As a result of the programme, we found input agro-dealers delivering inputs to even very remote areas in the region where previously no such option had existed. The number of input agro-dealers developing the input business has therefore increased in the region. In this way, NAIVS has provided a positive impact on private sector development.

Finally, I will look at my research question:

Research question: How did NAIVS impact on poverty reduction and the livelihoods of farmers in Ruvuma Region in Tanzania?

I found mixed results as to the impact of the programme on poverty and farmers' livelihoods in Ruvuma. Qualitative data confirms that the programme brought about poverty reduction and

improved food security, allowing recipients to buy beds, mattresses and bicycles, improve house roofs, send children to school and increase the number of meals from two to three per day, or meaning they no longer had to buy maize every year. According to the panel data the activities of household heads were increasingly diversified, although they still mainly engaged in agriculture. Conversely, the panel regression results find that NAIVS had no statistically significant impacts on poverty, assets or food consumption.

With regard to food security, the panel village survey in Round 4 suggests as many as 60 to 80 per cent of the villages experienced food insecurity in the lean season, which was also reported by some informants. It seems that there were geographical differences in food security, which particularly affected vulnerable households, such as female- and elderly-headed households. There was, therefore, no significant improvement in food security. The panel data did not suggest that calorie consumption increased; however, generally food consumption was diversified, probably because of the increased income from crop sales, especially of coffee and maize, which was partly due to the programme.

Among the reasons for the mixed results given by qualitative and quantitative research on the programme's impact on poverty and food security are complex voucher management, reporting errors in the quantitative data, and confirmation bias in the qualitative information. These limitations might also be due to the sampling bias towards respondents who are better-off than the average households. However, considering the leakage to wealthier farmer households and to the households which used inputs prior to the programme, elite capture and vouchers going missing as the programme expanded, as well as the fact that as real input prices rose, vouchers tended to be captured by wealthier households and elites, I would say that there was confirmation bias in the qualitative information, and that NAIVS was largely inefficient and ineffective in terms of its specific objectives, that is, targeting small-scale farmers for poverty reduction. Thus the panel regression results, that is, that there was no significant impact on poverty or food security, are more plausible.

Furthermore, considering the high ratio of farmers selling vouchers (30 ~ 40 percent or more in some years) due to lack of financial capital, higher liquidity of cash transfer might help these poor farmers more, as this could be used for other purposes and thus have a greater effect on the reduction of poverty.

Chapter 10. Conclusion

10.1. Summary of findings

Input subsidies have played a crucial but contentious role in development in sub-Saharan Africa (SSA) in the last 50 years. The late 1970s saw widespread debate about ‘state failure’ in these countries, some of which were almost bankrupted by the cost of open-ended universal fertiliser subsidies. International financial institutions first supported these subsidies but later withdrew their support and have since moved to an opposing extreme, backed up by ‘ideological’ neo-liberal ideas. The previous state-managed delivery of low cost fertilisers to farmers had flaws that needed to be addressed. Input subsidies were therefore removed in the 1980s – 90s by the Structural Adjustment Programme. Since the millennium, new doubts have arisen as to whether the market alone is capable of rectifying poverty, and new ‘market-smart’ subsidies have been framed and explored in many SSA countries. These target small-scale vulnerable farmers and aim to improve marginal productivity and avoid displacement by using coupons / vouchers, and by promoting the private sector for input procurement and delivery in order to avoid the market distortion which traditional subsidies used to face.

Detailed studies evaluating their performance have recently been undertaken. This thesis has contributed to a growing body of evidence on the effectiveness of reducing rural poverty by means of input subsidies by using a secondary literature review, an analysis of existing data sets and a detailed mixed-methods primary field work study of Ruvuma Region in Tanzania, along with an overview of five countries’ programmes. It provides an overview of the programme’s generic features and an analysis of the design, implementation issues, and impacts of these subsidies in SSA, as well as the challenges which must be considered for future development in the region.

The NAIVS programme is a ‘market-smart’ subsidy as it originally targeted small-scale farmers by using vouchers and used the private sector for input procurement and delivery. The theory of change (Figure 2) assumes that small-scale recipient farmers could increase maize yields and production through the use of subsidised inputs; and that if they received vouchers for three years they could accumulate enough income to reduce poverty and purchase commercial inputs by themselves, this result allowing their ‘exit’ from the programme. This intended outcome is influenced by market and weather conditions and the country’s food security policies, and hindered by leakage to wealthier farmers and mis-targeting.

Quantitative and qualitative data in Ruvuma suggests that since NAIVS started, average maize yields in the region, average maize production and sales of the panel sample households have all increased, even in the poor weather conditions of 2011/12. These increases must be due to increased input use, which is partly ascribed to the introduction of NAIVS. Panel data suggests

that the yield, production and sales of other main crops have also increased during the period. This is corroborated by the panel households' reduced purchase of main crops, and the diversification of maize consumption into several purchased food items, albeit with a small reduction in total calorie consumption, which was made possible from increased income from crop sales. Diversification of farmers' diet included the shift from maize to cassava consumption. The surplus maize was for sale, which was corroborated by increased maize sales.

However, the increase in maize yields did not seem to be attributable only to the programme but also to other initiatives such as Kilimo Kwanza. While qualitative data confirms that the programme had a positive impact on maize yields, the accumulation of assets such as beds, mattresses, bicycles, modern house roofs and the ability to send children to school, as well as bringing about improvements to food security, the panel regression results did not show any significant impact on the poverty and food security of recipient farmers. Although acknowledging a little sampling bias toward wealthier farmers, data limitations regarding other initiatives, and a plausible confirmation bias, I would suggest that the substantial flaws in implementation which hindered the effectiveness of the programme mean that voucher receipt had no significant impact on maize yields, poverty and food security in the region. This contradiction might also be due to the higher rate of increase in input use by non-recipient households than recipient households, which may be partly due to the spill-over effect of NAIVS or other initiatives such as Kilimo Kwanza. This occurred even with the expected positive impact due to the relatively large scale of the programme, which is estimated to be 42 per cent of the requirement.

The thesis has highlighted how programme design and implementation are key for the effectiveness and efficiency of 'market-smart' input subsidy programmes in SSA, by providing a mixed-methods case study. Contrary to the original design of the programme, the study reveals that vouchers were obtained by middle-scale farmers who had used inputs prior to the programme's pilot year, due to the high input and top-up prices in the food and input price crisis. It also reveals a lack of awareness among poor farmers of the effects of the inputs, and of the NAIVS programme itself. Later, although poor farmers became increasingly aware of the programme, increasing real top-up prices from year to year made it difficult for them to obtain vouchers, or they ended up selling vouchers to other farmers. The leakage to wealthier farmers was the reason the programme failed to promote new users of inputs through the provision of subsidy, as had been the aim.

Qualitative data confirms that village leaders used their power to distribute their vouchers to their families and 'friends', such as farmers who contributed manually or financially to village activities or who accepted that the leaders should receive an extra payment for the work of voucher management. Meanwhile, they did not give vouchers to the selected poor and vulnerable farmers, without giving any reason for their failure to do so. Thus, in many villages, farmers claimed that leaders were showing 'favouritism', even where leaders stated that they had demonstrated

‘egalitarian’ voucher distribution. Furthermore, politicians and leaders above village level also used their influence to capture the vouchers. The thesis suggests that there were frequent reports of elite capture and illicit behaviour.

Both qualitative and quantitative research, therefore, find that the actual implementation differed much from that in the design. Flaws in the ‘process’ in the theory of change (Figure 2), such as the late delivery of vouchers, thin voucher distribution by village leaders resulting in farmers receiving vouchers for only ‘one’ or ‘two’ years, the diversion of vouchers to richer farmers and the sales of vouchers by poorer recipients all hindered the realisation of the intended programme ‘impact’, namely an increase in maize yields, a reduction in poverty and greater household food security. Thus, the idealised theory of change did not work as had been intended (Figure 7). Vouchers were delivered late, which led to farmers taking up only a part of the voucher package. Elite capture and resale of vouchers by farmers were common in various countries like Malawi (Chirwa and Dorward, 2013; Jayne and Rashid, 2013) and Zambia (Mason and Smale, 2013); thin distribution of vouchers in order to prevent accusations of ‘favouritism’ was also found in Malawi (Cullen and Lawson, 2005) and is probably common in some other SSA countries. All these unforeseen tendencies made the programme relatively ineffective and inefficient. In fact, it simply helped elite and better-off farmers to expand the gap between them and their less fortunate counterparts, as was suggested by the analytical framework (Figure 3). Meanwhile, the reselling of vouchers or inputs naturally created a ‘cash transfer’ to poorer recipients, who may have also benefitted from lower consumer prices for maize. As Maliro (2011) suggests, there might be a process ‘that fertiliser ends further up the rural wealth distribution than was intended in the plans, and this is not unusual in the history of subsidised fertilizers in Africa’ (p.150).

In order for the subsidy programme’s idealised theory of change to be realised, it is necessary to develop carefully a clear programme design and an adequate implementation plan, to achieve timely input delivery to farmers, to prevent interference such as leakage to wealthier farmers and fraud, and to allow space for flexible modifications such as the revision of the face values of vouchers, if needed.

The World Bank accepted the request from the Tanzanian government to support financially all five years of the programme period, even with counterpart fund. Though having raised its popularity among farmers NAIVS was finalised in 2013/14 as it originally designed (World Bank, 2012). Since 2014/15, the new input support programme has been initiated, composed of input subsidy and loan provision, but gradually shifting from the former to the latter for financial sustainability. This shift to loan provision is intended to support ‘graduate’ farmers of the input subsidy, who need credit to buy more inputs to apply to their maize plots. It is also intended to provide opportunities for non-recipient farmers to gain access to the inputs more easily than before.

‘Life is difficult’ (*Maisha ni ngumu* in Swahili). I often heard this phrase from many of our research assistants – survey enumerators, translators, software programmers - when they apologised for asking me for better payment, or to be paid in advance. However, they were still better-off than small-scale farmers, for they had the techniques to get skilled work in order to obtain a monetary income. All of them were struggling to survive: disabled farmers approached me to ask for assistance for their children to get education, and even the better-off such as drivers/mechanics and school teachers, who have a regular monetary income, complained that it was difficult to support their families. Merchants and guest-house owners were better-off still but even they were struggling to get access to more resources. In a society such as this, where the institutional capacity is weak, an informal social network – they speak often of ‘friends’ and building up ‘trust’ - is important for mutual benefits. A mechanic, for example, might obtain the ‘trust’ of a merchant who needed to have his car taken to Dar es Salaam for repair, or get better and quicker service from hospitals or local administration by being ‘friends’ with old clients such as doctors and transport police officers. In a society where there is a ‘private realm’ (Ekeh, 1975), informal networks are important to get better access to resources and services, indeed, for survival. Given their existence, I would argue that the effects of the input subsidy were reduced by poor institutional management capacity at the lower end, and because the subsidy was the target of struggle among farmers, village leaders, government officers, politicians, and agro-dealers, leading to situations such as fraud, and farmers reselling cheaply or giving subsidised inputs or vouchers free to the leaders who asked for them in order to prevent unwanted consequences. The subsidy thus brought social tension and differentiation between the powerful elites and agro-dealers who benefitted from it, and small-scale, vulnerable farmers who did not. This is how the analytical framework actually worked.

Problems of ‘elite capture’ and fraud, which was frequently heard from the qualitative evidence in my study, are also seen in other countries, such as Malawi and Zambia, and occur under a wide variety of different organisational and delivery arrangements. From the analysis of these causes - being due to patron-client relationship or being captured for their own benefit by politicians, government officers, and traders, devising a way to avoid such effects of reducing cost-effectiveness would need to involve voucher delivery that does not go through these administrative cadres. Thus the subsidies could be delivered more accurately using modern technologies like point-of-sale devices or mobile phones (Ellis et al., 2009; ODI, 2013), which were tried in Malawi, Zambia and Nigeria recently, but whose impact are yet to be studied.

On the other hand, my study finds a substantial number of resale of vouchers, upwards of 30 – 40 percent in some years from quantitative evidence; a number of informants, including VVC members, agricultural extension officers, and farmer focus groups, suggested resale was because of high input prices, lack of awareness of effects of input use and preference for local seeds. Considering such limitations, for improving the livelihood chances of, or reducing poverty among,

the poorest in rural areas of a country like Tanzania, subsidising agricultural inputs, which is agriculturally-focused, voucher-based social protection programme, is not the most appropriate way. It might be that a targeted / conditional social cash transfer would be more appropriate in terms of being a more flexible instrument enabling use for their other acute living needs.

There were also positive impacts. As earlier mentioned, the study found a positive impact on increase in input use by farmers, which brought increased maize yields and production. It also found positive indirect impacts on reducing poverty. The real unit consumer price of maize flour reduced only by a little, while the real maize grain prices dropped by 62 per cent, which suggests a large increase in the milling margin. The real unit sales price also dropped by 30 per cent, suggesting that maize surplus farmers did not gain much in Ruvuma, while poor maize net-buyers benefitted due to a small reduction in the real consumer prices of maize. The real agricultural wage relative to maize prices in Ruvuma increased by 12 per cent during the two survey periods, which would have helped poor, labour-surplus farmer households. Though they are relatively 'powerful' female-headed households, panel female-headed households had prioritised access to vouchers, which could change the intra- and inter-household gender-unequal relationship in the communities. Many female-headed households, however, could not benefit from the programme and remained poor. Although challenges exist, I observed that the private sector developed and is expected to expand even after the subsidy finishes in Ruvuma, which represents a quite significant positive impact as regards better access to inputs for rural farmers in the future.

10.2 Implications for theory

In Chapter 3 I presented the analytical framework for the input subsidy programmes. The theory of change of NAIVS (Figure 2) presents how the input subsidy programmes are intended to work; however, my qualitative and quantitative findings confirm that social and political relations, as shown in the analytical framework for the impact on social relations (Figure 3), undermined this theory of change and prevented its realisation as intended (Figure 7).

The idealised theory of change (Figure 2) assumes that input subsidy programmes require only technocratic analysis. It assumes that the subsidised inputs provided would increase maize yields and reduce poverty, with some allowance for leakages. This theory of change also includes expected impacts on food prices, input markets and rural wages, which were analysed in the empirical chapters of the thesis. However, the results did not find the expected impacts in the theory of change.

Possible technical reasons for this - that the programme was poorly conceived and/or designed and/or implemented - were analysed in the empirical chapters. Another possibility is that the theory of change itself is flawed. An alternative hypothesis is that there are political economy forces at work which prevent the objectives of the programme from being achieved, even if it is perfectly conceived, designed and implemented. This is where the analytical

framework in social relations becomes relevant.

Input subsidies are not just technocratic programmes; they are interventions in the social relations of communities and the political economy of governance structures. Unless these relationships and dynamics are properly understood and analysed, the reasons that external interventions such as input subsidies fail to achieve their expected impacts will never be fully understood.

The thesis thus reveals that studies of input subsidy programmes require not only economic analysis but also social and political analysis. The theory of change which best reflects the reality (Figure 7) and analytical framework for social relations (Figure 3) use economic analysis but place social and political analysis at the forefront, in which a mixed-methods approach is used.

10.3 Implications for methodology

Input subsidy programmes are inherently complex: it is easy to lose sight of their aims, design and implementation plans and there are often flaws in implementation brought about by mismanagement and fraud (Ricker-Gilbert et al., 2013a). In order to grasp how the programmes have been implemented and how farmers have experienced them, the mixed-methods approach is ideal as it measures the impacts of the programmes and the real causes of these impacts by hearing the stakeholders' opinions of the programmes. Adopting this approach allows us to identify the real causes of the problems in these complex systems and find solutions and ways of improving which could not be obtained through a single-method approach. With the resurgent interest in these programmes in SSA expected to continue in coming years, and in order for these programmes to be effective and efficient, it is necessary to devise best programme design and implementation in the SSA context. Mixed-methods research into these programmes should therefore be promoted in order to look in detail at how they were implemented and where they were flawed. Few mixed-methods studies on input subsidy programmes have been conducted so far except for the studies on Malawi's FISP by Chirwa and Dorward (2013).

The thesis suggests that the theory of change which best reflects the reality and an analytical framework based on social and political relations and political economy are most appropriate for analysis of the design, implementation and impact of the input subsidy programme, such as Yuksel (2012)'s fascinating analysis of the input support programme in Kenya which uses an actor-oriented approach. The thesis argues that given that input subsidies often suffer from elite capture and illicit behaviour, a study of social and political relations is crucial in grasping how the subsidies function and what their impact is.

As the thesis suggests, a mixed-methods approach is crucial in evaluating the impact of the input subsidies: impact is measured by a quantitative approach, while a qualitative approach

allows explanation of the quantitative results. First, we are to analyse who obtained the vouchers; then, what impact the input subsidy programme has had. The social and political relations between actors involved is important in all development programmes whose design and implementation are influenced by social and political agencies. A socio-political approach is therefore indispensable to carry out the first of these analyses, and a political economy framework enables the second.

10.4 Implications for policy

Social, economic and agronomic contexts and food security policies vary among SSA countries. Nevertheless, this thesis's unique mixed-methods detailed study of the programme design and implementation of 'market-smart' subsidies provides generic lessons for more effective and efficient input subsidies which could be explored in SSA. I would suggest that if the programme design were carefully and clearly developed according to the local context, and its implementation were closely monitored and flexibly adapted to the market and social contexts, a 'market-smart' subsidy in SSA which targets poor and vulnerable households, and whose inputs are provided by private actors, could promote input access for poor small-scale farmers unable to buy commercial inputs. Such a programme could reduce poverty and food insecurity sustainably.

There are several challenges to overcoming the inefficiencies and ineffectiveness of subsidy programmes. The thesis argues that in order to reduce the effects of differentiation and displacement, input subsidies must maintain focus on their objective of improving access to inputs for small-scale, vulnerable farmers; and develop their design in such a way that vouchers actually reach this group (Ellis et al., 2009; FAO, 2015b). They can function as social protection programme, if targeting properly small-scale farmers. While, as Ellis and Maliro (2013) suggest, in targeting vulnerability to hunger, input subsidy programmes could complement social cash transfer programmes, with the former targeting small-scale farmers and the latter targeting landless, labour-less farmers. At the same time, the private sector should be promoted through training and the provision of credits, in order to avoid market distortion and expand the service area for inputs.

If elite capture and illicit behaviour are to be eliminated, the institutional mechanisms used to deliver vouchers and inputs need reconsideration. One possibility would be to put in place improved independent programme monitoring and evaluation. For the cash transfer programmes to be held accountable to beneficiaries and communities, a grievance mechanism has been included in some programmes. ODI (2013) reports such a mechanism in all the five social transfer programmes under study, including the ones in Kenya, Uganda and Mozambique. Its implementation varies, however, as some of the beneficiaries think that receiving a cash transfer is among their 'rights' (ODI 2013: 50). In her evaluation of the cash transfer programme in

Indonesia, Barca (2012) mentions that the grievance mechanism is not socialised among villagers and suggested that socialisation was necessary in order for the programme to be accountable.

An ex-post evaluation which identifies problems afterwards does nothing to improve the programme's effectiveness or reduce inefficiencies. Independent programme monitoring and evaluation would improve outcomes if monitoring and evaluation are participatory, and contain independent 'grievance' mechanisms and/or use 'action research' which identifies errors in targeting to be corrected during implementation. Such actions could promote a long-term solution, namely the strengthening of local, especially lower-level, institutional management capacity and the improvement of governance at all levels. Another possibility, as piloted in Zambia and implemented in Nigeria, would be to provide subsidy by e-voucher, which could prevent elite intervention in voucher delivery.

Considering the recent surge in input prices which has made it difficult for poor small-scale farmers to benefit from the subsidy because of the increasing price of top-up, it would be better to provide commodity-denominated subsidies rather than price-denominated subsidies such as NAIVS. This would fit the concept of the 'input subsidy' which ties inputs to exchange rather than money. Failure to maintain this tie has meant programme implementation has differed from programme design in various ways, as illustrated by NAIVS.

In order to raise the effectiveness of input use, access to credit and other productivity-enhancing infrastructure, such as irrigation, roads and output markets, should be developed, and the necessary food security policies, such as policies for crop trade and import tariffs, should be implemented. In order for farmers to continue to use inputs, it is vital to raise the profitability of input use with higher maize producer prices. One way to stabilise maize producer prices would be to promote producers' access to market price information so that they do not sell at prices suppressed by buyers in imperfect market conditions; another is a stable, government-guaranteed maize price in season. The establishment of farmers' associations which collectively store and market maize, such as the Warehouse Receipt System (IFAD, 2012) could also help farmers to reduce crop storage loss and obtain better prices through collective bargaining.

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Appendix 1. List of qualitative research activities (key-informant interviews, farmer group discussions and extended village meetings)

No.	Interviewee	Date	District	Village
1	Mr. David Rohrbach / World Bank officer	15 Oct. 2012	Dar Salaam es	
2	Mr. Masaaki Homma / JICA officer	19 Oct. 2012	Dar Salaam es	
3.	Mr. Yoichiro Kimata / JICA officer	19 Oct. 2012	Dar Salaam es	
4	Mr. Kamhabwa / MAFC officer	23 Oct. 2012	Dar Salaam es	
5	Prof. Kimbi / Sokoine University of Agriculture	2 Nov. 2012	Morogoro	Morogoro town
6	Prof. Gabagambi / Sokoine University of Agriculture	2 Nov. 2012	Morogoro	Morogoro town
7	Mr. Andrew Tarimo / Agriculture Officer, RS, Ruvuma	4 Nov. 2012	Songea Municipality	Songea town
8	Mr. Nachoa M. Zacharia / Municipal Director	5 Nov. 2012	Songea Municipality	Songea town
9	Mr. Helibert Filipo Tindwa / farmer	5 Nov. 2012	Songea District	Matimila
10	Mr. Francis Tindwa / Agriculture Officer	6 Nov. 2012	Songea Municipality	Songea town
11	Mr. Onesmo Ngao / Agriculture Officer, RS Ruvuma	7 Nov. 2012	Songea District	Songea town
12	RAPCO manager/ agro-dealer	7 Nov. 2012	Songea District	Songea town
13	NFRA officers	7 Nov. 2012	Songea District	Songea town
14	Mr. Simba / District Agriculture Officer	9 Nov. 2012	Tunduru	Tunduru town
15	Village chairman and VEO	10 Nov. 2012	Tunduru	Nampungu
16	M. Issa Alivo Taka / WAEO	10 Nov. 2012	Tunduru	Nampungu
17	Farmer group discussion	10 Nov. 2012	Tunduru	Nampungu
18	Ms. Amina Daudi / VEO	10 Nov. 2012	Tunduru	Nampungu
19	Group discussion with VVC Chairman / secretary / member	11 Nov. 2012	Tunduru	Nampungu
20	Mr. Mohamed Athmani / lowest-income farmer	11 Nov. 2012	Tunduru	Nampungu
21	Mr. Omari Zuberi / CUF chairman / highest-income farmer	11 Nov. 2012	Tunduru	Nampungu
22	Mr. Mohamed Makonganya / middle-income farmer	11 Nov. 2012	Tunduru	Nampungu
23	Manager of Namuyny store (TFC agent)	12 Nov. 2012	Tunduru	Nampungu
24	Mr. Issaya Tito Mbilinyi / agro-dealer	15 Nov. 2012	Songea	Songea
25	Village key stakeholder meeting	16 Nov. 2012	Mbinga	Tukuzi
26	Mr. Turuka / VAEO	16 Nov. 2012	Mbinga	Tukuzi
27	Mr. Ridhiki / VEO	17 Nov. 2012	Mbinga	Tukuzi

28	Group discussion with Faustin and Jaiza Mbano/VVC chairman / member	17 Nov. 2012	Mbinga	Tukuzi
29	Mr. Kelvin Emanuel / farmer	19 Nov. 2012	Mbinga	Tukuzi
30	Farmer group discussion	19 Nov. 2012	Mbinga	Tukuzi
31	Mr. Vernant Nbungu	19 Nov. 2012	Mbinga	Tukuzi
32	Focus Milinga / farmer	19 Nov. 2012	Mbinga	Tukuzi
33	Village key-stakeholder meeting	22 Nov. 2012	Songea District	Mlete
34	Ms. Ernest Ponela / VVC chairman	23 Nov. 2012	Songea District	Mlete
35	Famer group discussion	23 Nov. 2012	Songea District	Mlete
36	Mr. Saidim Suleimani / WAEO	23 Nov. 2012	Songea District	Mlete
37	Mr. Ahoye J. Mbecha / Village chairman	23 Nov. 2012	Songea District	Mlete
38	Mr. Erasto Oraph Mapunda / VEO	23 Nov. 2012	Songea District	Mlete
39	Mr. Bakari Athman Kawina / WEO	26 Nov. 2012	Songea District	Mlete
40	Mr. Simon Mbecha / farmer	26 Nov. 2012	Songea District	Mlete
41	Mr. Eric Komba / farmer	26 Nov. 2012	Songea District	Mlete
42	Mr. Ally Mamba / farmer	26 Nov. 2012	Songea District	Mlete
43	Ms. Adehelma Ponela / agro-dealer	26 Nov. 2012	Songea District	Mlete
44	Mr. Bigambo Ladsiaus / MVIWATA (Farmer Association) officer	27 Nov. 2012	Songea Municipality	Songea town
45	Ms. Rosemary John Haule / agro-dealer	27 Nov. 2012	Songea Municipality	Songea town
46	Mr. Furaha Mohamedi / SODECO (Songea Development Cooperative) manager	28 Nov. 2012	Songea Municipality	Songea town
47	Mr. Siarra Daud / TFC manager	28 Nov. 2012	Songea Municipality	Songea town
48	Ms. Grace Aloyce Msolle/ MAFC officer	2 Dec. 2012	Dar es Salaam	
49	Mr. Kamhabwa / MAFC officer	3 Dec. 2012	Dar es Salaam	
50	Dr. Msolla / MAFC manager	3 Dec. 2012	Dar es Salaam	
51	Mr. Mkwangwe / MAFC officer, Ulanga Agricultural Research Institute	5 Dec. 2012	Dar es Salaam	
52	Mr. Salum K. Mkumba / TFC manager	12 Dec. 2012	Dar es Salaam	
53	Mr. Gabriel / Ruccodia	11 Feb. 2013	Songea District	Morogoro
54	Mr. Renatus Phiri / Village chairman	16 Feb. 2013	Songea District	Morogoro
55	Mr. Mohamed Mohamed Ally / VEO	16 Feb. 2013	Songea District	Morogoro

56	VVC chairman	16 Nov. 2012	Namtumbo	Likuyu
57	Village chairman	18, 20 Feb. 2013	Namtumbo District	Milayoyo
58	Village meeting	19 Feb. 2013	Songea District	Morogoro
59	Mr. Saidi M. Suleimani / WAEO	19 Feb. 2013	Songea District	Morogoro
60	Mr. Ahoyer J. Mbecha / Village chairman	23 Feb. 2013	Songea District	Mlete
61	Village meeting	24 Feb. 2013	Songea District	Mlete
62	Village meeting	24 Feb. 2013	Namtumbo District	Naikesi
63	Village chairman	26 Feb. 2013	Songea District	Madaba
64	Mr. Jameson Konga/WEO	26 Feb. 2013	Namtumbo District	Ligera
65	Mr. Rubora / WAEO	27 Feb. 2013	Songea District	Madaba
66	VEO	27 Feb. 2013	Songea District	Madaba
67	Mr. Imam Hassani Jaruka / VVC chairman	27 Feb. 2013	Songea District	Madaba
68	Mr. Stephen & Ms. Fiona Van Aardt / managers of Kisimbaguri Estates Ltd.	27 Feb. 2013	Songea District	Madaba
69	Mr. Emanuel Daud Mkiakasungula / MADABA Agrochemical (agro-dealer)	28 Feb. 2013	Songea District	Madaba
70	Ms. Clementina Kilumile / manager of Clementina Shop (agro-dealer)	28 Feb. 2013	Songea District	Madaba
71	Ms. Daria Nduguru/ VVC chairman and Mr. Azizi Ligera / secretary, VVC	2 Mar. 2013	Songea District	Muhukuru Barabarani
72	Mr. Paskal Nlanzi / Village chairman	2 Mar. 2013	Songea District	Muhukuru Barabarani
73	Ms. Sonia Adriani Mrops / VEO	2 Mar. 2013	Songea District	Mhukuru Barabarani
74	Ms. Jenitha Daud Millinga / VEO	8 Mar. 2013	Mbinga	Tukuzi
75	Mr. Isaya Marcus Kumburu / village chairman	10 Mar. 2013	Mbinga	Lipumba
76	Village chairman	10 Mar. 2013	Mbinga	Lupiringa
77	Antoni Mwingira / VVC chairman	10 Mar. 2013	Mbinga	Lupiringa
78	Village chairman	12 Mar. 2013	Tunduru	Sisi kwa sisi
79	Mr. Ansgali Komba / VVC chairman	13 Mar. 2013	Mbinga	Lipumba
80	Village chairman	13 Mar. 2013	Tunduru	Mbesa
81	Mr. Michael Nduruguru / farmer	14 Mar. 2013	Mbinga	Mkwaya
82	Mr. Huaman Kisawala / VEO	15 Mar. 2013	Mbinga	Mkwaya
83	Village chairman	16 Mar. 2013	Mbinga	Mkwaya
84	Village meeting	17 Mar. 2013	Tunduru	Wenje

85	Village chairman	17 Mar. 2013	Tunduru	Mchoteka
86	Farmer group meeting	17 Mar. 2013	Tunduru	Mchoteka
87	VEO	20 Mar. 2013	Mbinga	Litrongi
88	Mr. Osmund Komba / CCM secretary	21 Mar. 2013	Mbinga	Litrongi
89	Farmer	21 Mar. 2013	Tunduru	Angalia
90	VEO	24 Mar. 2013	Tunduru	Chiungo
91	VVC chairman	24 Mar. 2013	Tunduru	Chiungo
92	Mr. Mathew Longiuo Kapinga / village chairman	25 Mar. 2013	Mbinga	Kipololo
93	Mr. Rapahel John Chlyenga / WAEO	25 Mar. 2013	Mbinga	Kipololo
94	Village chairman	26 Mar. 2013	Mbinga	Kipololo
95	Mr. Damas Kapinga	26 Mar. 2013	Mbinga	Kipololo
96	Village meeting	26 Mar. 2013	Mbinga	Namakambale
97	VVC chairman and other farmers	26 Mar. 2-13	Mbinga	Namakambale
98	Mr. John E. Nyangali / VEO	27 Mar. 2013	Mbinga	Kipololo
99	Mr. Linus A Kapinga / VVC Chairman	27 Mar. 2013	Mbinga	Kipololo
100	Village meeting	30 Mar. 2013	Tunduru	Namiungo
101	Village key stakeholder meeting	8 Apr. 2013	Mbinga	Mpepai
102	Mr. Revocatus Kyaruzi / WAEO	8 Apr. 2013	Mbinga	Mpepai
103	Mr. Ditrick H. Mapunda/ village chairman	8 Apr. 2013	Mbinga	Mpepai
104	Mr. Dastan Oswald Komba / VVC chairman	9 Apr. 2013	Mbinga	Mpepai
105	Mr. Korman Felix Komba / VVC chairman	13 Apr. 2013	Mbinga	Kingerikiti
106	Mr. Richard Rapahel Katale / WAEO	14 Apr. 2013	Mbinga	Kingerikiti
107	Mr. Hubert Odo Hyera / elderly farmer	14 Apr. 2013	Mbinga	Kingerikiti
108	WAEO	14 Apr. 2013	Mbinga	Kingerikiti
109	VEO	15 Apr. 2013	Mbinga	Kingerikiti
110	Village chairman	15 Apr. 2013	Mbinga	Kingerikiti
111	Mr. Buana Hyera / ex-village chairman	16 Apr. 2013	Mbinga	Kingerikiti
112	Mr. Lusius Jonas Ponela / village chairman	18 Apr. 2013	Mbinga	Ndondo
113	Mr. Raphael Nomba / VVC chairman	18 Apr. 2013	Mbinga	Ndondo

114	Village stakeholder meeting	18 Apr. 2013	Mbinga	Ndondo
115	Village chairman	19 Apr. 2013	Mbinga	Ndondo
116	Mr. Mbaga Isdory Komba / village chairman	22 Apr. 2013	Mbinga	Mahenge
117	VAEO	22 Apr. 2013	Mbinga	Mahenge
118	Mr. Alfred B. Hyera / VVC chairman	23 Apr. 2013	Mbinga	Mahenge
119	Mr. Sekundo H. Hyera / village chairman	25 Apr. 2013	Mbinga	Kitura
120	VVC chairman	25 Apr. 2013	Mbinga	Kitura
121	Mr. Inglibert Hyera / farmer	26 Apr. 2013	Mbinga	Kitura
122	Mr. Paul Hyera / farmer	27 Apr. 2013	Mbinga	Kitura
123	Village meeting	29 Apr. 2013	Mbinga	Mango
124	Mr. Rashidi Abilahi Rashidi / WAEO	29 Apr. 2013	Mbinga	Mango
125	Mr. Joseph Ndimbo / VVC chairman	30 Apr. 2013	Mbinga	Mango
126	Mr. John / Techno service (Agro-NGO)	1 May 2013	Mbinga	Mbinga town
127	VAEO	2 May 2013	Mbinga	Madaba
128	Mr. M. Mbunda Andoya, Andoya Hydro Electric Company / agro-dealer	4 May 2013	Mbinga	Mbinga town
129	Mr. Kamhabwa / MAFC officer - voucher section	8 May 2013	Dar Salaam	
130	Mr. M. Nyanda / MAFC Statistics Unit officer	8 May 2013	Dar Salaam	
131	Mr. David Rorbach / World Bank officer	11 Jun. 2013	Dar Salaam	
132	Dr. Msolla / MAFC Manager – voucher section	13 Jun. 2013	Dar Salaam	
133	Mr. Kamhabra / MAFC officer – voucher section	9 Oct. 2013	Dar Salaam	
134	Mr. Aretas F. Ndoro / Yara Tanzania Ltd.	12 Oct. 2013	Dar Salaam	

Appendix 2. Checklist for qualitative interviews

I. Key informant interviews

I-1. Agricultural officer at Regional Secretariat, Ruvuma

1. Did you know about NAIVS? If so, how did you hear about NAIVS? How was it implemented in Ruvuma?
2. How were you informed about the targeting criteria for selecting beneficiaries of NAIVS? How were you informed about its implementation of beneficiary selection?
3. Has NAIVS made any changes on input use of farmers in Ruvuma?
4. Have the number of local agro-dealers for inputs increased in Ruvuma?
5. Have the number of local agro-dealers for outputs (maize/rice) increased in Ruvuma?
6. Did input price lower after NAIVS started in Ruvuma?
7. Did output price lower after NAIVS started in Ruvuma?
8. Has NAIVS had any effects on the livelihoods of farmers in Ruvuma?
9. Has NAIVS had any other effects in Ruvuma?
10. What did you expect from NAIVS? Were these expectations achieved? If not, what is the request?

I-2. District Executive Director

1. Did you know about NAIVS? If so, how did you hear about NAIVS? How was it implemented in this district?
2. How were you informed about the targeting criteria for selecting beneficiaries of NAIVS? How were you informed about its implementation of beneficiary selection?
3. Has NAIVS made any changes on input use of farmers in this district?
4. Have the number of local agro-dealers for inputs increased in this district?
5. Have the number of local agro-dealers for outputs (maize/rice) increased in this district?
6. Did input price lower after NAIVS started in this district? Why?
7. Did output price lower after NAIVS started in this district? Why?
8. Has NAIVS had any effects on the livelihoods of farmers in this district?
9. Has NAIVS had any other effects in this district?
10. What did you expect from NAIVS? Were these expectations achieved? If not, what is the request?

I-3. District Agriculture and Livestock Development Officer

1. How were you informed about NAIVS? How was NAIVS implemented?
2. How were you informed about the targeting criteria for selecting beneficiaries of NAIVS? How were you informed about its implementation of beneficiary selection?
3. Has NAIVS made any changes on input use of farmers in this district?
4. Has NAIVS increased maize/rice productivity of recipient farmers in this district?
5. Has NAIVS increased maize/rice production of recipient farmers in this district?
6. Have the number of local agro-dealers for inputs increased in this district?
7. Have the number of local agro-dealers for outputs (maize/rice) increased in this district?
8. Did input price lower after NAIVS started in this district? Why?
9. Did output price lower after NAIVS started in this district? Why?
10. Has NAIVS had any effects on the livelihoods of farmers in this district?
11. Has NAIVS had any other effects in this district?
12. What did you expect from NAIVS? Were these expectations achieved? If not, what could it be implemented better?

I-4. Agricultural extension officers

1. How were you informed about NAIVS? How was NAIVS implemented?
2. How were you informed about the targeting criteria for selecting beneficiaries of NAIVS? How were you informed about its implementation of beneficiary selection?
3. Has NAIVS made any changes on input use of farmers?
4. Has NAIVS increased maize/rice productivity of recipient farmers?
5. Has NAIVS increased maize/rice production of recipient farmers?
6. Did you train farmers / agro-dealers on how to use subsidized inputs? If not, who trained?

7. Have the number of local agro-dealers for inputs increased?
8. Have the number of local agro-dealers for outputs (maize/rice) increased?
9. Did input price lower after NAIVS started? Why?
10. Did output price lower after NAIVS started? Why?
11. Has NAIVS had any effects on the livelihoods of farmers?
12. Has NAIVS had any other effects?
13. What did you expect from NAIVS? Were these expectations achieved? If not, what could it be implemented better?

I-5. Farmer associations/cooperatives

1. How were you informed about NAIVS? How was NAIVS implemented?
2. How were you informed about the targeting criteria for selecting beneficiaries of NAIVS? How were you informed about its implementation of beneficiary selection?
3. Has NAIVS made any changes on input use of farmers?
4. Has NAIVS increased maize/rice productivity of recipient farmers?
5. Has NAIVS increased maize/rice production of recipient farmers?
6. How did NAIVS relate to your activities?
7. Did you train farmers / agro-dealers on how to use subsidized inputs? If not, who trained them?
8. Have the number of local agro-dealers for inputs increased?
9. Have the number of local agro-dealers for outputs (maize/rice) increased?
10. Did input price lower after NAIVS started? Why?
11. Did output price lower after NAIVS started? Why?
12. Has NAIVS had any effects on the livelihoods of farmers?
13. Has NAIVS had any other effects?
14. What did you expect from NAIVS? Were these expectations achieved? If not, what could it be implemented better?

I-6. Agro-dealers

1. How were you informed about NAIVS? How was NAIVS implemented?
2. How were you informed about the targeting criteria for selecting beneficiaries of NAIVS? How were you informed about its implementation of beneficiary selection?
3. Has NAIVS made any changes on input use of farmers?
4. Has NAIVS increased maize/rice productivity of recipient farmers?
5. Has NAIVS increased maize/rice production of recipient farmers?
6. How did you relate to NAIVS? Did you distribute and buy vouchers from farmers?
7. Did you train farmers / agro-dealers on how to use subsidized inputs? If not, who trained them?
8. Have the number of local agro-dealers for inputs increased?
9. Have the number of local agro-dealers for outputs (maize/rice) increased?
10. Did input price lower after NAIVS started? Why?
11. Did output price lower after NAIVS started? Why?
12. Has NAIVS had any effects on the livelihoods of farmers?
13. Has NAIVS had any other effects?
14. What did you expect from NAIVS? Were these expectations achieved? If not, what could it be implemented better?

I-7. District Voucher Committee members

1. How were you selected as DVC members? How were you informed about NAIVS? Did you go to seminars/ training?
2. How was NAIVS implemented? How is the mechanism for voucher distribution and redemption? How did you monitor / relate to VVCs?
3. What are the targeting criteria for selecting beneficiaries of NAIVS? Was it implemented accordingly?
4. Has NAIVS made any changes on input use of farmers?
5. Has NAIVS increased maize/rice productivity of recipient farmers?
6. Has NAIVS increased maize/rice production of recipient farmers?

7. Have the number of local agro-dealers for inputs increased?
8. Have the number of local agro-dealers for outputs (maize/rice) increased?
9. Did input price lower after NAIVS started? Why?
10. Did output price lower after NAIVS started? Why?
11. Has NAIVS had any effects on the livelihoods of farmers?
12. Has NAIVS had any other effects?
13. What did you expect from NAIVS? Were these expectations achieved? If not, how could it be implemented better?

I-8. Village Executive Officers and Village leaders

1. How were you informed about NAIVS? How was NAIVS implemented?
2. How were you informed about the targeting criteria for selecting beneficiaries of NAIVS? How were you informed about its implementation of beneficiary selection?
3. Has NAIVS made any changes on input use of farmers in the village?
4. Has NAIVS increased maize/rice productivity of recipient farmers in the village?
5. Has NAIVS increased maize/rice production of recipient farmers in the village?
6. Have the number of local agro-dealers for inputs increased in the village?
7. Have the number of local agro-dealers for outputs (maize/rice) increased in the village?
8. Did input price lower after NAIVS started in this village? Why?
9. Did output price lower after NAIVS started in this village? Why?
10. Has NAIVS had any effects on the livelihoods of farmers in this village?
11. Has NAIVS had any other effects?
12. What did you expect from NAIVS? Were these expectations achieved? If not, how could it be implemented better?

I-9. Village Voucher Committee members

1. How were you selected as VVC members? How were you informed about NAIVS? Did you go to seminars/ training?
2. How was NAIVS implemented? What is the mechanism of beneficiary selection, recording and them, and reporting to DVC?
3. What are the targeting criteria for selecting beneficiaries of NAIVS? Was it implemented accordingly?
4. Has NAIVS made any changes on input use of farmers in the village?
5. Has NAIVS increased maize/rice productivity of recipient farmers in the village?
6. Has NAIVS increased maize/rice production of recipient farmers in the village?
7. Have the number of local agro-dealers for inputs increased in the village?
8. Have the number of local agro-dealers for outputs (maize/rice) increased in the village?
9. Did input price lower after NAIVS started in this village? Why?
10. Did output price lower after NAIVS started in this village? Why?
11. Has NAIVS had any effects on the livelihoods of farmers in this village?
12. Has NAIVS had any other effects?
13. What did you expect from NAIVS? Were these expectations achieved? If not, how could it be implemented better?

II. Farmer group interviews

II-1. Recipients

1. Why did you decide to take vouchers?
2. Did the subsidized inputs make profitable compared to the costs?
3. How do you think of allocation of vouchers? How do you think about its implementation process of NAIVS?
4. Did you change input use from commercial source after receipt of NAIVS? If you increased it, was it found to be profitable?
5. Have you changed your livelihood after introduction of NAIVS? If so, how?
6. Has NAIVS had any other effects in the village?
7. Has NAIVS improved your living? If so, how?

8. What did you expect from NAIVS? Were these expectations achieved? If not, what is the request?

II-2. Non-recipients

1. Did you know about NAIVS? If so, from which source and how were you informed? Were you selected as beneficiaries? If so, why did you not decided to take vouchers?
2. How do you think about the subsidized inputs? Do you think it makes profitable compared to the costs? Do you think that NAIVS improved their living of recipient farmers?
3. How do you think of allocation of vouchers? How do you think about its implementation process of NAIVS in your village?
4. Did you change any input use from commercial sources after introduction of NAIVS? If you increased it, why? Did you find it profitable compared to costs?
5. Have you changed your livelihood after the time of introduction of NAIVS to your village?
6. Has NAIVS had any other effects in the village?
7. What did you expect from NAIVS? Do you have any request to NAIVS to be changed/improved?

Appendix 3. Household survey questionnaire

Panel survey for Ruvuma 2013 (To be answered by household head or most knowledgeable household member)*

Date of interview: _____ day _____ month _____ year

	District	Ward	Village	Name of household head	Recipient (1) / Non-recipient HH (2)
Name					
Code					

Note: Ward and village code are the same

District Code

1=Songea rural
2=Tunduru
3=Mbinga
4=Namtumbo

Village code

1=Mlete
2=Muhukuru_Barabarani
3=Morogoro
4=Madaba
5=Sisi kwa sisi
6=Namiungo
7=Namakambale
8=Tuwemacho
9=Chiungo
10=Angalia1
11=Mchesi

12=Wenje
13=Mchoteka
14=Mbesa
15=Kitanda
16=Nampungu
17=Namakungwa
18=Litorongi
19=Lipumba
20=Mkwaya
21=Ndondo
22=Chiulu/Chiula

23=Kingerikiti
24=Kibandai 'A'
25=Mango
26=Langiro Asili
27=Mahenge
28=Tukuzi
29=Ulolola
30=Kipololo
31=Mpepai
32=Kitura
33=Ligera

34=Mlilayoyo
35=Naikesi
36=Likuyu/Sekamanga

Note: To identify the household, use the name of the household head of last time and the corresponding code from the village list drawn up in 2009.

	Name	Code/id number
Respondent (use code from household roster)		
Enumerator		
Supervisor		
Data enterer		

Note to Enumerator – please use following codes throughout the questionnaire

- **99 if the respondent does not know, does not remember or refuses to answer (in other words answer is not necessarily zero)**
- **88=Not Applicable (question irrelevant for the respondent)**
- **In all other cases blanks or empty spaces will be interpreted as zeros**

LOCAL UNIT CONVERSION CHART

Whenever during the interview the respondent refers to local units (bags, tins, debe, pishi, etc., make sure to return to this page and record or estimate in kilograms the weight, or in liters the content of the local units used by this particular respondent for this particular product.

Remember **1Ha=2.47 acres**

Product	Local unit	Weight in kgs	Content in liters

1. Household information

First, please write the names of the household member list in 2009 in (A2). Then please write the new household member names in (A2). Ask who is the current household head and put 1 for him/her.

(A1) ID	(A2) Household member name	(A3) Current household head Put 1 for household head	(A4) Sex 1=Male 2=Female	(A5) Age
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

2. Receipt of input voucher

V3. Were any household members selected as eligible for a voucher in **the following years?**
(1=yes, 2=no)

2012/13 (A)	2011/12 (B)	2010/11 (C)	2009/10 (D)	2008/9 (E)

V4. Did they receive any voucher in these years? (1=yes, 2=no)

2012/13 (A)	2011/12 (B)	2010/11 (C)	2009/10 (D)	2008/9 (E)

Note: Look at the 1st column of the 1st page whether this household is recipient sample HH or non-recipient sample HH.

If the household is non-recipient sample household and if yes in any column in V4, stop the survey. If not go to section A.

If the household is recipient sample household, look at the answer for 2008/9 year.

Note for enumerators. We now continue with some further questions about the **CURRENT household members** above 5 years old. To limit mistakes, repeat ALL household names listed above and indicate which ones are still present! Then proceed with follow up questions for the current members above 5 years old.

(A1) ID	(A2) Name (repeat names of household members listed above)	(A12)For members Highest grade completed 0=pre-school 1=Standard 1, 2=Standard 2, ..., 8=Standard 8 9=course after primary educ. 10=Form I 11=Form II 12=Form III 13=Form IV 14=course after second. educ. 15=Form V 16=Form VI 17=Course after Form VI 18=Diploma course 19=Other certificate 20=Some but not finished university 21=Completed University Degree 22=Adult education only 23=No education	For household members of 15 years or older, is [NAME]		
			an elected position 1=village chairman 2=Kitongoji chair 3=10 cell leader 4=member of village council 5=village execution officer 6=village voucher committee 7=none of the above	a member in a primary society, sacco, vicoba, funeral society, or other economic group 1=yes 2=no	A member in a religious, youth, women/s or other social group 1=yes 2=no
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

B. Activities of Household Members aged more than 5 years

[illegible]

Activity code

1=regular wage earner in private sector
2=regular wage earner in public sector
3=irregular wage earner
4=self employed w/o employees
5=unpaid family worker
6=student
7=looking for work
8=not working and not looking for work
9=household work
10=retired, pensioner
11=too old, too young
12=disabled
13=other
14=self employed with employees

Sector of employment

Primary sector

1=agriculture
2=fishing
3=livestock
4=mining and quarrying
5=other primary
17=forestry

Industrial sector

6=manufacturing/production/crafts
7=construction
8=other industry
9=processing

Service sector and government

10=wholesale/retail/shop
11=restaurant/food preparation
12=repair work
13=transport, storage and communication
14=banking, finance, real estate and business
15=public service, army, education, health
16=other service and government

D. NON-FARM INCOME

How much income (cash and in kind) have the different household members (≥ 5 years old) received from non-farm activities over the past year (2012)? If the individual was not a member of the household for the full year, list only their income during the time they were a member.

[illegible]

Note: D3B :

D4B :

D7B :

D9 :

G. AGRICULTURAL LAND OWNERSHIP AND USE (CROP PRODUCTION)

	A. Amount	B. Unit (1=ha; 2=acre)
G1. What is the total amount of land your household owns now ?		
G2. Among household members who (list ID no. from A1) owns* land? State the size of land each person has? (if more than two people have one land, put them in one column)		
1)		
2)		
3)		
4)		
5)		
G3. What is the total amount of land your household cultivated (both owned & rented) during the last cropping season (2011-2012)?		

*'owning land' includes either owning land or owning products from the land.

			A. Amount	B. Unit (1=ha; 2=acre)	C. Value/ Rent (000 TSH)
G4. Did HH buy/receive any agricultural land over the past four years ? 1=yes, bought 2=yes received as gift; 3=received from village or govt; 4=inherited 5= not bought or received		G5. If bought or received, state amount and value:			
G6. Did HH sell/give away any agricultural land over the past 4 years ? 1=yes, sold, 2=yes gave as gift; 3=gave to village or govt; 4=did not sell; 5= not sold or gave away		G7. If sold/given away, state amount and value;			
G8. Did HH rent in any land for agriculture during the past cropping season ? 1=yes, 2=no		G9. If rented, state amount and rent paid			
G10. Did HH rent out any land for agriculture during the past cropping seasons ? 1=yes, 2=no		G11. If rented, state amount and rent received			

Parcels operated during last cropping season (2011- 2012) We would now like to ask you about your last year's crop, in particular how many parcels you operated, the characteristics of these parcels, what you grew on them, how much inputs you used on them etc.

Note: 1) G18 total = G3 in page 18 2) 1 km= 1,000 m, 1 mile=1.6 km

G17. How many parcels of land did you operate (includes rented land) this **past year (2011- 2012)**?

[illegible]

For each of the parcels answer the following questions regarding the crops cultivated last year (2011-2012) in each parcel (follow sequence of plots indicated above).

G36. Parcel No Repeat the parcel numbers from above	G37. Type of cultivation 1=mono- crop 2=mixed crop	G38. Crop code (if mixed, repeat parcel number and list crop names			G39. Number of trees if applicable				G40. Production last year of each crop				G41. crop damage due to pest/insect attacks? 1=none 2=little 3=somewhat 4=a lot	G42 Pesticides used? 1=yes 2=no	G43 Organic fertilizer used? 1=yes 2=no If no go to next parcel	G44. If yes in G43, what was used? 1.=manure 2.=compost, 3.=others (specify)	G45. If used, how much was used? (code below)	
									Crop 1 (A)		Crop 2 (B)						Amou nt	Unit
		Crop 1	Crop 2	Crop 3	Tree 1 (A)		Tree 2 (B)		(1)	(2)	(1)	(2)						
		(A)	(B)	(C)	Na me. (1)	No. (2)	Na me (1)	No. (2)										
P1																		
P2																		
P3																		
P4																		
P5																		
P6																		
P7																		
P8																		
P9																		
P10																		

Crop code (G38)

1=maize
2=beans
3=coffee
4=banana
5=millet
6=sorghum
7=wheat
8=rice
9=cassava
10=yams
11=sweet potatoe
12=Irish potatoe
13=groundnuts
14=onions
15=tomatoes

16=pumpkin
17=carrottes
18=sweet pepper
19=cabbage
20=other vegetables
21=simsim (sesame)
22=peas
23=castor oil
24=sugar cane
25=papaya
26=other fruit
27=others, specify
28=tobacco
29=cashew
30=sunflower
31=avocado

32=paprika
33=soya beans
34=others

Tree (G39)

1=mango
2=abocado
3=banana
4=timber tree
5=lemon
6=orange
7=others (specify)

Units for production (G40)

1=kg
2=liter
3=100kg bags
4=20kg tins/debe
5=5kg tins
6=bunch (specify weight in front)
7=root bag (specify weight in front)
8=cups (specify weight in front)
9=pieces
10=others (specify)

Fertilizer units (G45)

1=cows
2=chickens
3=other animals (specify)
4=kg
5=liter
6=others (specify).

Answer fertilizer in last year

G36 Parcel No Repeat the parcel numbers from above	G46 Amount of fertilizer (kg) used								G47 Of those of which G46 obtained from input voucher								G48 Seeds (kg) used						G49 Of G48 obtained from input voucher		
	Urea (A)		Phosphorus fertilizer (B)			1. NPK 2. SA 3. CAN Select (C)			Urea (A)		Phosphorus fertilizer (B)			1. NPK 2. SA 3. CAN Select (C)			Traditional (A)		Modern (B)		Modern				
	Amount	Unit (code below)	1=D AP 2=M RP (Minjingu)	Amount	Unit (code)	Type	Amount	Unit (code)	Amount	Unit (code below)	1=D AP 2=M RP (Minjingu)	Amount	Unit (code below)	Type	Amount	Unit (code)	Amount	Unit (code)	1=OP V 2=hybrid 3=other	Amount	Unit (code)	1=OP V 2=hybrid 3=other	Amount	Unit (code)	
	(1)	(2)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(1)	(2)	(3)	(1)	(2)	(3)	
P1																									
P2																									
P3																									
P4																									
P5																									
P6																									
P7																									
P8																									
P9																									
P10																									

Units
 1=kg
 2=liter
 3=100kg bags
 4=20kg tins/debe
 5=5kg tins

6=bunch (specify weight in front)
 7=root bag (specify weight in front)
 8=cups (specify weight in front)
 9=pieces
 10=others (specify)

G54. What was the production and sales of main annual crops in **the past year (2011-2012)**? (Answer all the produced crops. State units and conversion rates to kg in the local unit conversion table). If some products haven't been completely harvested, give estimated total production. Note: $F+H+J+K=D$

	A. Produced in the past year 2011-2012? 1=yes 2=no	D. Total production	E. Units for production and sales (apply to all cols)	F. Amt sold	G. Total value of sales (Tsh. 000)	H. Amt used for household consumption	I. Month the bulk of the crop was harvested (1=Jan, 2=Feb, ..., 10=Oct, 11=Nov, 12=Dec)	J. Estimated loss since harvest due to drying, rats/mice, pests	K. Amt still stored
Maize									
Beans									
Coffee Arabica									
Banana									
Millet									
Sorghum									
Wheat									
Rice									
Cassava									
Yams									
sweet potatoes									
Irish potatoe									
Groundnuts									
Onions									
Tomatoes									
other Vegetables									
Sunflower									
Peas									
Castor oil									
Sugar cane									
trees for timber or firewood									
Papaya									
Other fruit									
Tobacco									
Cashew									
Simsim									
Paprika									
Other product (code from prev. page) G39									

Unit code

1=kg
2=liter

3=100kg bags
4=20kg tins
5=5kg tins
6=bunch (specify weight in front)

7=root bag (specify weight in front)
8=cups (specify weight in front)
9=pieces
10=other (specify)_____

Planting **this** seasonyear (2012 – 2013)

Please list all the parcels from above, and indicate the crop planted on each parcel **this seasonyear (2012 – 2013)**, as well as the inputs used.

G17a. How many parcels of land do you operate (includes rented land) this season (2012-13)?						
Parcel number	G18a. Size		G52. Do you cultivate this parcel this seasonyear ? 1=yes; 2=no	G53. Crop code (if no crop, put zero), if mixed, indicate all the crops		
	(A) Amount	(B) Unit 1=ha 2=acres		Crop 1(1)	Crop 2(2)	Crop 3(3)
P1						
P2						
P3						
P4						
P5						
P6						
P7						
P8						
P9						
P10						
P11						
P12						
P13						
P14						

Crop code

1=maize
2=beans
3=coffee
4=banana
5=millet
6=sorghum
7=wheat
8=rice
9=cassava

10=yams
11=sweet potatoe
12=Irish potatoe
13=groundnuts
14=onions
15=tomatoes
16=pumpkin
17=carrottes
18=sweet pepper
19=cabbage

20=other vegetables
21=simsim (sesame)
22=peas
23=castor oil
24=sugar cane
25=papaya
26=other fruit
27=others, specify
28=tobacco
29=cashew
30=sunflower
31=avocado

32=paprika
33=soya beans
34=others

V. INPUT VOUCHER

We would now like to ask you some questions about your experience in input voucher for fertilizer and seeds.

V1. Do you know that the government has distributed fertilizer and/or seed vouchers ? (1=yes; 2=no)

If yes, go to V2. If no, go to V3.

V2. If yes, how did you learn about it?

(1=village council; 2=radio; 3=neighbour; 4=extension agent; 5=input trader; 6= other, specify)

2012/13

(this year)

2011/12 (last year)

V3 Were any household members selected for the voucher in this year? (1=yes; 2=no) If no, go to next year.	<div style="border: 1px solid black; width: 100px; height: 30px; display: inline-block;"></div> <div style="display: inline-block; vertical-align: middle;">1= Yes 2=No</div>				
	Urea A	DAP B	Minjingu C	Maize improved seeds D.	Rice improved seeds E.
V4a. If yes in V3, select input type they received voucher (1=yes; 2=no).					
V4b. If yes in V4a, who got vouchers (list ID No. from A1), for each input? (select 1=yes; 2=no)					
1)					
2)					
3)					
4)					
5)					
V6. What was the subsidy value per voucher each selected person received ('000 TSH)?					
V7. Did the person use it for either maize/rice production ? (1=yes, 2=no) If no, go to V8. If yes, go to V12. (answer it for each person)					
1)					
2)					
3)					
4)					
5)					

V3a	<div style="border: 1px solid black; width: 150px; height: 30px; margin-bottom: 5px;"></div> 1= Yes 2= No				
V4aa	Urea A.	DAP B.	Minjin gu C.	Maize improved seeds D.	Rice impro ved seeds E.
V4ba					
V6a					
V7a					

2012/13

(this year

2011/12 (last year

	Urea A.	DAP B	Minji ngu C.	Maize improved seeds D	Rice impr oved seeds E		Ure a A.	DAP B	Minjin gu C	Maize improved seeds D	Rice improv ed seeds E
V8. If the person did use vouchers other than buying the stated good (urea, dap or minjingu, seeds), what did the person do with them (answer it for each person). If you answer 3, go to V9, if you answer either 4 or 5 go to V11, if you answer others go to next crop or V12: 1=She/he returned it, 2=She/he gave them away, 3=She/he used it for other agricultural production than maize/rice, 4=She/he used it to buy the other "voucher" goods (fertilizer/seed), 5=She/he used it to pay for other purchases or sold it, 6=others (specify)						V8a					
1)											
2)											
3)											
4)											
5)											
V9. If the person used it for agricultural production, for what agricultural products did she/he use it? 1=Coffee, 2=Cashewnuts, 3=Tobacco, 4=Other crops (specify)						V9a					
1)											
2)											
3)											
4)											
5)											
V10. If the person used voucher for other products, why did she/he do? 1=voucher was delayed, 2=it brings more income, 3=these products are not important for this place; 4=others (specify)						V10 a					
V11. If the person used it for other purchases or for resale, how much did the person get per voucher? ('000 TSH) (state the value for each person)						V11 a					
1)											
2)											
3)											
4)											
5)											
V12. A. Did you hear that people sold vouchers to other people? (1=yes, 2=no) B. If yes, was it many (1=many; 2=some; 3=few)						V12 a	A		B		
							<input type="text"/>		<input type="text"/>		

Go to next year.

Go to nex year

2010/11

V3b. Were any household members selected for the voucher in this year? (1=yes; 2=no) If no, go to next year.	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; width: 100px; height: 30px; margin-right: 10px;"></div> <div> 1= Yes 2=No </div> </div>				
	Urea A	DAP B	Minjingu C	Maize improved seeds D.	Rice improved seeds E.
V4ab. If yes in V3, select input type they received voucher (1=yes; 2=no).					
V4bb. If yes in V4a, who were selected? (list ID No. from A1), for each input select 1=yes; 2=no)					
1)					
2)					
3)					
4)					
5)					
V6b. What was the subsidy value per voucher each selected person received (*000 TSH)?					
V7b. Did the person use it for either maize/rice production ? (1=yes, 2=no) If no, go to V8b. If yes, go to V12b. (answer it for each person)					
1)					
2)					
3)					
4)					
5)					
V8b. If the person did use vouchers other than to buy the stated good (urea, dap or minjingu, seeds), what did the person do with them (answer it for each person). If you answer 3, go to V9, if you answer either 4 or five go to V11b, if you answer others go to next crop or V12b: 1=She/he returned it, 2=She/he gave them away, 3=She/he used it for other agricultural production than maize/rice, 4=She/he used it to buy the other “voucher”goods (fertilizer/seed), 5=She/he used it to pay for other purchases or sold it, 6=others (specify)					
1)					
2)					
3)					
4)					
5)					

2009/10

V3c	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; width: 150px; height: 30px; margin-bottom: 5px;"></div> <div> 1= Yes 2= No </div> </div>				
	Urea A.	DAP B.	Minjingu C.	Maize improved seeds D	Rice improved seeds E.
V4ac					
V4bc					
V6c					
V7c					
V8c					

2010/11						2009/10					
V9b. If the person used it for agricultural production, for what agricultural products did she/he use it? 1=Coffee, 2=Cashewnuts, 3=Tobacco, 4=Other crops (specify)						V9c					
1)											
2)											
3)											
4)											
5)											
V10b. If the person used voucher for other products, why did she/he do? 1=voucher was delayed, 2=it brings more income, 3=these products are not important for this area; 4=others (specify)						V10c					
V11b. If the person used it for other purchases or for resale, how much did the person get per voucher? ('000 TSH) (state the value for each person)							V11c				
1)											
2)											
3)											
4)											
5)											
V12b. A. Have you hear that people sold vouchers to other people? (1=yes, 2=no) B. If yes, was it many (1=many; 2=some; 3=few)					A <input type="text"/>	B <input type="text"/>	V12c	A <input type="text"/>		B <input type="text"/>	

Go to next year.

If the person used the voucher to buy fertilizer or seeds,

	2012/1 3 (A)	2011/ 12 (B)	2010/ 11 (C)	2009/10 (D)	2008/9 (E)
V13. Where did the person buy them? 1=in the village; 2=in the district town; 3= other, specify					
V14. Did the person receive any technical advice on how to use any of these three inputs? (1=yes; 2=no)					
V15. If yes in V14, who gave technical advice? 1=government, 2=Cooperative/primary society; 3=Donor or other publicly funded project, 4=Processing company; 5=Farmers's group; 6=private; 7=others					

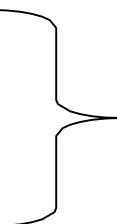
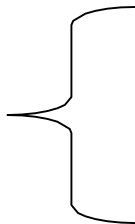
V16. If the selected person did not buy inputs when they were selected for the voucher, why they did not buy inputs? (multiple answers possible)	
I wanted to buy inputs, but: 1=I did not have cash and did not have anybody / credit organizations to lend me money to pay top-up 2=I did not have cash and did not want to take credit to pay top up 3=I did not have cash and could not take credit to pay the top up; 4=I did not have cash and could not find credit to pay the top up;	<div></div>
I did not want to buy inputs, for: 5=I don't think putting this amount of fertilizer will increase the yields sufficiently to be profitable 6=I don't think the maize or rice prices will be high enough to pay back the investment 7=If the weather is bad, I won't be able to pay back the loan 8=The top up price was too high 9=There was not good agro-dealers in the village 10=There was not good administration of vouchers in the village 11=I had already planted my crops 12=I had already put fertilizer on my crops 13=there was not sufficient guidance on how to use the package best 14=others ... specify	

V17. If you have received voucher, did input voucher increased your agricultural production? (1=yes; 2=no)

V18. If you have received voucher, did input voucher improved your life? (1=yes; 2=no)

V19. If yes in V18, what did it improve? (1= house improved; 2= food increased; 3=things in the house bought (specify things); 4=helped children to go to school; 5=others (specify))

V20. What is the problem of voucher programme, e.g. corruption, favouritism, etc.? Your opinion about input voucher.



H. FARM INPUTS

How much of various inputs did you use and buy for the production of **last year (2011-2012)**'s crop?

[illegible]

How much of various inputs did you use and buy for the production of **this year (2012-2013)**'s crop?

[illegible]

I. LIVESTOCK PRODUCTION AND SALES

I1. Did your household have any livestock during any period last year (2012)?

1= yes
2=no

If NO, go to animal product section. IF YES, how many animals does your household own now and last year (2012)?

	D. Number now	A. Number 1 year ago (Feb. – Mar. 2012)	B. Acquisitions since Feb. - March last year				C. Diminishments since Feb. - March last year				
			(1) # bought	(2) Total spent (‘000 Tsh)	(3) # born	(4) # obtained as gift or by exchange of labour or other goods or services	(1) # sold.	(2) Total payment received(‘000 Tsh)	(3) # killed for cons.	(4) # given as gift or in exchange of labour or other goods or services	(5) # died /stolen
I2. Draft bullocks or oxen											
I3. Cows and male cattle											
I4. Goats/sheep											
I5. Pigs											
I6. Horses mules donkeys											
I7. Poultry (chicken, ducks, turkeys, guinea fowl)											
I8. Rearing fish											
I9. Others (specify)											

Production of animal products over the past year (since last Feb. - March (in 2012)):

H10. Did your household produce any animal or bee products last year?

(1=yes, 2=no).

	A. Did your household produce any of the following animal products 1=yes; 2=no	B. Total production last year	C. Unit	D. Quantity sold last year	E. Value of sales (‘000 Tsh)
I11. Milk					
I12. Cheese, butter, yoghurt					
I13. Honey					
I14. Meat (Beef, goat/sheep, pork) (from animals slaughtered)					
I15. Eggs					
I16. Caught fish (processed, stored)					

Unit code

1=kg
2=liter

3=100kg bags
4=20kg tins
5=5kg tins

6=bunch (specify weight in
front)

7=root bag (specify weight in
front)

8=cups (specify weight in
front)
9=piece

J. HIRED FARM LABOUR

J1. Did you hire workers for the farm for last year's (2011 - 2012) crop? If yes, go to J2. If no, go to next section.

☐ 1=yes
☐ 2=no

[illegible]

K. PROCESSING OF FARM PRODUCTS

K1. Have you processed any farm products from crops/other plants **during the past twelve months (since March 2012)** (beer, butter, vegetable oil,...)

... (1=yes; 2=no)?

If no, go to next section.

	A0. During the past twelve months list all products made from crops and other plants by household members (beer, shea butter , vegetable oil, etc) (see codes in last column)	A. Total production last year		B. Total amount sold	C. Total sales last year '000 Tsh	D. Total cash production expenses during last year (tools, containers, labour, etc.) '000 Tsh
		A1. unit	A2. amount			
K2.						
K3.						
K4.						
K5.						
K6.						
K7.						

Product codes (A0)	Production unit code (A2)
1=beer/wine/strong drink	1=kg
2=maize or rice flour	2=liter
3=yam or cassava flour	3=100kg bags
4=oil	4=20kg tins
5=prepared/cooked food	5=5kg tins
6=other, specify	6=bunch (specify weight in front)
....	7=other (specify weight in front)

L. MARKETING OF CROPS

L1. Did you sell any of the products you produced last year (2012)? (1=yes, 2=no)

If no, go to the next section. If yes, we would like to ask you during which period of the year you sold the harvest of your two main products (e.g. maize, beans, bananas, rice, simsim..., except coffee and cashew nuts) **Note to enumerator: if any crops were sold, this section should be filled out (cross-check with G54F in page 12)**

	A0. Use crop codes from page 16	A1. When was most of the crop harvested? (1=Jan;2=Feb; ...; 12=Dec)	A2. When did you sell most of your crop? (1=jan;2=feb ; ...; 12=dec)	A3. How much did you sell them?		A4. What was the total value for which you sold it ('000 Tsh) ?	A5. Where did you sell it?		A6. Whom did you sell it to? (specify code from below)	A7. Why did you sell then? (code below)	
				(a) Unit (see below)	(b) Amount		(a) 1=at home 2=at the market 3=collection center	(b) Distance from home (kms)		(a) 1 st reason	(b) 2 nd reason
L2.											
L3.											
L4.											
L5.											
L6.											
L7.											
L8.											
L9.											
L10.											

Unit code (A3)

1=kg
2=liter
3=100kg bags
4=20kg tins
5=5kg tins
6=bunch (specify weight in front)
7=root bag (specify weight in front)
8=cups (specify weight in front)
9=pieces

10=other (specify)_____

Whom sold to? (A6)

1=private person
2=retail trader
3=wholesale trader
4=farmers's group
5=cooperative
6=other, specify

Main reason why sold then? (A7)

1=I needed cash immediately
2=I do not have storage place
3=The harvest deteriorates quickly after harvest.
4=I don't have transport to bring the goods to the market.
5= Traders only come now.
6=I did not expect to get a better price.
7=other, specify

M. EXTENSION

M1 Have you participated in the farmer field school program? _____

(1=yes,2=no) If no go to M3.

M2 If so, why? _____

(1=they address our needs; 2=I learn a lot about crops of interest to me;

3= they are very knowledgeable; 4=it is cheap; 5=we asked them to come)

M3 Have you consulted with extension agents in the last year (2012) beyond the farmer field school (1=Yes; 2=No) _____

M4. If no in M3, go to the next section. If yes, for which crops have you consulted an extension agent in the last year? (use crop codes from Section XXX)	M5 On what activities was the advise? 1=Cultivation 2=Pruning 3=Weeding 4=Harvesting 5=Washing and processing 6=Others	M6 Have you followed the advice given 1=yes; 2=no	M7 What was the main source of extension? _____ 1=Government 2=Cooperative/primary society-; 3=Donor or other publicly funded project 4=Processing company; 5=Farmers's group; 6=private; 7=others
Crop 1			
Crop 2			
Crop 3			
Crop 4			
Crop 5			

Crop codes	4=banana	10=yams	16=pumpkin	22=peas	28=tobacco	34=others
1=maize	5=millet	11=sweet potatoe	17=carrottes	23=castor oil		
2=beans	6=sorghum	12=Irish potatoe	18=sweet pepper		29=cashew	
3=coffee	7=wheat	13=groundnuts		24=sugar cane	30=sunflower	
	8=rice		19=cabbage	25=papaya	31=avocado	
		14=onions	20=other vegetables	26=other fruit	32=paprika	
	9=cassava	15=tomatoes	21=simsim (sesame)	27=others, specify	33=soya beans	

P1. Does any member of your household belong to some institutions like SACCO, ROSCA or VICOBA (1=yes, 2=no)	
P2. If you borrowed money, how much money did you borrow for buying inputs (‘000 TSH)?	
P3. For how many months have you borrowed the money?	
P4. How many outstanding loans do various members of your household have now (including those from previous years? (number)	
P5. What is the total amount of loans your household owes now? (‘000 Tsh)	
P6 How much interest do these loans have per year (‘000 Tsh)?	
P7. Have you given out any loans to other people? (1=yes, 2=no)	
P8. If yes, what is the total amount of loans you have given out to other people now? (‘000 TSH)	
P9. How much (average) interest do you collect on these loans per month? (‘000 TSH)	

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T. MAJOR SHOCKS AND OTHER TEMPORARY EVENTS THAT NEGATIVELY OR POSITIVELY AFFECTED THE HOUSEHOLD'S LIVING CONDITIONS IN the past 4 years

SHOCKS ARE EVENTS THAT OCCUR SUDDENLY. THEY GENERALLY DO NOT LAST FOR MORE THAN A FEW DAYS OR WEEKS. THE CONSEQUENCES OF SHOCKS (E.G. LOSS OF ASSETS, OR LACK OF FOOD) MAY BE FELT FOR A LONG PERIOD OF TIME.

In the past 4 years (since last survey in 2009) have the living conditions of your household been negatively or positively been affected by any of the following [SHOCKS]?

ID		In which years did the last two shocks occur?			
		(1) Year 1		(2) Year 2	
1	Major harvest losses due to wild animals, birds, livestock, insects, pests				
2	Fire/house burnt down				
3	Theft of household assets				
4	Unemployment from paid job				
5	Loss of livestock (death, theft, illness; NOT SALE)				
6	Eviction, loss of land (NOT SALE), e.g. following divorce, ...,				
7	Substantial post harvest maize loss				
		(a) ID No. of the household member from A1	(b) Year	(a) ID No. of the household member from A1	(b) Year
8	Major illness not resulting in family member				
9	Death of household member				
10	Death of person outside of household who provided important financial support				
11	Divorce				
12	Inheritance				
13	Other (specify)				

F. POVERTY SCORECARD

1. How many household members are 17-years-old or younger? 1= Four or more
2= Three 3= Two 4=One
5=None
2. Do all children ages 6 to 17 attend school? 1=No 2=Yes, or no children aged 6 to 17
3. Can the female head/spouse read and write? 1=No
2=Yes, but not in Kiswahili nor English 3=No female head/spouse
4=Yes, only in Kiswahili
5=Yes, in English (regardless of others)
4. What is the main building material of the floor of the main dwelling?
1=Earth 2=Concrete, cement, tiles, timber, or other
5. What is the main building material of the roof of the main dwelling?
1=Mud and grass
2=Grass, leaves, bamboo
3=Concrete, cement, metal sheets (GCI), asbestos sheets, tiles, or other
6. How many bicycles, mopeds, motorcycles, tractors, or motor vehicles does your household own?
1=None
2=One
3=Two or more
7. Does your household own any radios or radio cassettes?
1=No
2=Yes
8. Does your household own any lanterns?
1=No
2=Yes
9. Does your household own any irons (charcoal or electric)?
1=No
2=Yes
10. How many tables does your household own?
1=None
2=One 3=Two
4=Three or more

H. Household Consumption Expenditure

A. FOOD, BEVERAGES AND TOBACCO

On	Household Members		Visitors			
	(1) Adults	(2) Children	(3) Adult	(4) # days	(5) Children	(6) # days
(A) Male						
(B) Female						

How much of each of the following food items has the household (including meals prepared for visitors) consumed over the past 7 days. Enumerators - let wife assist as she may be more familiar with food consumption than the man.

Item Description	Code	Total amount consumed	Unit of Qty 1=kg, 2=liter, 3=pieces, 4=gram, 5=other	Purchased (incl. food bought while temporarily away from home by household members and visitors over past 7 days.		Consumption out of home produce	Obtained as gift
				Qty.	Value (TSH)		
(1)		(2)	(3)	(4)	(5)	(6)	(7)
Banana	101						
Maize (grains)	102						
Maize (cobs)	103						
Maize (flour)	104						
Beans (dry)	105						
Rice	106						
Millet/sorghum	107						
Bread	108						
Sweet Potatoes (Fresh)	109						
Casava(Fresh	110						
Cassava(Dry/Flour)	111						
Irish Potatoes	112						
Beef	113						
Pork	114						
Goat/sheep meat	115						
Other meat	116						
Chicken	117						
Fresh Fish	118						
Dry/Smoked fish	119						
Eggs	120						
Fresh Milk	121						
Cooking oil	122						
Margarine,Butter, etc	123						
Fruits	124						
Onions	125						
Tomatoes	126						
Cabbages	127						
Peas	128						
Spinach	129						
Other Vegetables	130						
Groundnuts	131						
Sugar	132						
Cooking oil	133						
Coffee	134						
Tea	135						
Salt	136						
Soda/soft drinks/ juice	137						
Beer local	138						
Beer commercial	139						
Cigarettes	140						
Other Tobacco	141						
Restaurant exp on food Food	142						
Restaurant exp on drinks	143						
Spices	144						
Biting	145						
Others (specify)	146						

Part B: Non-Durable Goods and frequently purchased services (**During Last 30 days**)

Item	Code	Unit of Quantity 1=kg 2=liter 3=pieces 4=gram 5=other	Purchases		Home Produced		Obtained as gift	
			Quantity	Value ('000sh)	Quantity	Value ('000sh)	Quantity	Value ('000sh)
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)
Household expenditures								
Rent of rented house	201							
Maintenance and repair expenses	202							
Water	203							
Electricity	204							
Paraffin (kerosene)	205							
Charcoal	206							
Firewood	207							
Others	208							
Personal care								
Matches	210							
Washing soap	211							
Bath soap	212							
Tooth paste	213							
Cosmetics	214							
Handbags, travel bags etc	215							
Batteries	216							
Newspapers and magazines	217							
Others	218							
Transport& communication								
Tyres, Tubes, spares, etc.	220							
Petrol, diesel etc.	221							
Taxi and/or bus fares	222							
Stamps, envelopes, etc	223							
Air time & service fee for mobile phones	224							
Expenditure on fixed phones	225							
Others	226							
Health expenditures								
Consultation Fees	230							
Medicines etc.	231							
Hospital/Clinic charges	232							
Traditional doctors fees/medicines	233							
Others	234							
Other service								
Sports, theaters etc	240							
Dry Cleaning and Laundry	241							
Houseboys/girls, Shamba boys etc.	242							
Barber and beauty shops	243							
Expenses in hotels, lodging places	244							
Milling expenses	245							

Part C: SEMI-DURABLE AND DURABLE GOODS AND SERVICES (During Last 365 days)

Item Description	Code	Purchases Value ('000 TSh)	Free (obtained as gift) Value (‘000 Tsh)
(1)		(2)	(3)
Clothing			
Men's clothing	301		
Women's clothing	302		
Children's wear	303		
Clothing Material and tailoring	304		
Men's Footwear	305		
Women's Footwear	306		
Children's Footwear	307		
Other Footwear and Repairs	308		
Furniture, Carpet, Furnishings etc			
Furniture Items (chairs, sofas, tables, beds, cupboards, chest of drawers, wardrobes, book cases)	401		
Carpets, Mats, etc.	402		
Curtains	403		
Bedding Mattresses	404		
Blankets and bed sheets, etc.	405		
Mosquito nets	406		
Insecticide for mosquito nets or spraying the compound	407		
Other and Repairs	409		
Household Appliances and Equipment			
Electric iron/Kettles/cooking pots etc.	421		
Charcoal and Kerosene stoves	422		
Electronic gas/stoves	423		
Water heater	424		
Electronic Equipment (TV, dish antenna, decoder, etc.)	425		
Radio/cassette player/stereo equipment	426		
Computer/printer	427		
Bicycles	428		
Motorcar, pick-ups, etc.	429		
Motor cycles	430		
Phone Handsets (Both Fixed and Mobile)	431		
Refrigerator/freezer	432		
Other equipment and repairs	433		
Jewelry, Watches etc.	434		
Glass/Table Ware, Utensils & Electric goods			
Plastic Basins	441		
Plastic plates/tumblers	442		
Jerry cans and Plastic buckets	443		
Enamel and metallic utensils	444		
Switches, plugs, cables, bulbs etc	445		
Others and repairs	449		
Education			
Schools fees including PTA	601		
Boarding and Lodging	602		
School uniform	603		
Books and supplies	604		
Other educational expenses	609		
Other services			
Expenditure on household functions	801		
Insurance Premiums	802		
Other services N.E.S.	809		

E. HOUSEHOLD ASSETS				
	A. Number owned today	C. If sold today, how much they are worth in total ('000Tsh)?	D1. How much did the household spend (‘—000 Tsh) for purchase of the following items during last year (2012)?	D2. How much did the HH spend (‘- 000Tsh) for repair of the following items during last year?
Consumer durables				
F18. Radio/cassette player/stereo equipment				
F19. TV set/video				
F20. Dish antenna/decoder				
F21. Telephone fixed				
F22. Cell phone				
F23. Computer/printer				
F24. Refrigerator/freezer				
F25. Sewing machine				
F26. Chairs				
F27. Sofas				
F28. Tables				
F29. Beds				
F30. Cupboards, chest of drawers, boxers, wardrobes, bookcases				
F31. Electric gas/stove				
F32. Other stove				
F33. Water heater				
F34 Books (not school books)				
F35 Watch				
F36 Canoe				
F37 Bicycle				
F38 Motor vehicle				
F39 Motor bike				
Production tools				
F61 hoe** ⁶⁷				
F41 Wheel barrow				
F42 Plough for animal traction.				
F43 Tractor				
F44 Trailer for tractor, harvester/reaper, plough for tractor, harrow				
F45 Sprayer and/or fogger				
F46 Water pumping set				
F47 Milking machine				
F48 Milling machine				
F49 Coffee pulping machine				
F50 Tobacco curing machine				
F51 Cashew machines				
F52 Incubator				
F53 Fishing net and other fishing equipment				

⁶⁷ ** Indicates that the item was not included in the first or second round

	A. Number owned today	C. If sold today, how much they are worth in total ('000Tsh)?	D1. How much did the household spend (‘—000 Tsh) for purchase of the following items during last year (2012)?	D2. How much did the HH spend (‘- 000Tsh) for repair of the following items during last year?
F54 Beehives				
F55 Sugar cane processing machine				
F56 Irrigation Pump* ⁶⁸				
F60 Power tillage**				
Buildings				
F57 Storage building for agric products				
F58 Tobacco curing hut				
F59. Animal shed				

D NON-CONSUMPTION EXPENDITURE

Items Description	Code	Value during last 12 months ('000Tsh)
(1)		(2)
Taxes and duties paid	901	
Pension and social security contribution	902	
Remittances, gifts and other transfers including title	903	
Contributions to funerals and other functions	904	
Others (like subscriptions, interest to consumer debts, etc)	909	

F60 Do you have any non-farm enterprise assets (**not** your house, land, consumer durables, farm equipment or non-farm equipment **mentioned above**)? (1=yes, 2=no) (A) _____

F61 If yes, and if sold today, is their total value? _____

1=less than 100,000 Tsh

2=between 100,000 and 250,000 Tsh

3=between 250,000 and 500,000 Tsh

4=between 500,000 and 1,000,000 Tsh

5=between 1,000,000 and 2,000,000 Tsh

6=between 2,000,000 and 5,000,000 Tsh

7=over 5,000,000 Tsh

F62 Did you acquire any of these non-farm enterprise assets (**not** your house, land, consumer durables, farm equipment or non-farm equipment **mentioned above**) during the past four years (1=yes; 2=no)? _____

F63 If yes, how much did you pay in total ('000 TSH)? _____

We would like to thank you very much for your time and cooperation.

⁶⁸ * indicates that the item was not included in the first round.

Appendix 4. Village survey questionnaire

Panel survey for Ruvuma 2013

Village Questionnaire (February – March 2013)

(to be answered by village committee/council or focus group of knowledgeable villagers)

Date of interview: _____ day _____ month

	District	Ward	Village
Name			
Code			

Alama ya Wilaya

1=Songea vijijini
2=Tunduru
3=Mbinga
4=Namtumbo
5=Songea mjini

Alama ya kijiji

1= Mlete
2= Muhukuru barabarani
3=Morogoro
4=Madaba
5=Sisi kwa sisi
6=Namiungo
7=Namakambebe
8=Tuwemacho
9=Chiungo
10=Angalia 1
11=Mcheshi
12=Wenje
13=Mchotekari
14=Mbesa
15=Kitanda
16=Nampungu
17=Namakungwa
18=Litorongi
19=Lipumba
20=Mkwaya
21=Ndondo
22=Chiulu/Chiula

23=Kingeriti
24=Kibandai A
25=Mango
26=Langiro asili
27=Mahenge
28=Tukuzi
29=Ulolela
30=Kipololo
31=Mpepai
32=Kitura
33=Ligera

34=Mlilayoyo
35=Naikesi
36=Likuyu/Sekam
anga

Note – codes for ward and village are the same

	Name
Enumerator	
Supervisor	
Data enterer	

Note to Enumerator – please use following codes throughout the questionnaire

99= respondent does not know, does not remember or refuses to answer, but the answer is not necessarily zero

88=not applicable (question irrelevant for the respondent)

Information about Village Respondents

May we please ask you a few questions about yourselves before we start the interview?

A1. How many people are present in the meeting? _____

A.2.A. Is the village chairman present? _____ (1=yes; 2=no)

If no, go to A3. B. how many years served as chair _____

A.3 A. Is village executive officer present? _____ If no, go to A4.

B. Years served as Mtendaji ya kijiji (village executive officer) _____

A.4 Number of other elected officials present _____

~~A.5~~ How many people present have completed: A. no formal schooling

_____ B. some primary _____ C. primary _____ d. some secondary _____

e. form IV _____ f. form VI _____

A.5. How many people live in the village now? _____

(incl. those temporarily away)

A.6 How many households live in the village?

A7. Out of which how many farmer households?

Geographical and agro-ecological information about the village

[illegible]

B7. Rainfall received in parcel last year compared to normal in past (1=much above normal; 2=somewhat above normal; 3=around normal/average; 4= somewhat below normal; 5=much below normal) ____

B8. In which year and how did the irregular rainfall affect since March 2009? (1=much affected; 2=affected; 3=average, 4=not affected)

	2012/13	2011/12	2010/11	2009/10
Heavy rainfall				
Rain did not come timely				
Drought				
Flooding				
Hailstorm				

B9. How many households in the village grow maize? (1=most of the households, 2=half of the households, 3=a few households, 4=none) _____

B10. How many households in the village grow rice? _____

B11. Which crop most of the households grow in the village? (1=maize, 2=rice, 3=coffee, 4=cashew nuts, 5=tobacco, 6=others (specify)) _____

B12. What is the distance to the nearest town (km)? _____

B13. How many hours does a truck take to go to the nearest town during the dry season? Hours A _____
Min B _____

B14. How many hours does a truck take to go to the nearest town during the rainy season? Hours A _____
Min B _____

Socio-economic information about the village

Is there a in the village?	A. 1=yes 2=no	B. If yes, did services start since 1= last year 2= bw 2 and 5 years ago 3= > 5 yrs ago	C. If no, distance to nearest similar facility?		
			1. In km	2. In minutes (usual mode of transport).	3. Code 1=foot 2=bicycle 3=motorcycle 4=public transport (bus, taxi) 5=private transport (car, truck)
C1. Bore hole for water					
C2. Village well					
C3. Public water tap					
C4. Market to buy crops					
C5. Market to sell food					
C6. All weather road (tarmac)					
C7. All weather road (gravel)					
C8. Electricity					
C9. Possible to receive cell phone					
C10. Bus service to nearby town?					
C11. Village bank or other formal credit society or association					
C12. Agricultural Extension agent					
C13. Veterinary service					
C14. Sales point for agricultural inputs (fertilizer, seeds,...)?					
C15. Primary society					
C16. Warehouse Receipt System					

C19. Solar					
C20. Others (taja)					

C17. Is there tractor in the village? (1=yes, 2=no) _____

If yes, how many tractors are there in the village? _____

C18. Is there truck in the village? (1=yes, 2=no) _____

If yes, how many trucks are there in the village? _____

D16 Collapse in remittances								
D17 Epidemic (malaria, cholera, ...)								
D18. Pest./insect attacks								
D19 Animal disease								
D20 Banditry/thefts								
D21 Others (Specify)								

D. Labor and input market information

We would like to ask you some questions on the daily standard agricultural wage rate for adults. Note that this rate should be the sum of the remunerations **received in cash as well as those received in kind**, i.e. the cost of non-cash wage items such as meals, part of the harvest, etc.? If compensation for hired labor is typically not expressed in daily wage rates, we would like to ask you how much it typically costs to perform a number of tasks and how many man days it typically takes. We would first like to ask you about the daily agricultural wage rates for adults.

Activities	(A) Unit (1=Sh. /day, 2=Sh./ acre)	(B) Cultiva te	(C) Plantin g	(D) Weedi ng	(E) Cuttin g weeds	(F) Harves ting	(G) Prunin g
E.1 What was the adult agricultural wage rate last seasonyear (2011-2012) for each of the following activities (Tsh/day) ?							
1) Coffee							
2) Cashew nuts							
3) Tobacco							
4) Maize							
5) Rice							
6) Beans							
7) Cassava							
8) Others							

E.2 Did the agricultural daily wage rate increase compared to six years ago (2007)? _____
(1. increased much 2. increased a bit 3. about the same 4. decreased a bit 5. decreased much)

E.3 the total labor cost of preparing 1 acre of land **last year** and how long does it take on average A_ _____(Tsh) B____(days)

E.4 the total labor cost of weeding 1 acre of land **last year** and how long does it take on average A_____ (Tsh) B____(days)

E.5 What was on average the total labor cost of preparing 1 acre of land in the six **years ago (2007)** _____(Tsh)

E.6 Where does hired labor mostly come from?

(1=this village; 2=neighboring villages; 3=this district; 4=this region; 5=other regions; 6=outside Tanzania)?

E.7 During the peak season month for labour demand do some village members go to other villages _____ or town to work? (1=yes, 2=no)?

E. Marketing information

F1. What are the highest prices and lowest prices to sell and buy each crop? And which month was the highest and lowest price? And how many kilograms for the unit of crops?						
	Unit (Kg)	(1) To sell/ (2) To buy	Lowest price		Highest price	
			Price (Tsh.)	Month (number)	Price (Tsh.)	Month (number)
Maize (green)		(1)				
		(2)				
Maize (ripe)						
Rice		(1)				
		(2)				
Cassava (green)		(1)				
		(2)				
Cassava (ripe)						

F2. What is the market price of 1 bag of Urea and how many kg does it contain? A. _____ price
(TSH) B. _____ kg

F3. What is the top-up price for voucher of Urea last year? (Sh.) _____ (kilo)

F4. What is the market price of 1 bag of DAP and how many kg does it contain? A. _____ price
(TSH) B. _____ kg

F5. What was the top up price of 1 bag of DAP last year? _____

F6. What is the market price of 1 bag of Minjingu and how many kg does it contain? A. _____ price
(TSH) B. _____ kg

F7. What was the top up price of 1 bag of Minjingu last year? _____

F8. What is the market price of 1 bag of maize improved seeds? _____

F9. What was the top up price for voucher of 1 bag of maize improved seeds last year? _____

F10. What is the market price of 1 bag of rice improved seeds? _____

F11. What was the top up price for voucher of 1 bag of rice improved seeds last year? _____

F12. How many input-dealers are there in the village? _____

F13. At the sales point for agricultural inputs mentioned in C13, is fertilizer typically physically available when needed (1=yes; 2=no)? _____

F14. How many different traders/companies visited the village last year to buy **maize**? _____

F15. How many different traders/companies visited the village last year to buy **rice**? _____

F16. How many different traders/companies visited the village last year to buy **coffee**? _____

F17. How many different traders/companies visited the village last year to buy **cashew nuts**? _____

F18. How many different traders/companies visited the village last year to **sell inputs**? _____

Thank you so much for time and your collaboration.

Appendix 5. Methodology of ordering and weighting panel data

1. Ordering panel data

In Round 3, there are 839 household records from 892 households. 691 households gave data on household members / guests. Only 675 households have individual data and 637 households have all food consumption and selected semi-durable goods consumption, non-durable goods consumption data. I only use these. In Round 3 data, 19 households have reported more than one household head. I took the oldest reported member as head of these households. I corrected the extreme outlier consumer unit price more than median prices (30 cases). I corrected the extreme outlier amount consumed per adult equivalent 20 times more than the median amount; in most cases, they had a miscoded unit of consumption. I corrected the median price of non-durable goods and frequently-purchased services 20 times more than median prices. Most of these cases were due to the misspecification of a unit amount. Pan and Christiaensen (2010) suggested that they utilised a regional median price for calculating the purchased price of non-durable goods and frequently-purchased services but I checked the unit price of each item carefully and therefore used the reported unit price of each household.

For the first analysis, I used the same methodology as with the Household Budget Survey (HBS), excluding the same non-food items from the calculation for the total household consumption. For some frequently-purchased services, such as houseboys/girls, barber and beauty shops and expenses in hotels, some households have a high expenditure per adult equivalent, which I leave for later analysis of the share of whole consumption expenditure of these households. I used food CPI to adjust the time difference: $147.6 \text{ (June 2007) to } 196.0 \text{ (March 2009)} = 1.3279$ from NBS website (CPI summary from 2002 – 2010).

For the poverty line calculation, I used the food poverty line and basic needs poverty line for rural areas. Therefore, I did not use the Fisher Index, as the HBS 2007 has no Fisher Index for the regions but only for Dar es Salaam and other urban and rural areas⁶⁹. Pan and Christiaensen (2010) used the median for the number of guest visit days but I used participants' own data. Pan and Christiaensen used the threshold age of becoming adult as 19 but in my own survey I considered it to be 17. They also used the mean average weight of sample age/sex group for the purposes of calculation, whereas I used each household weight.

In Round 3, there were only data from 194 heads of household (households) as to whether they received vouchers or not. 144 households reported that they had received vouchers while 50

⁶⁹ URT (2009a) *Household Budget Survey 2007* Dar es Salaam: MoFEA and NBS: MoFEA, NBS.

households reported that they had not. I took the 144 households for Round 4 as recipient households, and picked randomly from other households on the panel to represent non-recipient households, by 1.5 times of recipient households from the same villages. I dropped three villages (one village in Tunduru and two villages in Mbinga) where no households reported that they had received vouchers in Round 3. I will look at the household / village characteristics of these villages later. I surveyed 349 households in 33 villages in Round 4.

There were high ratio of households (494 households out of 688 households = about 72% of the households responded) who said that they were not applicable for voucher receipt that I treated the households who declared themselves non-applicable as non-recipients. I only sampled 25 households among the households who reported as non-recipients in Round 3 and added other 80 households as non-recipient households. I will also look into the characteristics of the dropped 25 households who reported as non-recipients in 2008/9.

Among these 349 households, only 309 households have all the food, semi-durable goods and frequently-purchased items and non-durable goods consumption data in both rounds. These households compose my panel sample. The voucher receipt experiences of my panel sample households during the period of both rounds are shown in Chapter 5.

Here I have to reiterate that my panel sample households are over-represented in the Mbinga and Tunduru districts where cash-crops (coffee and cashew nuts) are cultivated, as cash-cropping households were the focus of the study by the World Bank/FAO. In Mbinga in particular 40% more than the population ratio cultivates these crops. Meanwhile, Namtumbo is under-represented by 54%. This over-representation might negatively affect the analysis of the impact of voucher receipt on the maize yield of my panel sample households; however, as regards its impact on income poverty, it might skew the results towards showing a higher impact if the respondents in question used vouchers for growing cash crops to increase cash income. I will control the districts in the regression.

In Round 3 data, only 76 households have data for non-durable goods and frequently-purchased services for poverty estimates according to the methodology of HBSs. If we make a panel sample, only 41 households (32 households were recipients plus 9 households were non-recipients in Round 4) have non-durable goods consumption data in Round 3. As these numbers are so small compared to the number of the total panel sample (322 households), I only attempt to calculate the food poverty line compared with the national poverty line.

2. Weighting panel data

As the panel household distribution is skewed toward cash-growing regions, in the analysis sample weighting was made with the indices as shown in the following table:

Table 5.1. Sample weight indices

	Census: Agricultural households in 2011/12	Census: Agricultural households in rural villages	Ratio of Agricultural households to region total (%)	Ratio of panel sample to region total (%)	Over- sampled	Weight to be made
Songea District	32,983	30,410	15.41	16.18	0.83	1.21
Songea Municipality	37,025	8,072	4.09			
Mbinga District	85,811	79,375	40.23	51.46	1.28	0.78
Namtumbo District	33,633	31,414	15.92	8.41	0.53	1.89
Tunduru District	53,299	48,022	24.34	23.95	0.98	1.02
Total	242,751	197,292	100.00	100		

Appendix 6. Strategic guideline for implementation and procedure for NAIVS for 2011/12⁷⁰

Ministry of Agriculture, Food and Cooperatives
18, Oct. 2011

Re: Strategic guideline for implementation and procedure to use voucher for Agricultural input subsidy for 2011/12

1. Government budgeted 119.97 Billion Tsh. for 2011/12. It is for distributing inputs for 1,8 million households in 96 districts in 20 regions, which shows below Attachment No.1

3. Target for Process of voucher

- (i) Subsidy would arrive in time to the households which were determined by VVC, Village government and Village assembly.
- (ii) Assure correct way of use of improved seeds and fertilizer to increase production, food security and income for farmers.
- (iii) Assure that each District develops correct data of no. of target farmers and voucher distribution in each village.
- (iv) Increase capacity of openness and use of agricultural inputs of District, Ward and village to strengthen delivery of inputs and to give training of agricultural technique to farmers on correct use of agricultural inputs.
- (v) To connect agro-dealers with NMB to pay loan to buy agricultural inputs
- (vi) To put system of agro-dealers to be paid through NMB after they sell inputs to farmers through vouchers

4. Issues to consider

To increase efficiency on execution of plan of agricultural input subsidy through voucher, the following issues are to be considered:

- (i) To create VVC which would determine beneficiary households and monitor closely that inputs be delivered to the target farmers and that be used correctly to increase production
- (ii) All the Voucher committees do evaluation and create quarterly reports of implementation of plan of Agricultural input subsidies and distribution at each level.
- (iii) Agricultural inputs be delivered to the area whose use would increase production.
- (iv) Subsidies would be delivered to the households who have merit for 3 years' period. Beneficiary households of the past three years (2008/9 to 2010/11) cannot apply to the subsidy at 2011/12.
- (v) Households who have received input subsidy for 3 years and are prepared to buy rely on agricultural inputs are recommended to get loans through groups such as SACCOS, AMCOS or by sell their crops through Warehouse Receipt System.
- (vi) List of agro-dealers is given to Ministry of Agriculture before 28th October, 2011. After that date the request for its change should be made with explanation to Ministry and which is the last decision.
- (vii) After the vouchers are reached to the Regions, they would be delivered to the districts within 48 hours. And each District must assure that voucher be distributed to village within 3 days.
- (viii) To be prohibited to transfer voucher from one district to another without approval of Ministry.

5. Funds for supervision

District government guarantees to separate budget for monitoring of plan of agricultural input subsidies as one activity of District. And, money for monitoring is given by Ministry of

⁷⁰ Author's translation from Swahili to English.

Agriculture on condition that it would be explained of receipt and use before the end of the fiscal year 2011/12.

6. Responsibilities of agro-dealers before being paid by Bank

After bringing inputs to farmers and receiving voucher, agro-dealers would do the following:

- (i) To prepare list of households who were given inputs and no. of vouchers per each input which is approved by VVC. Copy of the list is remained at the village.
- (ii) To entrust District livestock officer do verification and put records of households, voucher with form of verification of voucher of NMB and form which is established to put payment for the companies who distributed inputs.
- (iii) To entrust NMB to issue voucher and form verified by District livestock officer for payment.

7. Conclusion

This execution of the plan of subsidy is given openness and sustainability and be satisfied with procedure, agro-dealers achieve without change. If there is any problem in execution and monitoring of agro-dealers, steps to follow are to be made according to advice.

Attachment No. 2

1. Ministry of Agriculture, food and cooperatives Responsibility of Ministry

- Separate money for subsidies on Ministry's budget
- Prepare voucher with budget and put amount of voucher to regions according to the criteria
- Put report of voucher distribution for each region
- Give education of execution and monitoring of input subsidy to farmers to use different ways (publication, radio, magazine, public meetings, etc.) before and on the agricultural season
- Cooperate with NMB on accomplishment of use of voucher for delivery of input to farmers
- Give direction for creation of committee of monitoring of procedure of vouchers at region, district and village,
- Ascertain for farmers that procedure for voucher would be taken into account the criteria of criteria put
- Cooperate with PO-RALG on transfer vouchers at different levels which accomplishes provision of agricultural input subsidy to farmers according to the its procedure
- Ascertain that vouchers be ready and distributed to the village before the beginning of agricultural season

2. NVSC

NVSC is created by Ministry and meet each quarter of the year under its chairman and Primary secretary of Ministry. The members are:

- Minister of MAFC ---- Chairman
- Primary secretary of MAFC ----- Secretary
- Representative of Ministry of Finance, Economy and planning --- Member
- Representative of Office of Prime Minister-RALG
- Director of office concerned in MAFC
- Representative of Agricultural input companies
- Representative of Agro-dealers
- NMB
- Representative of farmers' group
- Representative of Community-based organizations

- Director of Assistant to agricultural input

Responsibilities of NVSC

- Prepare policy, guideline and direction with regard to execution of plan to use vouchers
- Arrange criteria for distribution of vouchers at the region with:
 - (i) Regions whose rain and soil are suited for maize and rice farming
 - (ii) Whole area is cultivated with maize and rice
 - (iii) Amount of maize and rice harvested
 - (iv) No. of households whose area is more than 1 acre for maize and rice farming
 - (v) Area used under irrigation (production of maize and rice)
- Recommend direction which is used by District on distribution of voucher to villages
- Ascertain for Voucher programme that it would be given money on time
- Evaluate report of execution and make revision if it is useless
- Ascertain for procedure of voucher openly and accomplish as government things intended
- Approve budget of programme for the year which is given by Ministry of Finance, Economy and Planning
- Approve reports of execution of each quarter of the year

3. RVC Members are:

- RC – Chairman
- RAS – Secretary
- Regional Agricultural Adviser –member
- Representative of each DVC directed by District council
- Representative of farmers' groups
- Representative from NMB

Caution; Chairman of RVC is able to invite organization or individual which are of use

Responsibilities of RVC

- Prepare estimation of needs of agricultural inputs (fertilizer, improved seeds and ?) and approved by secretary of NVSC
- Receive vouchers from MAFC and distribute at each district under security of Police
- Issue report of distribution of voucher at each district if it is with Ministry, DVC, WVC, and VVC, Input companies and agro-dealers.
- Ascertain that areas with irrigation method which is cultivated on giving vouchers
- Monitor and evaluate execution of procedure of voucher on schedule of visit each District
- Ascertain input to be used according to the guideline
- Evaluate data collected from District on production of food crops, especially maize and rice, area cultivated maize and rice, area with irrigation with no. of farmers who produce these crops
- Receive and arrange reports of execution and procedure of voucher and entrusted by MAFC.

4. DVC

Each district government involved with procedure of voucher creates DVC whose members are:

- DC – Chairman
- DED (District / Municipal/ city) – Secretary
- DAS (District / Municipal / City) – Member
- District councilor(s)
- Chairman of District government
- Representative from Farmers' group

- Representative from Agricultural input agro-dealers' association
- Representative from citizen's organizations
- Representative of Input company
- District agricultural / livestock officer
- District Community development officer
- Representative from NMB

Caution: Chairman of DVC is able to invite organization or individual which is seen as useful.

Responsibilities of DVC

- Receive vouchers of agricultural input from Regional commissioner and distribute to VVC
- Develop reports on distribution of voucher of agricultural inputs for each village if it is necessary with RVC, WVC and VVC
- Collect and pass reports of production of maize and rice, use of inputs and other reports concerned for each ward and village
- Select ward and village which profit from procedure of voucher (whose area has qualification of maize and rice production)
- Ascertain that cultivated area with irrigation method would be given on voucher distribution
- Use criteria which recognize the amount of voucher to be given for each village
- Monitor and evaluate execution and procedure of voucher whose schedule of visit to each ward and village
- Issue village government report on amount of voucher distributed and give direction for creation of VVC and criteria used for selection to committee members on commitment and procedures utilized
- Hold seminar for village government, VVC on giving instructions on aims and correct use of voucher on giving agricultural input subsidy
- Educate VVC on criteria for selection of beneficiary HHs and distribution of vouchers
- Select and confirm agro-dealers which give service to farmers on the following procedure:
 - 1) Agro-dealers request DVC to distribute inputs and announce village that they would be expected to distribute inputs
 - 2) Names of supplicants are sent to village assembly which asks opinion
 - 3) DVC confirms name of agro-dealer taking into account of opinions of village assembly
 - 4) DVC ascertains each village be given at least two agro-dealers
- Ascertain agro-dealers do business at ward or village
- Evaluate receipt of agricultural input at district which argues shortage in distribution of inputs
- Cooperate with CBOs, financial organizations and cooperative society for saving and loans for target of making farmers able to get loan to buy inputs
- Receive complaints concerned with execution of subsidy programme with voucher from ward and village and give to RVC for 2011/12 by using attachment No. 3
- Ascertain District Agricultural / livestock officer and to do reconciliation of agro-dealers in cooperation with NMB.

5. WVC

Each ward which benefits from execution of input subsidy programme creates WVC whose members are following:

- WEO – Chairman

- WAEO – Secretary
- Ward Councillor – member
- Community development officer
- Representative of farmers

Responsibilities of WVC

WVC will have big responsibilities of following up and monitoring execution of subsidy programme for voucher distribution at villages concerned.

6. Village level

VVC is created with 6 members which have 3 men/women who are not village government officers and whose criteria are:

- (i) Be model farmer at the village
- (ii) Be ready to monitor and give explanation on use of voucher and inputs to their farmers
- (iii) Have qualification of leader
- (iv) Be able to read and write

These 6 members are recommended by village government and proved by Village assembly. There chairman and secretary are selected. And agriculture officer is member at VVC.

Responsibility for VVC

VVC has the following work:

- Educate farmers on the criteria for selecting HHs and select beneficiary HHs with cooperation of Village/Ward Executive officer
- Develop cash book of HHs who satisfy criteria for receiving input subsidy, who received and would receive them through vouchers.
- Select HHs who are eligible and desire to receive vouchers with chairmen of hamlets which is approved by Village governments and Village assembly. Criteria for beneficiaries are:
 - (i) Follow the guideline of the village concerned
 - (ii) Have persisting work in the village and his/her prime activity is maize or rice farming
 - (iii) Household who have the area which could be harvested and in that area it can have 1 acre of maize or rice
 - (iv) Household don't have capacity to buy agricultural inputs from market price but have capacity to top-up
 - (v) Household which is headed by special groups, especially widows and disabled are given 1st priority.
 - (vi) Household have already signed to the agreement document with village government on correct use of agricultural inputs and execution of agricultural good practice⁷¹.

Look: Subsidy would be given to the households for 3 years' period

- Bring the list of households who would be beneficiaries for vouchers to the district and display copy at the announcement board at village
- Receive voucher, hold meeting openly and develop schedule with special time for distributing voucher to the targeted beneficiaries.

⁷¹ The author has not heard any such document.

- Agro-dealers and VEO plan special date for selling inputs through vouchers and voucher book be remained with VEO.
- Monitor use of agricultural inputs at beneficiaries.
- Bring reports of execution to village governments, village assembly, and VVC, and DVC.

Responsibility of HHs

- Prepare area which will be used to cultivate maize or rice
- Receive vouchers from VVC
- Use vouchers to buy agricultural inputs for intended aims
- Use inputs for good agricultural practices following the advice from Agricultural officers
- Write signatures to agreement document with village government on correct use of agricultural inputs and execution of good agricultural practices.

Caution: Not allowed to sell or exchange voucher of agricultural inputs and anything more than intended for inputs.

Others

(i) National Voucher Meeting

This meeting is held once in year to ascertain accomplishment of work of the passed year. And it will discuss and pass decision which relate to execution and efficiency of procedure of voucher of following year. This decision together with criteria used for voucher distribution matches with weather condition of the area concerned, voucher with amount of subsidy. And decision is concerned with evaluation of execution of voucher programme. Members of the meeting is coming from:

- National community service
- RAS
- District
- Private sector: Fertilizer company (3), Seed company (3), and Pesticide company (3)
- Farmers' group and CBO (3)
- NGOs (5)

Responsibilities of National meeting

- Establish report of execution of the passed year and suggest change or improvement for committee of operation
- Break down and pass criteria used to distribute vouchers at region and district
- Pass distribution of voucher to targeted region and district by using guidelines issued and procedure of voucher
- Discuss and pass suggestions of programme and budget for the year concerned.

(ii) Sector of Agricultural input

Responsibilities of sector of Agricultural input

- Secretary of NVC:
 - (i) Help Chairman of NVC and prepare for meetings of NVC
 - (ii) Write minutes of NVC
 - (iii) Prepare and develop various reports of inputs
- Monitor and evaluate execution of the project
 - (iv) Initiate system of evaluation and execution of the programme with separation from evaluation of MAFC
 - (v) Prepare and publish bid for preparing system of evaluation and take report related to the execution of the programme
 - (vi) In cooperation with Evaluation by District and connect report of execution of the programme
 - (vii) Monitor execution and evaluation of the work of the programme, results of the programme and success which comes from and goals which the programme helped
 - (viii) Prepare report of execution linked to character accepted at the programme

- Plan, arrange and accomplish work of the programme
 - (i) Prepare budget and annual work plan of execution of the programme
 - (ii) Connect agro-dealers for accomplishment of the work: develop estimate of the needs of inputs and distribution and prepare report from distribution of the region, district and village
 - (iii) Complete bid related to input delivery in time
 - (iv) Mobilize and educate on procedure of voucher
 - (v) Prepare specialists and adviser on completion of the programme related to presentation of instructions, monitoring and evaluation of execution
- Make District government to provide experts, data and reports of execution of the programme from National input committee
- Pass policy and aims of procedure of voucher like going together with aims of the programme
- Arrange and strengthen close relation and participants of procedure of voucher like NMB, AGRA, CNFA, IFDC, IDA, community organization, farmers' groups, and private organizations.
- Prepare report of examination of numbers in time and make report to treasury of World Bank
- In cooperation with tool of news at region, give instructions adequate to important points and use of vouchers
- Arrange actual needs, delivery, distribution and use of agro-inputs.

(iii) District Voucher stakeholder meeting

This meeting is held National Voucher stakeholder meeting twice a year. This meeting discusses work procedures, annual budget and report of district work.

Members of the meeting:

- Members of DVC
- Rep. from District government
- Rep. from RAS
- Rep. from private fertilizer company
- Rep. of private seed company
- Rep. from Agro-dealer association of agricultural input
- Rep. from NGOs
- Rep. from farmers' group

Responsibility of the meeting

- Study distribution of voucher in the villages which takes into account procedures planned by NVC
- Discuss and study recommendation of work plan and annual budget of National Voucher stakeholder committee at District level
- Pass report of work and provide recommendation for NVC.

(iv) Complaints and solutions

Levels of regions, districts, wards and village do procedure of receipt and are occupied with complaints concerned execution of plan of agricultural input subsidy in the areas where they manage following procedures:

- Provide address and tel. no. and name of chairman of voucher committee at the level where there is guarantee of receipt of complaints at the committee. Complaints of level of village are going to levels of wards, the ones of wards go to district, the ones of district go to region.
- Put procedure of accepting complaints of execution at the levels of monitoring. Reports of accepting complaints are in the section of reports of execution of the plan of agricultural input subsidy. In cooperation with MFAC, address, tel. no. and normal letter go to following address:
Office of director responsible for agricultural input, MFAC

(v) Participation of private sector

Agro-dealer

Agro-dealer distributes inputs in accordance with the procedures of voucher on the basis of the following criteria:

- (i) Have shop of inputs in the village or ward concerned
- (ii) Have education related to administration of agricultural input business
- (iii) Have expertise of agricultural input business
- (iv) Have experience of business of agricultural input in the district
- (v) Have business license
- (vi) Have registration and be given ID No. of TIN from TRA
- (vii) Have account from NMB in the district concerned
- (viii) Have capacity of delivery of inputs up to village all the time
- (ix) Have registration of MFAC as a seller of seeds, fertilizer and pesticides (TPRI).

Roles of agro-dealers

- Guarantee that he has agro-inputs which satisfy the needs
- Agro-dealers know use of inputs sold at the shops
- Receive voucher with money from farmers and sell inputs concerned
- Bring voucher used at the District office of agriculture and livestock for verification before bringing them to the Bank
- Preserve stock of the inputs they bought from company concerned and show it if necessary
- When Agro-dealers asks for payment of distribution of inputs they show invoice of sales of inputs which shows that they bought them where with cashbook which shows goods which are entered and are sold. Also they are joined to list of farmers whom they served.

Responsibilities of company

- Bring and sell agro-inputs to agro-dealers
- Follow up sales of inputs which guarantee quality of inputs which show at markets
- Provide education of correct use of inputs

Responsibilities of NMB

- Prepare for Agri. Voucher deposit form and open to agro-dealers which shows after sales of inputs with verification of voucher
- Receive and verify voucher used sell inputs from agro-dealers after evaluated by District agricultural and livestock officer and pay

(vi) Following up and evaluation

Procedure of distribution of inputs with voucher is held with monitoring, follow-up and evaluation from Ministry, region, district, ward up to village. Ministry communicates procedures in the way of developing report which take into account in the following:

- Procedure and distribution of agro-inputs
- Distribution in time
- Verification of beneficiary farmers
- Verification of farmers who bought inputs with using vouchers
- Verification of farmers who use inputs
- Verification of crops used improved seeds and fertilizers in relation to production with no use of improved inputs
- Measure capacity of agro-dealers which accomplish distribution of inputs in relation to the needs
- Evaluate data of buying and sales of inputs
- See vouchers of agro-inputs which was sold in relation to the list of target farmers coming from VVC

- Evaluate procedure and easiness of returning money of subsidy from NMB to agro-dealers
- Break down problem of craftsmanship at step of execution of procedure of vouchers

(vii) Important issues which are taken into account

- Vouchers are not allowed to transfer to the person who are not selected by VVC
- Use of voucher which have place to be written: Farmer of one place cannot use voucher in another place
- Use of voucher after May 2012
- Government servants, leaders and executive officer cannot participate at agro-business with subsidy of vouchers
- Tools of government monitor closely on performance of agro-dealers and Executive officers. In these they would advice failures
- No. and type of voucher given to target farmers:
 - (i) 1 voucher of improved seeds (for maize 10 kg. or 15 kg for rice)
 - (ii) 1 voucher for planting fertilizers (50 kg of 1 bag of DAP, or 2 bags of 50 kg of Minjingu)
 - (iii) 1 voucher for boosting fertilizer which is 1 bag of 50 kg of UREAThese amounts of voucher are sufficient at the 1 acre of cultivating crops concerned
- Responsibility of District agricultural officer who go to pick up copy of 'agricultural Voucher deposit form' from NMB for records
- District has plan of constructing capacity of agro-dealers at village, ward and district levels
- Farmers are motivated to invest and establish groups like SACCOS, VICOBA and Warehouse Receipt System which enable to get loan for agro-inputs after finishing plan of subsidy through voucher

Step to be taken by farmers to buy inputs

1. Farmers are informed that subsidy is not enduring thing but only for 3 years
2. Farmers are motivated to accompany various groups like SACCOS, AMCOS and are motivated to sell crops which pass plan of Warehouse Receipt System which enable to get loan.
3. Farmers are motivated to enter to the contract farming which benefits farmers
4. Farmers are enabled to get cultivating land title document and license of house which give guarantee of loan of inputs
5. Farmers are motivated to construct process of placing saving at the financial institution after selling crops
6. Farmers are advised to buy inputs at the time of sales of crops

Appendix 7. Panel sample distribution and voucher receipt experience

District	Village	Recipient HHs	Non-recipient HH	Total HHs	District total	District total recipients
Songea	Mlete	17	0	17	50	44
	Muhukuru	7	4	11		
	Morogo	8	1	9		
	Madaba	12	1	13		
Tunduru	Sisi kwa sisi	2	3	5	74	40
	Namiungo	2	3	5		
	Namakambale	4	7	11		
	Tuwemacho					
	Chiungo	4	3	7		
	Angalia 1	2	3	5		
	Mchesi	1	2	3		
	Wenje	5	2	7		
	Mchoteka	7	1	8		
	Mbesa	3	6	9		
	Kitanda	5	0	5		
	Nampungu	2	1	3		
	Namakungwa	3	3	6		
Mbinga	Litorongi	7	2	9	162	99
	Lipumba	12	6	18		
	Mkwaya	13	3	16		
	Ndondo	7	6	13		
	Chiulu/Chiula					
	Kigerekiti	8	6	14		
	Kibandai A	2	6	8		
	Mango	3	3	6		
	Langiro Asili	7	8	15		
	Magenge	8	4	12		
	Tukuzi	6	4	10		
	Ulolela					
	Kipololo	14	0	14		
	Mpepai	4	6	10		
	Kitura	8	6	14		
Namtumbo	Ligera	2	1	3	26	21
	Milayoyo	12	1	13		
	Naikesi	5	2	7		
	Likuyu/Sekamanga	2	1	3		
Total		204	105	309	309	204

Source: Author's data

Appendix 8. Determinants of the probability of households being selected for voucher in the pilot year

Average marginal effects of logit estimates	v3 dfdx/ (se)	v3 dfdx/ (se)
Log of age of household head	-0.072 (0.154)	0.009 (0.127)
Gender of household head (if male=1, female=0)	0.117 (0.378)	0.042 (0.325)
Education (If household head has completed standard 5=1, if not=0)	0.109 (0.248)	0.049 (0.189)
Whether household head is sick/disabled (Sick/disabled=1, if not=0)	0.113 (0.285)	0.068 (0.241)
Log of number of farmers in the household	-0.114 (0.352)	-0.083 (0.285)
If household received training on input use (yes=1, no=0)	-0.244 (0.670)	-0.044 (0.515)
Log of household size	-0.085 (0.365)	-0.092 (0.294)
Log of amount of cash income	-0.002 (0.040)	-0.004 (0.031)
Log of number of bullocks	-0.055 (0.463)	-0.063 (0.336)
Log of number of cows	0.170 (0.268)	0.112* (0.170)
Log of number of goats	0.087* (0.128)	0.036 (0.102)
Log of number of pigs	-0.086 (0.182)	-0.043 (0.137)
Log of number of chickens	0.044 (0.099)	0.018 (0.074)
If household members belong to credit associations/bank	0.044 (0.489)	0.119 (0.334)
Quality of land (Poor=1, Average=2, Good=3)	-0.003 (0.203)	0.044 (0.161)
Log of land owned area	-0.010 (0.164)	0.058 (0.135)
Log of area of land cultivated	0.092 (0.221)	0.050 (0.174)
Log of amount of remittance/gift received from relatives/friends	-0.009 (0.049)	-0.001 (0.038)
Log of amount of contribution to social functions	0.056 (0.103)	0.009 (0.076)
Whether household member belongs to religious/ social group	-0.034 (0.251)	-0.053 (0.189)
Access to irrigation facilities	-0.068 (0.236)	-0.052 (0.189)
House roof made of metal/stone/concrete	0.041 (0.253)	0.091 (0.202)
Log of amount of total household consumption	-0.050 (0.143)	-0.015 (0.111)
Whether household members/relatives are elected for position in village	-0.011 (0.229)	0.032 (0.181)
Whether household member belongs to primary society, SACCO, or other economic group	0.036 (0.515)	-0.061 (0.350)
Whether household member/relative is VVC member	0.134 (0.316)	0.085 (0.235)
Log of amount of urea used for maize plots in 2007/8	0.021 (0.049)	0.032** (0.037)
Log of amount of maize improved seeds used in 2007/8	0.169** (0.191)	0.142** (0.154)
Whether village has access to health centre (yes=1, no=0)	-0.193 (0.532)	
Whether village does not have access to water facilities (no access=1, access=0)	-0.200* (0.313)	
Whether village has market access (yes=1, no=0)	-0.038 (0.450)	
Whether village has gravel roads (yes=1, no=0)	-0.194 (0.339)	
Log of distance to town	0.021 (0.133)	
Whether village has agricultural agents (yes=1, no=0)	-0.169* (0.236)	
Whether village has points for input sales (yes=1, no=0)	0.406** (0.516)	
Whether village has access to bank (yes=1, no=0)	0.052 (0.315)	

Log of number of visited maize buyers in village	0.102***	
	(0.092)	
Whether village has cell phone network (yes=1, no=0)	0.216**	
	(0.289)	
Number	221	292
Pseudo R-squared	0.213	0.107

Note: The table provides marginal effects based on logit models. dfdx=marginal effects; se=standard error. Models for being selected for vouchers in the pilot year are estimated: in the left column the model uses only individual variables and in the left it uses also village variables. *, **, *** indicate significance at the 10%, 5% and 1% respectively.

Appendix 9. Determinants of the probability of voucher receipt in the pilot year

Average marginal effects of logit estimates	v4 dfdx/ (se)	v4 dfdx/ (se)
Log of age of household head	-0.035 (0.125)	-0.082 (0.152)
Gender of household head (if male=1, female=0)	0.015 (0.338)	0.093 (0.397)
Education (If household head has completed standard 5=1, if not=0)	-0.010 (0.195)	0.092 (0.253)
Whether household head is sick/disabled (Sick/disabled=1, if not=0)	0.123 (0.248)	0.159 (0.287)
Log of number of farmers in the household	-0.048 (0.293)	-0.099 (0.356)
If household received training on input use (yes=1, no=0)	-0.153 (0.588)	-0.310 (0.889)
Log of household size	-0.079 (0.303)	-0.099 (0.366)
Log of amount of cash income	-0.004 (0.032)	-0.004 (0.040)
Log of number of bullocks	0.047 (0.334)	0.168 (0.458)
Log of number of cows	0.001 (0.175)	0.010 (0.258)
Log of number of goats	0.035 (0.105)	0.083* (0.130)
Log of number of pigs	-0.001 (0.138)	-0.001 (0.177)
Log of number of chickens	0.008 (0.076)	0.007 (0.100)
If household members belong to credit associations/bank	0.060 (0.335)	-0.044 (0.490)
Quality of land (Poor=1, Average=2, Good=3)	0.060 (0.167)	0.006 (0.205)
Log of land owned area	0.038 (0.138)	-0.005 (0.166)
Log of area of land cultivated	0.062 (0.180)	0.096 (0.225)
Log of amount of remittance/gift received from relatives/friends	0.001 (0.039)	0.001 (0.049)
Log of amount of contribution to social functions	0.012 (0.078)	0.061 (0.104)
Whether household member belongs to religious/ social group	-0.057 (0.195)	-0.015 (0.251)
Access to irrigation facilities	0.003 (0.190)	0.045 (0.228)
Houseroof is metal/stone/concrete	0.064 (0.212)	0.059 (0.259)
Log of amount of total household consumption	0.016 (0.115)	-0.021 (0.146)
Whether household members/relatives are elected for position in village	0.019 (0.185)	-0.048 (0.225)
Whether household member belongs to primary society, SACCO, or other economic group	-0.008 (0.348)	0.131 (0.506)
Whether household member/relative is VVC member	0.111 (0.236)	0.116 (0.308)
Log of amount of urea used for maize plots in 2007/8	0.034** (0.038)	0.018 (0.048)
Log of amount of maize improved seeds used in 2007/8	0.114** (0.137)	0.129** (0.170)
Whether village has access to health centre (yes=1, no=0)		-0.065 (0.541)
Whether village does not have access to water facilities (no access=1, access=0)		-0.044 (0.313)
Whether village has market access (yes=1, no=0)		-0.064 (0.455)
Whether village has gravel roads (yes=1, no=0)		-0.083 (0.341)
Log of distance to town		-0.013 (0.135)
Whether village has agricultural agents (yes=1, no=0)		-0.101 (0.233)
Whether village has points for input sales (yes=1, no=0)		0.449** (0.515)
Whether village has access to bank (yes=1, no=0)		0.033 (0.319)
Log of number of visited maize buyers in village		0.064*

Whether village has cell phone network (yes=1, no=0)		(0.091) 0.106 (0.291)
Number	292	221
Pseudo R-squared	0.111	0.182

Note: The table provides marginal effects based on logit models. dfdx=marginal effects; se=standard error. Models for having received vouchers in the pilot year are estimated: in the right column the model uses only individual variables and in the left it uses also village variables. *, **, *** indicate significance at the 10%, 5% and 1% respectively.

Appendix 10. Determinants of the probability of households/relatives having VVC members in the pilot year

Average marginal effects of logit estimates	vouchercat dfdx/(se)
Log of age of household head	-0.015 (0.220)
Gender of household head (if male=1, female=0)	-0.141 (0.445)
Education (If household head has completed standard 5=1, if not=0)	0.015 (0.276)
Whether household head is sick/disabled (Sick/disabled=1, if not=0)	-0.082* (0.450)
Log of number of farmers in the household	0.055 (0.381)
Log of household size	-0.034 (0.396)
Log of amount of cash income	-0.010 (0.042)
Log of number of bullocks	-0.020 (0.394)
Log of number of cows	0.016 (0.212)
Log of number of goats	0.009 (0.136)
Log of number of pigs	0.007 (0.189)
Log of number of chickens	-0.003 (0.099)
If household members belong to credit associations/bank	-0.042 (0.468)
Quality of land (Poor=1, Average=2, Good=3)	0.067* (0.225)
Log of land owned area	0.031 (0.168)
Log of area of land cultivated	0.031 (0.225)
Log of amount of remittance/gift received from relatives/friends	-0.000 (0.052)
Log of amount of contribution to social functions	-0.004 (0.101)
Whether household member belongs to religious/ social group	0.169*** (0.256)
Access to irrigation facilities	0.056* (0.210)
House roof is metal/stone/concrete	-0.030 (0.286)
Log of amount of total household consumption	0.025 (0.157)
Whether household members/relatives are elected for position in village	0.114*** (0.307)
Whether household member belongs to primary society, SACCO, or other economic group	0.080 (0.469)
Whether household used urea one year before the programme	0.002 (0.051)
Whether household used maize improved seeds one year before the programme	0.037 (0.158)
Number	284
Pseudo R-squared	0.255

Note: The table provides marginal effects based on logit model. dfdx=marginal effects; se=standard error. A model for household members or relatives having VVC members in pilot year is estimated including village variables. *, **, *** indicate significance at the 10%, 5% and 1% respectively.

Appendix 11. Determinants of the probability of households not received vouchers after being selected for vouchers in the pilot year

Average marginal effects of logit estimates	noreceipt dfdx/ (se)	noreceipt dfdx/ (se)
Log of age of household head	0.089** (1.125)	0.103* (0.547)
Gender of household head (if male=1, female=0)	0.020 (1.239)	0.023 (0.595)
Education (If household head has completed standard 5=1, if not=0)	-0.007 (0.616)	0.033 (0.336)
Whether household head is sick/disabled (Sick/disabled=1, if not=0)	-0.014 (0.675)	-0.038 (0.438)
Log of number of farmers in the household	-0.018 (0.673)	-0.034 (0.422)
Household received training on input use (yes=1, no=0)	0.110 (1.107)	0.089 (0.679)
Log of household size	0.020 (0.808)	0.011 (0.443)
Log of off-farm cash income	0.003 (0.105)	0.002 (0.048)
Log of number of cows	0.034* (0.486)	0.052** (0.222)
Log of number of goats	-0.007 (0.244)	0.002 (0.143)
Log of number of pigs	-0.022 (0.453)	-0.026 (0.213)
Log of number of chickens	0.017* (0.252)	0.004 (0.115)
If household members belong to credit associations/bank	0.061 (1.048)	0.037 (0.497)
Quality of land (Poor=1, Average=2, Good=3)	-0.020 (0.469)	-0.009 (0.236)
Log of land owned area	-0.007 (0.346)	0.007 (0.199)
Log of area of land cultivated	-0.018 (0.552)	-0.007 (0.248)
Log of amount of remittance/gift received from relatives/friends	-0.006 (0.122)	-0.003 (0.061)
Log of amount of contribution to social functions	-0.014 (0.278)	0.001 (0.114)
Whether household member belongs to religious/ social group	0.014 (0.565)	0.005 (0.291)
Access to irrigation facilities	-0.055** (0.686)	-0.037 (0.335)
Houeroof is metal/stone/concrete	-0.021 (0.567)	0.012 (0.300)
Log of amount of total household consumption	0.008 (0.333)	-0.016 (0.168)
Whether household members/relatives are elected for position in village	0.022 (0.565)	0.004 (0.275)
Whether household member belongs to primary society, SACCO, or other economic group	-0.024 (1.172)	-0.028 (0.524)
Whether household member/relative is VVC member	0.013 (0.685)	-0.020 (0.379)
Whether household used urea one year before the programme	0.023 (0.483)	
Whether household used maize improved seeds one year before the programme	0.002 (0.992)	
Whether village has access to health centre (yes=1, no=0)	-0.036** (1.556)	
Whether village does not have access to water facilities (no access=1, access=0)	-0.082** (0.961)	
Whether village has market access (yes=1, no=0)	0.131 (1.093)	
Whether village has gravel roads (yes=1, no=0)	-0.138 (1.568)	
Log of distance to town	0.004 (0.298)	
Whether village has agricultural agents (yes=1, no=0)	-0.099 (1.020)	
Whether village has access to bank (yes=1, no=0)	-0.062 (1.461)	
Log of number of visited maize buyers in village	0.010 (0.251)	
Log of number of bullocks		-0.064 (0.551)
Log of amount of urea used for maize plots in 2007/08		-0.002

Log of amount of maize improved seeds used in 2007/08		(0.056)
		-0.001
		(0.204)
Number	146	292
Pseudo R-squared	0.361	0.134

Note: dfdx=marginal effects; se=standard error. The table provides marginal effects based on logit models. Models for not receiving vouchers after being selected in the pilot year are estimated: In the left column the model does not include the number of bullocks and uses the input use experience, in the right it does not include the village variables nor the input use experience but includes number of bullocks and the input use in 2007/08. *, **, *** indicate significance at the 10%, 5% and 1% respectively.

Appendix 12. Determinants of the probability of receiving vouchers in any year of the programme

Average marginal effects of logit estimates	dfdx/ (se)	dfdx/ (se)
Log of age of household head	-0.011 (0.160)	-0.054 (0.125)
Gender of household head (if male=1, female=0)	-0.115 (0.465)	-0.155 (0.347)
Education (If household head has completed standard 5=1, if not=0)	-0.006 (0.291)	0.021 (0.197)
Whether household head is sick/disabled (Sick/disabled=1, if not=0)	-0.125 (0.315)	-0.091 (0.250)
Log of number of farmers in the household	0.016 (0.400)	-0.015 (0.306)
Log of household size	0.020 (0.421)	0.069 (0.321)
Log of off-farm cash income	-0.023 (0.048)	-0.028** (0.034)
Log of number of cows	-0.172* (0.328)	-0.072 (0.186)
Log of number of goats	0.011 (0.150)	-0.002 (0.111)
Log of number of pigs	-0.049 (0.222)	-0.013 (0.149)
Log of number of chickens	0.030 (0.120)	0.056** (0.082)
If household members belong to credit associations/bank	-0.055 (0.569)	0.170 (0.402)
Quality of land (Poor=1, Average=2, Good=3)	-0.022 (0.221)	0.033 (0.167)
Log of land owned area	0.021 (0.213)	0.052 (0.150)
Log of area of land cultivated	0.062 (0.262)	0.043 (0.189)
Log of amount of remittance/gift received from relatives/friends	-0.008 (0.057)	0.003 (0.042)
Log of amount of contribution to social functions	0.014 (0.118)	-0.013 (0.080)
Whether household member belongs to religious/ social group	-0.008 (0.298)	-0.012 (0.206)
Access to irrigation facilities	-0.053 (0.273)	-0.021 (0.215)
Houseroof is metal/stone/concrete	0.092 (0.299)	0.074 (0.206)
Log of amount of total household consumption	0.074 (0.171)	0.080** (0.118)
Whether household members/relatives are elected for position in village	0.019 (0.250)	0.067 (0.188)
Whether household member belongs to primary society, SACCO, or other economic group	0.269* (0.667)	-0.054 (0.435)
Whether household member/relative is VVC member	0.237** (0.502)	0.125 (0.286)
Whether household used urea one year before the programme	0.273*** (0.277)	0.241*** (0.185)
Whether household used maize improved seeds one year before the programme	0.047 (0.628)	0.104 (0.422)
Whether village has access to health centre (yes=1, no=0)	0.200 (0.603)	
Whether village does not have access to water facilities (no access=1, access=0)	0.073 (0.341)	
Whether village has market access (yes=1, no=0)	-0.212 (0.520)	
Whether village has gravel roads (yes=1, no=0)	-0.111 (0.370)	
Log of distance to town	-0.050 (0.177)	
Whether village has agricultural agents (yes=1, no=0)Agriext	-0.141* (0.271)	
Whether village has points for input sales (yes=1, no=0)	0.122 (0.585)	
Whether village has access to bank (yes=1, no=0)	0.138 (0.356)	
Log of number of visited maize buyers	0.035 (0.100)	
Whether village has cell phone network (yes=1, no=0)	-0.101	

If household received training on input use (yes=1, no=0)	(0.312)	0.189 (0.631)
Log of number of bullocks		0.086 (0.408)
Number	198	292
Pseudo R-squared	0.300	0.185

Note: dfdx=marginal effects; se=standard error. The table provides marginal effects based on logit models. Models for receiving vouchers in any year are estimated: in the left column the model includes village variables but not includes receiving training on input use nor the number of bullocks, while in the right column it includes opposite to this. *, **, *** indicate significance at the 10%, 5% and 1% respectively.

Appendix 13. Voucher recipient propensity score logit model (voucher receipt in 2011/12)

Voucher receipt in 2011/12	Coefficient	Standard Error	Z value	Probability of more than z value
Log of household head age	-0.02546	0.388922	-0.07	0.948
Gender of household head (1=male, 0=female)	-0.00236	0.239482	-0.01	0.992
Household heads having completed standard 7 (1=yes, 0=no)	-0.05701	0.182537	-0.31	0.755
Sick/disabled household heads (1=yes, 0=no)	0.379142	0.224785	1.69	0.092
Log of number of farmers in the household	-0.21496	0.314207	-0.68	0.494
Average slope of parcels cultivated (1=very steep, 2=average, 3=mostly flat)	-0.19464	0.330959	-0.59	0.556
Log of landholding (acre)	-0.17419	0.125521	-1.39	0.165
Log of amount of contribution to social organisations (Thousand TZS)	0.051339	0.086923	0.59	0.555
Log of total annual household consumption (Thousand TZS)	0.04866	0.115166	0.42	0.673
Whether household head belongs to religious / social groups (1=yes, 0=no)	0.066053	0.185357	0.36	0.722
Whether household head was elected for positions (1=yes, 0=no)	0.385128	0.200451	1.92	0.055
Whether household head was in VVC (1=yes, 0=no)	0.178718	0.246193	0.73	0.468
Log of usage amount of urea (kg)	0.141809	0.042351	3.35	0.001
Log of usage amount of improved seeds (kg)	0.280957	0.143473	1.96	0.05
Village has market (1=yes, 0=no)	-0.10079	0.244786	-0.41	0.681
Log of distance to town (km)	0.0576	0.070571	0.82	0.414
Village has input sales points (1=yes, 0=no)	0.272134	0.335477	0.81	0.417
Constant	-0.79772	1.600822	-0.5	0.618

Note: the common support option has been selected.

The region of common support is [.09255678, .96561197].

Description of estimated propensity

score in region of common support

	Estimated	propensity score		
	Percentile	Smallest		
1%	0.097881	0.092557		
5%	0.1170156	0.092963		
10%	0.139482	0.097881	Observation	216
25%	0.2081425	0.102287	Sum of Weight	216
50%	0.3090957		Mean	0.355451
		Largest	Standard Deviation	0.19753
75%	0.4654767	0.858854		
90%	0.6601106	0.892885	Variance	0.039018
95%	0.7432452	0.936104	Skewness	0.892795
99%	0.8928846	0.965612	Kurtosis	3.126766

* Step 1: Identification of the optimal number of blocks.

Use option detail if further details on output are required.

The final number of blocks is five, which ensures that the mean propensity score does not differ between treatments and controls in each block.

Step 2: Test for balancing propensity score

Use option detail if further details on output are required.

Balance is achieved.

This table shows the inferior boundary, number of treatments, and number of controls in each block.

Inferior of block of pscore	v41112		
	0	1	Total
0.0925568	42	8	50
0.2	66	24	90
0.4	23	23	46
0.6	8	15	23
0.8	0	7	7
Total	139	77	216

Note: Common support option has been selected.

Appendix 14. Impact of voucher receipt in 2011/12 on maize yield

	Controlling for urea Log of maize yield Marginal effects (Standard error)	Controlling for improved maize seeds Log of maize yield Marginal effects (Standard error)
Time (Round3=0, Round4=1)	0.890*** (0.226)	0.841*** (0.229)
Voucher receipt in 2011/12 (1=yes, 0=no)	0.108 (0.220)	0.159 (0.223)
Intersection term of time and voucher receipt	-0.278 (0.332)	-0.202 (0.341)
Log of household head age	0.075 (0.324)	0.093 (0.336)
Gender of household head (1=male, 0=female)	0.361 (0.255)	0.544** (0.243)
Household heads having completed standard 7 (1=yes, 0=no)	0.140 (0.162)	0.133 (0.165)
Sick/disabled household heads (1=yes, 0=no)	0.111 (0.234)	0.183 (0.230)
Log of number of farmers in the household	-0.213 (0.244)	-0.197 (0.252)
Average slope of parcels cultivated (1=very steep, 2=average, 3=mostly flat)	0.045 (0.275)	-0.017 (0.279)
Log of landholding (acre)	0.129 (0.111)	0.121 (0.114)
Log of amount of contribution to social organisations (Thousand TZS)	-0.041 (0.058)	-0.012 (0.057)
Log of total annual household consumption (Thousand TZS)	-0.142 (0.122)	-0.078 (0.110)
Whether household members/relatives belonged to religious / social group (1=yes, 0=no)	-0.374* (0.204)	-0.145 (0.164)
Whether household members/ relatives were elected for positions (1=yes, 0=no)	-0.119 (0.163)	0.011 (0.157)
Whether household members/ relatives were VVC members (1=yes, 0=no) max	-0.069 (0.234)	-0.211 (0.250)
Linear prediction	0.589*** (0.218)	
Village has market (1=yes, 0=no)	0.408 (0.508)	0.254 (0.514)
Log of distance to town (km)	-0.076 (0.131)	-0.037 (0.135)
Village has input sales points (1=yes, 0=no)	-0.581 (0.416)	-0.425 (0.413)
Mobile phone network (1=yes, 0=no)	-0.212 (0.350)	0.129 (0.324)
Residuals	0.156*** (0.040)	
Linear prediction		0.761** (0.331)
Residuals		0.203** (0.095)
Constant	4.451*** (1.462)	4.353*** (1.483)
Number	363	363
Pseudo residuals	0.199	0.172

Note: Table shows average marginal effects of OLS using village level fixed effects. Errors are calculated using the delta method. In the left column the model controls for use of urea by training on input use as an instrumental variable. In the right column the model controls for use of improved seeds by belonging to SACCO as an instrumental variable. *, **, *** indicate significance at the 10%, 5% and 1% respectively.

Appendix 15. Voucher recipient propensity score logit model (voucher receipt in any one year).

Voucher receipt in any one year	Coefficient	Standard Error	Z value	Probability of more than z value
Log of household head age	-0.6694584	0.415872	-1.61	0.107
Gender of household head (1=male, 0=female)	-0.4200181	0.271039	-1.55	0.121
Household heads having completed standard 7 (1=yes, 0=no)	0.208131	0.207038	1.01	0.315
Sick/disabled household heads (1=yes, 0=no)	0.0009641	0.255229	0	0.997
Log of number of farmers in the household	0.4805359	0.336908	1.43	0.154
Average slope of parcels cultivated (1=very steep, 2=average, 3=mostly flat)	-0.1294073	0.360581	-0.36	0.72
Log of landholding (acre)	0.0260887	0.134359	0.19	0.846
Log of amount of contribution to social organisations (Thousand TZS)	-0.0474446	0.090196	-0.53	0.599
Log of total annual household consumption (Thousand TZS)	0.2220723	0.124767	1.78	0.075
Whether household head belongs to religious / social groups (1=yes, 0=no)	0.0609893	0.226797	0.27	0.788
Whether household head was elected for positions (1=yes, 0=no)	0.5374811	0.217803	2.47	0.014
Whether household head was in VVC (1=yes, 0=no)	0.584715	0.354657	1.65	0.099
Log of usage amount of urea (kg)	0.2553411	0.053277	4.79	0
Log of usage amount of improved seeds (kg)	0.5609707	0.359143	1.56	0.118
Village has market (1=yes, 0=no)	-0.2016598	0.258755	-0.78	0.436
Log of distance to town (km)	0.068076	0.077417	0.88	0.379
Village has input sales points (1=yes, 0=no)	-0.1795154	0.378255	-0.47	0.635
Constant	0.6732821	1.718058	0.39	0.695

Note: the common support option has been selected.

The region of common support is [.19880223, .99995837].

Description of estimated propensity score in region of common support

Estimated propensity score			
	Percentile	Smallest	
1%	0.2131462	0.198802	
5%	0.2957141	0.204536	
10%	0.3889459	0.213146	Obs 219
25%	0.529505	0.216592	Sum of Wgt. 219
50%	0.7213971		Mean 0.702735
		Largest	Std. Dev. 0.223414
75%	0.907823	0.999825	
90%	0.9708361	0.999896	Variance 0.049914
95%	0.9972571	0.999936	Skewness -0.41133
99%	0.9998958	0.999958	Kurtosis 2.057641

Step 1: Identification of the optimal number of blocks

Use option detail if you want more detailed output

*** The final number of blocks is 6

This number of blocks ensures that the mean propensity score is not different for treated and controls in each block

Step 2: Test of balancing property of the propensity score

Use option detail if you want more detailed output

The balancing property is satisfied

This table shows the inferior bound, the number of treated and the number of controls for each block.

Inferior of block of pscore	voucher1		Total
	0	1	
0.1988022	0	1	1
0.2	16	6	22
0.4	24	29	53
0.6	18	32	50
0.8	6	27	33
0.9	1	59	60
Total	65	154	219

Appendix 16. Impact of voucher receipt in any one year on maize yield

	Controlling for urea	Controlling for improved seeds
	Marginal effects (Standard error)	Marginal effects (Standard error)
Log of maize yield		
Time (Round3=0, Round4=1)	0.900*** (0.297)	0.909*** (0.302)
Voucher receipt in any one year (1=yes, 0=no)	-0.101 (0.231)	0.076 (0.231)
Intersection term of time and voucher receipt	-0.235 (0.340)	-0.256 (0.347)
Log of household head age	0.140 (0.324)	0.157 (0.337)
Gender of household head (1=male, 0=female)	0.359 (0.266)	0.581** (0.248)
Household heads having completed standard 7 (1=yes, 0=no)	0.108 (0.158)	0.107 (0.161)
Sick/disabled household heads (1=yes, 0=no)	0.024 (0.239)	0.114 (0.233)
Log of number of farmers in the household	-0.147 (0.248)	-0.147 (0.261)
Average slope of parcels cultivated (1=very steep, 2=average, 3=mostly flat)	0.230 (0.279)	0.199 (0.283)
Log of landholding (acre)	0.154 (0.107)	0.105 (0.109)
Log of amount of contribution to social organisations (Thousand TZS)	-0.026 (0.057)	-0.005 (0.057)
Log of total annual household consumption (Thousand TZS)	-0.169 (0.129)	-0.098 (0.114)
Whether household members/relatives belonged to religious / social group (1=yes, 0=no)	-0.357 (0.218)	-0.107 (0.167)
Whether household members/ relatives were elected for positions (1=yes, 0=no)	-0.152 (0.163)	-0.065 (0.161)
Whether household members/ relatives were VVC members (1=yes, 0=no) max)	-0.053 (0.238)	-0.179 (0.257)
Linear prediction	0.595** (0.242)	
Village has market (1=yes, 0=no)	0.360 (0.517)	0.241 (0.524)
Log of distance to town (km)	-0.089 (0.132)	-0.033 (0.135)
Village has input sales points (1=yes, 0=no)	-0.500 (0.432)	-0.319 (0.422)
Mobile phone network (1=yes, 0=no)	-0.266 (0.358)	0.161 (0.311)
Residuals	0.158*** (0.040)	
Linear prediction		0.706** (0.349)
Residuals		0.211** (0.092)
Constant	4.366*** (1.446)	4.120*** (1.468)
Number	372	372
Pseudo residuals	0.181	0.155

Note: Table shows average marginal effects of OLS using village level fixed effects. Errors are calculated using the delta method. In the left column the model controls for use of urea by training on input use as an instrumental variable. In the right column the model controls for use of improved seeds by training on input use as an instrumental variable. *, **, *** indicate significance at the 10%, 5% and 1% respectively.

Appendix 17. Adult equivalence scale

Age groups	Sex	
	Male	Female
0 – 2	0.40	0.40
3 – 4	0.40	0.48
5 – 6	0.56	0.56
7 – 8	0.64	0.64
9 – 10	0.76	0.76
11 – 12	0.80	0.88
13 – 14	1.00	1.00
15 – 18	1.20	1.00
19 – 59	1.00	0.88
60 +	0.80	0.72

Source: Household Budget Survey 2007 Report

Appendix 18. Propensity score matching for voucher receipt in 2011/12

The treatment is v41112

v41112	Freq.	Percent	Cum.
0	207	67.87	67.87
1	98	32.13	100
Total	305	100	

The table shows sample distribution of receiving vouchers in 2011/12 (=1) and not receiving vouchers in 2011/12 (=0) groups.

Estimation of the propensity score

Iteration 0: log likelihood =- 156.58249

Iteration 1: log likelihood = -141.37639

Iteration 2: log likelihood = -141.21383

Iteration 3: log likelihood = -141.21374

Probit regression

Number of obs =246

LR chi2(16) =30.74

Prob > chi2 =0.0145

Log likelihood=-141.21374

Pseudo R2 =0.0982

Voucher receipt in 2011/12	Coefficient	Standard Error	z	P>z	[95% Confidence interval]	
Log of household head age	0.2960005	0.3341167	0.89	0.376	-0.358856	0.9508572
Sex of household head	-0.029746	0.2720977	-0.11	0.913	-0.563048	0.5035553
Education level of household head	-0.09205	0.181764	-0.51	0.613	-0.448301	0.2642008
Whether household head is bad health	0.2039094	0.2133064	0.96	0.339	-0.214163	0.6219822
Log of number of farmers in the household	0.0980743	0.3004575	0.33	0.744	-0.490812	0.6869601
Average soil quality of parcels	0.0218845	0.2973226	0.07	0.941	-0.560857	0.6046262
Log of land owned	-0.119095	0.1183673	-1.01	0.314	-0.35109	0.1129012
Log of contribution amount to village activities	0.0274624	0.078531	0.35	0.727	-0.126456	0.1813803
Log of total household consumption per adult equivalent	0.15742	0.1085865	1.45	0.147	-0.055406	0.3702456
Average access to irrigation facilities of parcels	-0.517331	0.563062	-0.92	0.358	-1.620912	0.5862507
Whether household members or relatives are in elected positions in the village	0.1784946	0.1847983	0.97	0.334	-0.183703	0.5406926
Whether household head belongs to SACCO	0.286952	0.2038072	1.41	0.159	-0.112503	0.6864068
Whether household members or relatives are in VVC	0.2231761	0.2251528	0.99	0.322	-0.218115	0.6644674
Whether the village has access to input sales points	0.6605032	0.3209018	2.06	0.04	0.0315473	1.289459
Log of number of maize buyers in the village	0.1075111	0.0737344	1.46	0.145	-0.037006	0.2520279
Whether the village has access to mobile phone network	0.1458992	0.1872104	0.78	0.436	-0.221026	0.5128249
Constant	-2.784114	1.192424	-2.33	0.02	-5.121223	-0.447006

Note: The table provides likelihood of being graduates based on probit model. The model for receiving vouchers in 2011/12 is estimated. The common support option has been selected. The region of common support is [.12943347, .88299271]

Description of the estimated propensity score in region of common

support Estimated propensity score

	Percentiles	Smallest		
1%	0.1333417	0.1294335		
5%	0.1471731	0.1313777		
10%	0.1683902	0.1333417	Obs	236
25%	0.2298322	0.1356887	Sum of Wgt.	236
50%	0.3061657		Mean	0.343591
		Largest	Std. Dev.	0.16375
75%	0.3997136	0.7943176		
90%	0.6053674	0.7981146	Variance	0.026814
95%	0.7193064	0.8555462	Skewness	1.244609
99%	0.7981146	0.8829927	Kurtosis	4.089123

Note: The table shows the percentile distribution counting from the bottom of the estimated propensity score in region of common support. The least 13 th percentile of the sample in the region has the 1% probabilities on the participation to the programme and about 80 th ~ 88th percentile of the sample has 99% probabilities.

* Step 1: Identification of the optimal number of blocks

Use option detail if you want more detailed output

* The final number of blocks is 5

This number of blocks ensures that the mean propensity score is not different for treated and controls in each block

* Step 2: Test of balancing property of the propensity score

Use option detail if you want more detailed output

* The balancing property is satisfied

The table shows the number of treated and the number of controls for each block which has certain inferior bound in the propensity score. The left column indicates the number of voucher non-recipients in 2011/12 and the right column shows the number of recipients.

Inferior of block	v41112		
of pscore	0	1	Total
0.1294335	27	9	36
0.2	104	37	141
0.4	17	18	35
0.6	6	16	22
0.8	0	2	2
Total	154	82	236

Note: the common support option has been selected.

End of the algorithm to estimate the pscore

Appendix 19. Impact of voucher receipt in 2011/12 on poverty

	(1) Poverty headcount ratio dydx/(se)	(2) Poverty headcount ratio dydx/(se)	(3) Poverty headcount ratio dydx/(se)	(4) Poverty headcount ratio dydx/(se)
Time (Round3=0, Round4=1)	-0.237 (0.473)	-0.163 (0.515)	-0.100 (0.499)	-0.390 (0.465)
Voucher receipt in 2011/12 (1=received, 0=no)	0.302* (0.163)	0.301 (0.182)	0.318* (0.169)	0.306* (0.166)
Intersection of Time and voucher receipt in 2011/12	0.016 (0.200)	0.010 (0.218)	-0.020 (0.209)	0.003 (0.200)
Log of household head age	0.360 (0.218)	0.298 (0.237)	0.363* (0.209)	0.296 (0.197)
Sex of household head (1=male, 0=female)	0.029 (0.130)	0.021 (0.145)	-0.015 (0.137)	-0.053 (0.130)
Whether household head completed standard 5 (1=yes, 0=no)	-0.326*** (0.098)	-0.362*** (0.107)	-0.365*** (0.104)	-0.340*** (0.101)
Log of number of farmers in the household	0.196 (0.153)	0.141 (0.166)		
Averaged soil quality of parcels (1=Poor, 2=Average, 3=Good)	-0.145 (0.118)	-0.198 (0.128)	-0.181 (0.122)	
Log of size of cultivated land (acre)	-0.322*** (0.089)			
Averaged access to irrigation facilities of parcels (1=yes, 0=no)	-0.032 (0.115)	-0.052 (0.124)	-0.068 (0.122)	
Whether household members or relatives are in elected positions in the village (1=yes, 0=no)	0.125 (0.093)	0.050 (0.099)	0.038 (0.096)	0.005 (0.088)
Whether household head belongs to saving and credit organisation (SACCO) (1=yes, 0=no)	-0.243** (0.095)	-0.212** (0.106)	-0.207** (0.100)	-0.198** (0.095)
Whether household members / relatives are VVC members (1=yes, 0=no)	-0.075 (0.122)	-0.124 (0.134)	-0.103 (0.129)	-0.074 (0.122)
Whether household has modern house-roof (1=yes, 0=no)		-0.033 (0.118)		
Village variables				
Access to market (1=yes, 0=no)	-0.016 (0.834)	0.275 (0.911)	0.096 (0.882)	-0.089 (0.805)
Access to all-weather road (1=yes, 0=no)	0.128 (0.349)	0.138 (0.391)	0.182 (0.371)	0.149 (0.344)
Log of distance to town (km)	0.145 (0.360)	0.078 (0.401)	0.153 (0.382)	0.228 (0.360)
Whether village has permanent input sales points (1=yes, 0=no)	0.184 (0.565)	-0.046 (0.617)	-0.052 (0.594)	0.087 (0.578)
Log of number of maize buyers in the village	0.124 (0.162)	0.116 (0.182)	0.146 (0.172)	0.193 (0.164)
Whether village has mobile phone network (1=yes, 0=no)	-0.411 (0.388)	-0.444 (0.424)	-0.322 (0.398)	-0.203 (0.366)

	-0.017	-0.019	-0.022	-0.012
Log of real urea price in village (Thousand TZS)	(0.028)	(0.031)	(0.030)	(0.029)
Log of real labour daily cost for land in the village (Thousand TZS)	-1.936 (1.773)	-2.054 (2.009)	-1.982 (1.885)	-2.476 (1.766)
Log of real maize sales prices by households (Thousand TZS)	0.012 (0.059)	0.024 (0.064)	0.027 (0.063)	0.027 (0.062)
Constant	11.118 (10.130)	11.832 (11.388)	10.956 (10.741)	13.909 (10.249)
Number	132	130	132	141
Residuals	0.423	0.340	0.332	0.293

Note: Table shows average marginal effects of OLS using village level fixed effects. dfdx=marginal effects; se=standard error. Errors are calculated using the delta method. Different column represent results using different independent variables. Column (1) does not use the variable of modern houseroof. Column (2) does not use the variable of land size for cultivation, column (3) does not use number of farmers in the households nor land size for cultivation, nor of modern houseroof, on top of excluded variables for column (3), column (4) does not use variable for soil quality. Real prices are calculated by CPI (base year=2009).

*, **, *** indicate significance at the 10%, 5% and 1% respectively.

Appendix 20. Propensity score matching for voucher receipt in any one year of the programme

The treatment is voucher1

voucher1	Freq.	Percent	Cum.
0	102	33.44	33.44
1	203	66.56	100
Total	305	100	

The table shows sample distribution of receiving vouchers in any year (=1) and not receiving vouchers in any year (=0) groups.

Estimation of the propensity score

Iteration 0: log likelihood = -149.06073
 Iteration 1: log likelihood = -132.32286
 Iteration 2: log likelihood = -131.71132
 Iteration 3: log likelihood = -131.70487
 Iteration 4: log likelihood = -131.70487

Probit regression

Number of obs =240
 LR chi2(17) = 34.71
 Prob > chi2 = 0.0068
 Log likelihood = -131.70487
 Pseudo R2 = 0.1164

Voucher receipt in any year	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]
Log of maize yields	0.0531935	0.0395754	1.34	0.179	-0.02437 0.13076
Log of household head age	-0.4571851	0.3755911	-1.22	0.224	-1.19333 0.27896
Sex of household head	-0.2346842	0.2782773	-0.84	0.399	-0.7801 0.310729
Education level of household head	0.1259401	0.1888371	0.67	0.505	-0.24417 0.496054
Whether household head is in bad	-0.0791109	0.2252815	-0.35	0.725	-0.52065 0.362433
Log of number of farmers in the household	0.4020094	0.3000727	1.34	0.18	-0.18612 0.990141
Average slope of parcels	-0.230695	0.3326282	-0.69	0.488	-0.88263 0.421244
Log of land owned	0.0406415	0.122766	0.33	0.741	-0.19998 0.281259
Log of contribution amount to village activities	-0.0044246	0.0809137	-0.05	0.956	-0.16301 0.154163
Log of total household consumption per adult equivalent	0.2494343	0.1072811	2.33	0.02	0.039167 0.459701
Whether household head belongs to religious group	0.2585279	0.1935373	1.34	0.182	-0.1208 0.637854
Whether household members or relatives are in elected position in the village	0.3089814	0.1872112	1.65	0.099	-0.05795 0.675909
Whether household members or relatives are in VVC	0.6062033	0.3234813	1.87	0.061	-0.02781 1.240215
Whether the village has access to market	-0.4185851	0.2398174	-1.75	0.081	-0.88862 0.051448
Log of distance to town	0.0705447	0.0723251	0.98	0.329	-0.07121 0.212299
Whether the village has access to input sales points	0.182444	0.3130508	0.58	0.56	-0.43112 0.796012
Whether the village has mobile phone network	0.3350118	0.2071261	1.62	0.106	-0.07095 0.740971
Constant	0.3495794	1.531078	-0.23	0.819	-3.35044 2.651278

Note: The table provides likelihood of being graduates based on probit model. The model for receiving vouchers in any year is estimated. The common support option has been selected. The region of common support is [0.26190214, 0.99833101]

Description of the estimated propensity score in region of common support Estimated propensity score

	Percentiles	Smallest		
1%	0.2905345	0.261902		
5%	0.3670591	0.268492		
10%	0.4613078	0.290535	Obs	238
25%	0.5923545	0.295835	Sum of Wgt.	238
50%	0.6976195		Mean	0.691766
		Largest	Std. Dev.	0.165588
75%	0.8215132	0.972629		
90%	0.8955993	0.994704	Variance	0.027419
95%	0.9447695	0.995994	Skewness	-0.44208
99%	0.9947042	0.998331	Kurtosis	2.673806

Note: The table shows the percentile distribution counting from the bottom of the estimated propensity score in region of common support. The least 26 th ~ 29 th percentiles of the sample in the region has the 1% probabilities on the participation to the programme and about 99 th percentile of the sample has 99% probabilities.

Step 1: Identification of the optimal number of blocks

Use option detail if you want more detailed output

The final number of blocks is 6

This number of blocks ensures that the mean propensity score is not different for treated and controls in each block

Step 2: Test of balancing property of the propensity score

Use option detail if you want more detailed output

The balancing property is satisfied.

The table shows the number of treated and the number of controls for each block which has certain inferior bound in the propensity score. The left column indicates the number of non-recipients in any year and the right column shows the number of recipients in any year.

Inferior of block of pscore	voucher1		
	0	1	Total
0.2	1	3	4
0.3	9	1	10
0.4	26	25	51
0.6	28	75	103
0.8	9	61	70
Total	73	165	238

Note: the common support option has been selected.

End of the algorithm to estimate the pscore

Appendix 21. Impact of voucher receipt in any one year on poverty

	(1)	(2)	(3)	(4)
	Poverty headcount ratio dydx/ (se)	Poverty headcount ratio dydx/ (se)	Poverty headcount ratio dydx/ (se)	Poverty headcount ratio dydx/ (se)
Time (Round 3=0, Round4=1)	-0.096 (0.155)	-0.134 (0.152)	-0.046 (0.151)	-0.139 (0.138)
Whether household received voucher in any one year (1=received, 0=no)	-0.195** (0.082)	-0.197** (0.081)	-0.149* (0.083)	-0.188** (0.083)
Intersection of Time and voucher receipt in any one year	0.111 (0.117)	0.145 (0.112)	0.132 (0.113)	0.117 (0.112)
Log of household head age	0.026 (0.111)	0.035 (0.109)	0.106 (0.111)	0.067 (0.111)
Sex of household head (1=male, 0=female)	-0.180** (0.079)	-0.177** (0.078)	-0.169** (0.079)	-0.200** (0.079)
Whether household head completed standard 5 (1=yes, 0=no)	-0.185*** (0.057)	-0.176*** (0.056)	-0.183*** (0.057)	-0.200*** (0.057)
Average soil quality of parcels (1=poor, 2=average, 3=good)	-0.123* (0.068)	-0.121* (0.065)	-0.122* (0.066)	
Log of non-farm income (Thousand TZS)	-0.036*** (0.010)	-0.035*** (0.010)		
Averaged access to irrigation facilities of parcels (1=yes, 0=no)	-0.064 (0.079)			
Whether household members / relatives are in elected positions (1=yes, 0=no)	-0.037 (0.054)	-0.049 (0.052)	-0.034 (0.053)	-0.046 (0.053)
Whether household head belong to savings and credit organisations (SACCO) (1=yes, 0=no)	-0.047 (0.066)	-0.046 (0.064)	-0.082 (0.064)	-0.092 (0.064)
Whether household members / relatives are VVC members (1=yes, 0=no)	-0.120 (0.084)	-0.110 (0.082)	-0.099 (0.083)	-0.099 (0.083)
Village variables				
Access to all-weather road (1=yes, 0=no)	0.047 (0.099)	0.047 (0.097)	0.065 (0.098)	0.039 (0.099)
Log of distance to town (km)	0.049 (0.053)	0.031 (0.051)	0.022 (0.051)	0.026 (0.051)
Whether village has permanent input sales point	0.246* (0.132)	0.258** (0.131)	0.246* (0.132)	0.221* (0.129)
Log of number of maize buyers	0.033 (0.037)	0.039 (0.036)	0.040 (0.037)	0.034 (0.036)
Whether village has mobile phone network (1=yes, 0=no)	-0.150 (0.130)	-0.126 (0.124)	-0.139 (0.126)	-0.136 (0.126)
Log of real labour daily cost for land preparation (Thousand TZS)	-0.534 (0.461)	-0.486 (0.445)	-0.418 (0.449)	-0.432 (0.443)

Log of real maize prices (Thousand TZS)	-0.001 (0.015)	-0.001 (0.015)	-0.002 (0.015)	-0.004 (0.015)
Log of size of cultivated land (acre)			-0.111** (0.050)	
Constant	4.129 (2.704)	3.853 (2.636)	3.238 (2.661)	3.251 (2.604)
Number	357	370	370	374
Residuals	0.174	0.162	0.142	0.121

Note: Table shows average marginal effects of OLS using village level fixed effects. dfdx=marginal effects; se=standard error. Errors are calculated using the delta method. Column (1) uses all the listed variables except for land size for cultivation. On top of this excluded variable, Column (2) does not include variable on access to irrigation facilities. Column (3) includes land size for cultivation but does not include the variable on access to irrigation facilities nor non-farm income. On top of the excluded variables for Column (3) Column (4) does not include the average soil quality nor the land size for cultivation. Real prices are calculated by CPI (base year=2009). *, **, *** indicate significance at the 10%, 5% and 1% respectively.

Appendix 22. Impact of voucher receipt in any one year on ownership of household assets 1

	(1) Radio dydx/ (se)	(2) Tables dydx/(se)	(3) Modern house roof dydx/(se)	(4) Bicycles, motor vehicles, etc. dydx/(se)
Time (Round 3=0, Round4=1)	0.009 (0.138)	0.323 (0.218)	0.238* (0.142)	0.232 (0.215)
Whether household received voucher in any one year (1=received, 0=no)	0.273*** (0.074)	-0.024 (0.116)	0.211*** (0.076)	0.203* (0.115)
Intersection of Time and voucher receipt in any one year	-0.016 (0.102)	0.124 (0.160)	-0.173* (0.105)	-0.249 (0.158)
Log of household head age	0.135 (0.098)	-0.070 (0.154)	0.053 (0.101)	0.029 (0.153)
Sex of household head (1=male, 0=female)	0.049 (0.070)	0.197* (0.110)	0.059 (0.073)	0.001 (0.109)
Whether household head completed standard 5 (1=yes, 0=no)	0.043 (0.051)	0.054 (0.081)	0.031 (0.053)	0.120 (0.080)
Average soil quality of parcels (1=poor, 2=average, 3=good)	0.051 (0.058)	0.021 (0.092)	0.070 (0.060)	0.090 (0.091)
Log of non-farm income (Thousand TZS)	0.027*** (0.009)	0.040*** (0.014)	0.016* (0.009)	0.058*** (0.014)
Whether household members / relatives are in elected positions (1=yes, 0=no)	-0.007 (0.047)	-0.004 (0.075)	0.033 (0.049)	0.006 (0.074)
Whether household head belong to savings and credit organisations (SACCO) (1=yes, 0=no)	-0.013 (0.059)	0.020 (0.093)	0.210*** (0.061)	0.154* (0.092)
Whether household members / relatives are VVC members (1=yes, 0=no)	-0.042 (0.075)	0.115 (0.118)	-0.037 (0.077)	-0.015 (0.117)
Village variables				
Access to all-weather road (1=yes, 0=no)	-0.090 (0.090)	0.067 (0.141)	0.145 (0.092)	-0.033 (0.139)
Log of distance to town (km)	0.018 (0.046)	-0.043 (0.072)	0.003 (0.048)	0.125* (0.072)
Whether village has permanent input sales point (1=yes, 0=no)	-0.084 (0.118)	0.034 (0.186)	-0.015 (0.122)	-0.197 (0.184)
Log of number of maize buyers visiting to village	-0.002 (0.032)	-0.028 (0.051)	0.018 (0.033)	0.054 (0.051)
Whether village has mobile phone network (1=yes, 0=no)	0.006 (0.113)	0.045 (0.177)	-0.228* (0.117)	-0.107 (0.175)
Log of real labour daily cost for land preparation (Thousand TZS)	0.394 (0.405)	0.537 (0.637)	0.183 (0.418)	-0.511 (0.630)
Log of real maize prices (Thousand TZS)	0.000 (0.014)	0.049** (0.022)	0.030** (0.014)	0.009 (0.021)
Constant	-2.533 (2.394)	-1.960 (3.768)	-1.064 (2.464)	2.733 (3.726)
Number	384	384	381	384
Residuals	0.124	0.086	0.145	0.111

Note: Table shows average marginal effects of OLS using village level fixed effects. ddfdx=marginal effects; se=standard error. Errors are calculated using the delta method. Tables, bicycles (Do not own=0, Own one table or bicycles, etc.=1, Own more than two=2), Radio (Own radio=1, Do not own=0), Modern house roof (Have modern house roof=1, Do not have=0), Real prices are calculated by CPI (base year=2009). *, **, *** indicate significance at the 10%, 5% and 1% respectively.

Appendix 23. Impact of voucher receipt in any one year on ownership of household assets 2

	(1) Mobile phone dydx/ (se)	(2) Log of bed dydx/(se)
Time (Round 3=0, Round4=1)	0.617*** (0.207)	0.984*** (0.132)
Whether household received voucher in any one year (1=received, 0=no)	0.253** (0.111)	0.242*** (0.070)
Intersection of Time and voucher receipt in any one year	0.165 (0.152)	-0.081 (0.097)
Log of household head age	-0.162 (0.147)	0.059 (0.094)
Sex of household head (1=male, 0=female)	0.025 (0.105)	0.101 (0.067)
Whether household head completed standard 5 (1=yes, 0=no)	0.153** (0.077)	0.051 (0.049)
Average soil quality of parcels (1=poor, 2=average, 3=good)	-0.078 (0.088)	0.006 (0.056)
Log of non-farm_income (Thousand TZS)	0.054*** (0.013)	0.024*** (0.008)
Whether household members / relatives are in elected positions (1=yes, 0=no)	-0.016 (0.071)	0.032 (0.045)
Whether household head belong to savings and credit organisations (SACCO) (1=yes, 0=no)	0.183** (0.088)	0.106* (0.056)
Whether household members / relatives are VVC members (1=yes, 0=no)	0.081 (0.112)	-0.048 (0.071)
Village variables		
Access to all-weather road (1=yes, 0=no)	0.319** (0.134)	0.113 (0.085)
Log of distance to town (km)	-0.130* (0.069)	-0.044 (0.044)
Whether village has permanent input sales point (1=yes, 0=no)	-0.069 (0.178)	-0.111 (0.113)
Log of number of maize buyers visiting to village	-0.026 (0.049)	-0.008 (0.031)
Whether village has mobile phone network (1=yes, 0=no)	-0.009 (0.169)	0.005 (0.107)
Log of real labour daily cost for land preparation (Thousand TZS)	0.756 (0.607)	0.767** (0.386)
Log of real maize prices (Thousand TZS)	0.022 (0.021)	0.012 (0.013)
Constant	-3.728 (3.591)	-4.547** (2.283)
Number	384	384
Residuals	0.247	0.479

Note: Table shows average marginal effects of OLS using village level fixed effects. ddx=marginal effects; se=standard error. Errors are calculated using the delta method. Beds: Number of beds. Mobile phone (not own=0, own one=1, own more than two=2). *, **, *** indicate significance at the 10%, 5% and 1% respectively.

Appendix 24. Propensity score matching for graduates

The treatment is graduates

graduates	Freq.	Percent	Cum.
0	243	78.64	78.64
1	66	21.36	100
Total	309	100	

The table shows sample distribution of graduates (=1) and non-graduates (=0) groups. Estimation of the propensity score

Iteration 0: log likelihood = -128.53839
 Iteration 1: log likelihood = -95.556327
 Iteration 2: log likelihood = -93.572197
 Iteration 3: log likelihood = -93.512375
 Iteration 4: log likelihood = -93.512285

Probit regression

Number of obs =222
 LR chi2(19) = 70.05
 Prob > chi2 = 0.0000
 Log likelihood = -93.512285
 Pseudo R2 = 0.2725

Graduates	Coefficient	Standard Error	z	P>z	[95% Conf. Interval]	
Log of household head age	-0.42648	0.39872	-1.07	0.285	-1.20796	0.354994
Sex of household head	0.3519	0.321702	1.09	0.274	-0.27862	0.982424
Education level of household head	0.211154	0.23061	0.92	0.36	-0.24083	0.66314
Average soil quality	-0.23433	0.353519	-0.66	0.507	-0.92721	0.458559
Log of contribution amount to village	0.054563	0.10162	0.54	0.591	-0.14461	0.253734
Log of number of farmers in the household	0.037986	0.043164	0.88	0.379	-0.04661	0.122586
Log of total household consumption per adult equivalent	0.2849	0.131793	2.16	0.031	0.026591	0.54321
Average in access to irrigation facilities by parcels	-1.08874	0.921709	-1.18	0.238	-2.89525	0.71778
Whether household members or relatives are in elected position in the village	-0.1846	0.212678	-0.87	0.385	-0.60144	0.232241
Whether household head belongs to SACCO	0.216002	0.24254	0.88	0.379	-0.26498	0.696984
Whether household members or relatives are in VVC	0.298276	0.259766	1.15	0.251	-0.21086	0.807408
Whether the village has access to all weather road	0.145802	0.276335	0.53	0.598	-0.39581	0.687409
Log of distance to town	-0.03197	0.143674	-0.22	0.824	-0.31356	0.249629
Whether the village has access to input sales points	1.464775	0.526235	2.78	0.005	0.433373	2.496177
Log of maize buyers in the village	0.260995	0.11481	2.27	0.023	0.03597	0.486019
Whether the village has mobile phone	0.107632	0.27133	0.4	0.692	-0.42416	0.639429
Log of real urea price	0.120766	0.04785	2.52	0.012	0.026982	0.21455
Log of daily labour wage for land preparation	0.062173	0.0465	1.34	0.181	-0.02897	0.153311
Log of real maize price	0.052891	-0.04601	1.15	0.25	-0.03729	0.143068
Constant	-2.50383	1.856307	-1.35	0.177	-6.14212	1.134467

Note: The table provides likelihood of being graduates based on probit model. The model for being graduates is estimated. The common support option has been selected. The region of common support is [0.09800602, 0.94581225]

Appendix 25. Impact of being graduates on poverty and ownership of household assets

	(1) Poverty headcount ratio dydx/(se)	(2) Radio dydx/(se)	(3) Tables dydx/(se)	(4) Modern houeroof dydx/(se)
Time (Round 3=0, Round4=1)	0.047 (0.187)	-0.014 (0.162)	0.309 (0.240)	0.156 (0.172)
Whether household received voucher for more than three years (1=received, 0=no)	0.021 (0.098)	0.239*** (0.084)	0.081 (0.125)	0.185** (0.091)
Intersection of Time and voucher receipt for more than three years	-0.134 (0.141)	-0.069 (0.122)	0.179 (0.181)	-0.136 (0.131)
Log of household head age	0.009 (0.138)	-0.009 (0.121)	0.086 (0.179)	-0.025 (0.128)
Sex of household head (1=male, 0=female)	-0.165 (0.103)	0.045 (0.088)	0.184 (0.130)	0.114 (0.094)
Whether household head completed standard 5 (1=yes, 0=no)	-0.198*** (0.076)	0.035 (0.066)	-0.047 (0.099)	0.028 (0.071)
Average soil quality of parcels (1=poor, 2=average, 3=good)	-0.084 (0.079)	0.057 (0.069)	-0.044 (0.102)	0.069 (0.073)
Log of non-farm_income (Thousand TZS)	-0.032** (0.012)	0.024** (0.011)	0.042*** (0.016)	0.019 (0.011)
Whether household members / relatives are in elected positions (1=yes, 0=no)	-0.075 (0.063)	0.018 (0.055)	0.016 (0.081)	0.077 (0.058)
Whether household head belong to savings and credit organisations (SACCO) (1=yes, 0=no)	-0.062 (0.076)	-0.017 (0.067)	0.065 (0.099)	0.168** (0.071)
Whether household members / relatives are VVC members (1=yes, 0=no)	-0.063 (0.091)	-0.027 (0.080)	0.023 (0.118)	-0.108 (0.085)
Village variables				
Access to market (1=more than 1 hour to reach market, 0=otherwise)	-0.059 (0.248)	-0.120 (0.211)	-0.084 (0.312)	-0.083 (0.224)
Access to all-weather road (1=yes, 0=no)	-0.058 (0.140)	-0.151 (0.120)	0.053 (0.178)	0.184 (0.128)
Log of distance to town (km)	0.135* (0.071)	0.038 (0.062)	0.029 (0.092)	-0.009 (0.066)
Whether village has permanent input sales point (1=yes, 0=no)	0.259 (0.173)	-0.076 (0.152)	0.218 (0.226)	-0.035 (0.162)
Log of number of maize buyers visiting to village	0.065 (0.062)	-0.018 (0.054)	0.018 (0.080)	-0.026 (0.057)
Whether village has mobile phone network (1=yes, 0=no)	0.051 (0.172)	0.027 (0.151)	0.038 (0.224)	-0.428*** (0.162)
Log of real labour daily cost for land preparation (Thousand TZS)	-0.708 (0.647)	0.417 (0.545)	0.130 (0.808)	0.627 (0.579)
Log of real maize prices (Thousand TZS)	0.008 (0.018)	-0.007 (0.016)	0.039* (0.024)	0.027 (0.017)
Constant	4.786 (3.993)	-2.092 (3.340)	-0.332 (4.951)	-3.224 (3.535)
Number	258	265	265	262
Residuals	0.158	0.129	0.108	0.175

Note: Table shows average marginal effects of OLS using village level fixed effects. dfdx=marginal effects; se=standard error. Errors are calculated using the delta method. Tables (Do not own=0, Own one table or bicycles, etc.=1, Own more than two=2), Radio (Own radio=1, Do not own=0), Modern house roof (Have modern house roof=1, Do not have=0). Real prices are calculated by CPI (base year=2009). *, **, *** indicate significance at the 10%, 5% and 1% respectively.

Appendix 26. Impact of being graduates on ownership of household assets

	(1) bicycle dydx/(se)	(2) Mobile phone dydx/(se)	(3) Log of bed dydx/(se)
Time (Round 3=0, Round4=1)	-0.061 (0.253)	0.633** (0.259)	0.893*** (0.152)
Whether household received voucher for more than three years (1=received, 0=no)	0.217* (0.131)	0.078 (0.134)	0.216*** (0.079)
Intersection of Time and voucher receipt for more than three years	0.127 (0.190)	0.152 (0.194)	-0.049 (0.114)
Log of household head age	0.010 (0.188)	-0.183 (0.193)	0.009 (0.113)
Sex of household head (1=male, 0=female)	-0.020 (0.137)	-0.040 (0.140)	0.141* (0.082)
Whether household head completed standard 5 (1=yes, 0=no)	0.005 (0.104)	0.089 (0.106)	0.076 (0.062)
Average soil quality of parcels (1=poor, 2=average, 3=good)	0.066 (0.107)	-0.044 (0.110)	-0.002 (0.064)
Log of non-farm_income (Thousand TZS)	0.063*** (0.017)	0.048*** (0.017)	0.026** (0.010)
Whether household members / relatives are in elected positions (1=yes, 0=no)	-0.007 (0.085)	0.043 (0.087)	0.011 (0.051)
Whether household head belong to savings and credit organisations (SACCO) (1=yes, 0=no)	0.132 (0.104)	0.250** (0.106)	0.062 (0.062)
Whether household members / relatives are VVC members (1=yes, 0=no)	-0.058 (0.125)	0.046 (0.127)	-0.009 (0.075)
Village variables			
Access to market (1=more than 1 hour to reach market, 0=otherwise)	-0.244 (0.329)	-0.444 (0.336)	0.192 (0.198)
Access to all-weather road (1=yes, 0=no)	-0.088 (0.188)	0.375* (0.192)	0.058 (0.113)
Log of distance to town (km)	0.170* (0.097)	-0.112 (0.099)	-0.054 (0.058)
Whether village has permanent input sales point (1=yes, 0=no)	-0.121 (0.238)	-0.046 (0.243)	-0.018 (0.143)
Log of number of maize buyers visiting to village	0.114 (0.084)	-0.011 (0.086)	-0.042 (0.050)
Whether village has mobile phone network (1=yes, 0=no)	-0.115 (0.236)	0.016 (0.241)	0.060 (0.142)
Log of real labour daily cost for land preparation (Thousand TZS)	-0.899 (0.851)	0.799 (0.869)	0.657 (0.511)
Log of real maize prices (Thousand TZS)	-0.010 (0.025)	0.006 (0.026)	0.009 (0.015)
Constant	5.543 (5.215)	-3.909 (5.329)	-3.815 (3.134)
Number	265	265	265
Residuals	0.144	0.220	0.490

Note: Table shows average marginal effects of OLS using village level fixed effects. dfdx=marginal effects; se=standard error. Errors are calculated using the delta method. Bicycle (Do not own=0, Own one table or bicycles, etc.=1, Own more than two=2), Mobile phone (not own=0, own one=1, own more than two=2). Beds=number of beds. *, **, *** indicate significance at the 10%, 5% and 1% respectively.

Appendix 27. Impact of being graduates on ownership of livestock

	(1) Log of poultry dydx/(se)	(2) Log of cow dydx/(se)	(3) Log of goat dydx/(se)	(4) Log of pig dydx/(se)
Time (Round3=0, Round4=1)	0.588 (0.645)	0.191 (0.267)	0.422 (0.448)	0.354 (0.300)
Voucher receipt for more than three years(1=yes, 0=no)	-0.005 (0.251)	0.259** (0.104)	0.406** (0.174)	0.137 (0.117)
Intersection of Time and voucher receipt for more than three years	0.416 (0.405)	0.060 (0.168)	0.058 (0.281)	0.048 (0.188)
Log of household head age	0.300 (0.370)	0.099 (0.153)	0.228 (0.256)	0.358** (0.172)
Sex of household head (1=male, 0=female)	-0.186 (0.273)	0.083 (0.113)	-0.200 (0.189)	-0.091 (0.127)
Whether household head completed standard 5 (1=yes, 0=no)	-0.005 (0.201)	-0.126 (0.083)	-0.019 (0.139)	-0.081 (0.093)
Averaged soil quality of parcels (1=Poor, 2=Average, 3=Good)	0.174 (0.219)	-0.030 (0.091)	0.162 (0.152)	-0.138 (0.102)
Log of total non-farm income (Thousand TZS)	0.080** (0.033)	-0.006 (0.014)	0.006 (0.023)	0.022 (0.015)
Averaged access to irrigation facilities of parcels (1=yes, 0=no)	-0.002 (0.282)	-0.063 (0.117)	0.444** (0.196)	0.066 (0.131)
Whether household members or relatives are in elected positions in the village (1=yes, 0=no)	0.151 (0.168)	-0.095 (0.070)	-0.082 (0.117)	0.131* (0.078)
Whether household head belongs to saving and credit organisation (SACCO) (1=yes, 0=no)	0.179 (0.198)	0.127 (0.082)	0.285** (0.138)	0.039 (0.092)
Whether household members / relatives are VVC members (1=yes, 0=no)	0.227 (0.236)	0.097 (0.098)	-0.335** (0.163)	-0.021 (0.109)
Village variables				
Access to market (1=yes, 0=no)	0.088 (0.368)	0.097 (0.153)	-0.015 (0.255)	-0.029 (0.171)
Access to all-weather road (1=yes, 0=no)	-0.192 (0.250)	-0.196* (0.104)	-0.299* (0.174)	-0.105 (0.116)
Log of distance to town (km)	-0.928 (0.633)	-0.384 (0.262)	-0.137 (0.439)	-0.238 (0.294)
Whether village has permanent input sales points (1=yes, 0=no)	-0.089 (0.190)	-0.098 (0.079)	-0.056 (0.132)	0.013 (0.088)
Log of number of maize buyers in the village	-0.888* (0.535)	0.161 (0.222)	-0.342 (0.371)	-0.280 (0.249)
Whether village has mobile phone network (1=yes, 0=no)	0.080* (0.047)	0.024 (0.020)	0.068** (0.033)	0.019 (0.022)
Log of real urea price in village (Thousand TZS)	1.806 (2.294)	0.979 (0.950)	1.242 (1.590)	0.129 (1.066)
Log of real labour daily cost for land in the village (Thousand TZS)	-0.017 (0.047)	-0.022 (0.020)	0.034 (0.033)	0.010 (0.022)
Log of real maize sales prices by households (Thousand TZS)	-10.147 (14.418)	-5.676 (5.974)	-6.841 (9.997)	-1.171 (6.699)
Constant	238	238	238	238
Residuals	0.148	0.147	0.204	0.111

Note: Table shows average marginal effects of OLS using village level fixed effects.
 dfdx=marginal effects; se=standard error. Errors are calculated using the delta method. *, **, ***
 indicate significance at the 10%, 5% and 1% respectively.

Appendix 28. Impact of being graduates on children not attending primary school

	Children not attending primary school dydx/(se)
Time (Round3=0, Round4=1)	0.058 (0.091)
Voucher receipt for more than three years (1=yes, 0=no)	0.046 (0.047)
Intersection of Time and voucher receipt for more than three years	-0.057 (0.068)
Log of household head age	-0.120* (0.068)
Sex of household head (1=male, 0=female)	-0.001 (0.049)
Whether household head completed standard 5 (1=yes, 0=no)	-0.001 (0.037)
Averaged soil quality of parcels (1=Poor, 2=Average, 3=Good)	-0.051 (0.039)
Log of total non-farm income (Thousand TZS)	0.003 (0.006)
Whether household members or relatives are in elected positions in the village (1=yes, 0=no)	0.035 (0.031)
Whether household head belongs to saving and credit organisation (SACCO) (1=yes, 0=no)	-0.014 (0.037)
Whether household members / relatives are VVC members (1=yes, 0=no)	-0.045 (0.045)
Village variables	
Access to market (1=yes, 0=no)	0.004 (0.118)
Access to all-weather road (1=yes, 0=no)	-0.008 (0.068)
Log of distance to town (km)	-0.044 (0.035)
Whether village has permanent input sales points (1=yes, 0=no)	0.083 (0.086)
Log of number of maize buyers in the village	-0.009 (0.030)
Whether village has mobile phone network (1=yes, 0=no)	-0.002 (0.085)
Log of real labour daily cost for land in the village (Thousand TZS)	-0.159 (0.306)
Log of real maize sales prices by households (Thousand TZS)	-0.010 (0.009)
Constant	1.680 (1.875)
Number	265
Residuals	0.078

Note: Table shows average marginal effects of OLS using village level fixed effects. dfdx=marginal effects; se=standard error. Errors are calculated using the delta method. *, **, *** indicate significance at the 10%, 5% and 1% respectively.

Appendix 29. Impact of voucher receipt in 2011/12 on log of total calorie consumed in last 7 days per adult eater equivalent

	(1) Log of total calorie consumed per adult eater equivalent dydx/(se)	(2) Log of total calorie consumed per adult eater equivalent dydx/(se)
Time (Round3=0, Round4=1)	0.100 (0.193)	-0.300*** (0.102)
Voucher receipt in 2011/12 (1=received, 0=no)	-0.088 (0.093)	-0.170* (0.087)
Intersection of Time and voucher receipt in 2011/12	0.012 (0.143)	0.255*** (0.106)
Log of household head age	0.486*** (0.143)	0.520*** (0.134)
Sex of household head (1=male, 0=female)	-0.106 (0.107)	-0.049 (0.090)
Whether household head completed standard 5 (1=yes, 0=no)	0.148* (0.075)	0.118* (0.067)
Averaged soil quality of parcels (1=Poor, 2=Average, 3=Good)	0.122 (0.088)	0.137* (0.074)
Log of non-farm income (Thousand TZS)	0.025* (0.013)	0.034*** (0.012)
Whether household members or relatives are in elected positions in the village (1=yes, 0=no)	0.023 (0.070)	-0.036 (0.062)
Whether household head belongs to saving and credit organisation (SACCO) (1=yes, 0=no)	0.042 (0.088)	-0.037 (0.078)
Whether household members / relatives are VVC members (1=yes, 0=no)	0.063 (0.109)	0.073 (0.094)
Village variables		
Access to market (1=yes, 0=no)	0.492* (0.257)	
Access to all-weather road (1=yes, 0=no)	-0.060 (0.144)	
Log of distance to town (km)	-0.060 (0.070)	
Whether village has permanent input sales points (1=yes, 0=no)	-0.176 (0.182)	
Log of number of maize buyers in the village	-0.032 (0.051)	
Whether village has mobile phone network (1=yes, 0=no)	-0.049 (0.165)	
Log of real labour daily cost for land preparation (Thousand TZS)	1.073* (0.620)	
Log of real maize prices (Thousand TZS)	0.002 (0.021)	-0.014 (0.019)
Constant	-5.173 (3.611)	0.826 (0.540)
Number	394	462
Residuals	0.097	0.091

Note: Table shows average marginal effects of OLS using village level fixed effects. dfdx=marginal effects; se=standard error. Errors are calculated using the delta method. Column (1) includes all the variables. Column (2) does not use village variables except for real maize prices. *, **, *** indicate significance at the 10%, 5% and 1% respectively.

Appendix 30. Impact of voucher receipt in any year on log of total calorie consumed in last 7 days per adult equivalent eater

	(1) Log of total calorie consumed per adult equivalent eater dydx/(se)	(2) Log of total calorie consumed per adult equivalent eater dydx/(se)
Time (Round3=0, Round4=1)	-0.372*** (0.119)	-0.002 (0.209)
Voucher receipt in 2011/12 (1=received, 0=no)	0.023 (0.092)	0.096 (0.099)
Intersection of Time and voucher receipt in 2011/12	0.216*** (0.109)	0.024 (0.138)
Log of household head age	0.476*** (0.135)	0.494*** (0.143)
Sex of household head (1=male, 0=female)	-0.053 (0.090)	-0.106 (0.104)
Whether household head completed standard 5 (1=yes, 0=no)	0.140*** (0.068)	0.167*** (0.076)
Averaged soil quality of parcels (1=Poor, 2=Average, 3=Good)	0.148*** (0.071)	0.123 (0.086)
Log of non-farm income (Thousand TZS)	0.030*** (0.012)	0.025* (0.013)
Whether household members or relatives are in elected positions in the village (1=yes, 0=no)	-0.058 (0.062)	0.013 (0.069)
Whether household head belongs to saving and credit organisation (SACCO) (1=yes, 0=no)	-0.052 (0.077)	-0.014 (0.087)
Whether household members / relatives are VVC members (1=yes, 0=no)	0.101 (0.096)	0.088 (0.110)
Village variables		
Log of real maize prices (Thousand TZS)	-0.017 (0.019)	-0.000 (0.020)
Access to market (1=yes, 0=no)		0.402 (0.256)
Access to all-weather road (1=yes, 0=no)		-0.067 (0.143)
Log of distance to town (km)		-0.090 (0.069)
Whether village has permanent input sales points (1=yes, 0=no)		-0.229 (0.176)
Log of number of maize buyers in the village		-0.074 (0.050)
Whether village has mobile phone network (1=yes, 0=no)		0.286* (0.166)
Log of real labour daily cost for land preparation (Thousand TZS)		0.965 (0.593)
Constant	0.884 (0.552)	-4.886 (3.507)
Number	462	384
Residuals	0.084	0.105

Note: Table shows average marginal effects of OLS using village level fixed effects. dfdx=marginal effects; se=standard error. Errors are calculated using the delta method. Column (2) includes all the household and village variables. Column (1) does not use the village variables except for the real maize prices. *, **, *** indicate significance at the 10%, 5% and 1% respectively.

Appendix 31. Impact of being graduates on log of total calorie consumed in last 7 days per adult equivalent eater

	(1) Log of total calorie consumed per adult equivalent eater dydx/(se)	(2) Log of total calorie consumed per adult equivalent eater dydx/(se)
Time (Round3=0, Round4=1)	-0.187 (0.241)	-0.300** (0.130)
Voucher receipt for more than three years (1=yes, 0=no)	-0.051 (0.107)	-0.142 (0.105)
Intersection of Time and voucher receipt for more than three years	0.042 (0.165)	0.107 (0.129)
Log of household head age	0.712*** (0.181)	0.763*** (0.180)
Sex of household head (1=male, 0=female)	0.023 (0.131)	0.026 (0.111)
Whether household head completed standard 5 (1=yes, 0=no)	0.230** (0.100)	0.182** (0.091)
Averaged soil quality of parcels (1=Poor, 2=Average, 3=Good)	0.139 (0.104)	0.185** (0.085)
Log of non-farm income (Thousand TZS)	0.009 (0.016)	0.023 (0.015)
Whether household members or relatives are in elected positions in the village (1=yes, 0=no)	0.035 (0.082)	-0.032 (0.075)
Whether household head belongs to saving and credit organisation (SACCO) (1=yes, 0=no)	0.033 (0.099)	-0.008 (0.093)
Whether household members / relatives are VVC members (1=yes, 0=no)	0.057 (0.119)	0.049 (0.106)
Village variables		
Access to market (1=yes, 0=no)	0.037 (0.315)	
Access to all-weather road (1=yes, 0=no)	0.083 (0.180)	
Log of distance to town (km)	-0.103 (0.093)	
Whether village has permanent input sales points (1=yes, 0=no)	-0.061 (0.229)	
Log of number of maize buyers in the village	-0.102 (0.081)	
Whether village has mobile phone network (1=yes, 0=no)	0.195 (0.226)	
Log of real labour daily cost for land preparation (Thousand TZS)	1.205 (0.818)	
Constant	-7.362 (5.014)	-0.264 (0.724)
Number	265	298
Residuals	0.129	0.113

Note: Table shows average marginal effects of OLS using village level fixed effects. dfdx=marginal effects; se=standard error. Errors are calculated using the delta method. Column (1) includes all the household and village variables. Column (2) does not use village variables. *, **, *** indicate significance at the 10%, 5% and 1% respectively.