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Research Outline and Preliminary Findings: Impact of Agricultural Input Subsidies on Poverty in Tanzania

by

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ABSTRACT

On the preliminary analysis of the qualitative research, in some villages where the voucher was distributed somehow according to the guideline of the programme, the farmers and key stakeholders mentioned that there was positive impact of agricultural input voucher where recipient farmers have increased maize/rice production and increased income and improved living, while in other villages this impact is really unseen because of the corruption where the benefits of the voucher were captured only by powerful people, such as government officers, village voucher committees, agro-dealers, financially-able farmers, and politicians. In the latter case, the implementation is influenced by power and corruption.

In the villages where vouchers were distributed to farmers mostly according to the guideline, recipient farmers in Ruvuma increased maize/rice production substantially. On average they have had about 5 or less bags of maize per acre before the programme. But with the voucher they could have about 10 to 25 bags per acre, depending on the weather, places, and their production practices.

Because of increased production the life of farmers in the villages was improved after the programme introduction, e.g. enough maize/rice now for their own consumption, improvement of the house either from mud to bricked, or thatched roof to cement, buying beds, mattress, and bicycles, paying school fees for children.

But there are several issues that might have hindered the effective impact of voucher on maize/rice productivity and poverty.

The first one is the late delivery of vouchers. Vouchers have come late in agricultural season in the area in 2010/11 and 2011/12, which made sometimes difficult the use of inputs for farmers and made less use of inputs. The farmers who had already planted with 1st application of fertilizers by the time of delivery of vouchers sometimes use the fertilizer for other crops or use the seeds for next year.

The second is about targeting. Implementation of targeting criteria for beneficiaries of vouchers and farmers' knowledge about targeting criteria slightly differ among villages, which sometimes made targeting of vouchers to the people who were not intended by the programme. And some informants in a village in Songea DC reported that a few power people, e.g. the village voucher committee members, have 4 or 5 vouchers in 1 household. Though the number of allocation of vouchers to that village in last year was 3 times of the number of farmers in that village, there are other people who have not received any vouchers in the village. It seems that there is an allocation bias of vouchers toward powerful households.

The third is increase of input price. The input market price increased so much since 2010/11; meanwhile the voucher price maintained almost the same price, which made difficult the continuous uptake of vouchers by poor farmers and their lives. The input price was high in 2008/9 due to the high prices in international market. After that it reduced once in 2009/10, it has been increasing again since 2010/11. For example, the price of UREA in Tunduru district increased more than 2.2 times in 2011/12 since 2009/10. The one of DAP increased more than 1.4 times during the same period. Meanwhile, the voucher price of UREA and DAP during the same period decreased by 1,000 Tsh. per 2 bags and increased only 3,000 Tsh. per bag, respectively.

Informants mentioned that the reasons for increasing input prices were: exchange rate; increase of fuel prices; and that some agro-dealers want to maximize profit in monopolistic situation. TFC, who has about 25-30% share in fertilizer market in the country informed that international fertilizer prices change substantially during a year.

The fourth is selling vouchers to agro-dealers by farmers. This collusion between farmers and agro-dealers occurred especially in the first years of programme since farmers were not aware of the importance of using inputs for their production. Farmers often sell signed vouchers back to the agro-dealers with cheap prices, where agro-dealers could receive redemption of full price as if they had sold inputs. But as the years of the programme go, farmers have become aware of the importance of the inputs, this tendency has reduced.

The fifth is cheating by agro-dealers. Many small agro-dealers did not have enough capital, so that they could not deliver inputs to the area after being contracted by the government and getting loans from the input supplier companies. And some agro-dealers have sold either fake fertilizers, e.g. mixing it with sold, etc. or less amount than indicated in the bag. District officials in some districts in Ruvuma and Ministry of officials informed that they have been making monitoring visits to the villages and caught some cheating cases. They brought some cases to the court and put them in jail.

In other villages the vouchers were used not according to the guideline. In some villages when the vouchers were so few, almost no farmers in the village get vouchers except for village leaders and government officials. For example, vouchers were captured firstly by the village leaders and village voucher committees, in order for them to get more vouchers they write the names of dead person or children as beneficiaries, and even they sold vouchers to agro-dealers to get some profits. Farmers in the village know about the situation, but they are not willing to report the situation to the government, for they say that even higher level of government officials know the situation and even they are involved in this situation. Farmers fear about the disturbance to come from these powerful people after they report about the situation.

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1.0 BACKGROUND

While the agricultural GDP growth in Sub-Saharan Africa has averaged nearly 3 % over the past 25 years, the growth rate of agricultural GDP per capita for the region was close to zero or negative from the 1970s to early 1990s. With positive growth rate of agricultural GDP per capita in the last 15 years, this trend has been reversed by improvements in agricultural performance, better macroeconomic policies and higher commodity prices. But the food production, especially cereal yields are still lagging (World Bank, 2007). One of the main reasons for this low productivity is low levels of input (access to irrigation, fertilizer and improved seeds) use. Other reasons for low productivity include soil degradation, low population density, underdeveloped road network, diverse agro-ecological system and policy distortion against agriculture. Input use in Sub-Saharan Africa is 8 kg / hectare, compared with 78 kg / hectare in Latin America, 96 kg / hectare in East and Southeast Asia, and 101 kg / hectare in South Asia in 2002 (Morris *et al.*, 2007). The low use of inputs is mainly caused by high prices and under-developed market. These are due to low volume of demand and high transport cost because of lack of access to good road (World Bank, 2007).

In this context several African countries (Nigeria, Malawi, Zambia, Kenya, Tanzania, Ghana, Rwanda, Mali and Senegal) have reintroduced input subsidies since late 1990s (Banful, 2011). African union member states gathered for the African Fertilizer Summit in 2006 and declared their unanimous commitment to increase fertilizer use from the then current low level of 8 kg per hectare to an average of 50 kg per hectare and that they would provide funding for financing mechanisms for fertilizer operation, smart subsidies, and elimination of all taxes and tariffs on fertilizers and their raw materials (African Union, 2006).

Tanzania liberalized its agricultural markets in the mid-1980s and have removed price controls and input subsidies and privatized various public enterprises, as these were thought to cause fiscal constraints and to result in inefficient and corrupt management. Fertilizer subsidies were gradually removed from 1990. After all subsidies were cut, the relative price of fertilizer increased. But because of low initial use of fertilizer in national context, its impact on fertilizer use was not significant and its impact on national maize production has been modest (by only less than 5%) (Cooksey, 2012).

Maize has been one of the success stories of agricultural liberalization in this country (Cooksey, 2005). In general the availability of maize has kept pace with demand, even if the removal of pan-territorial prices led to a decline in marketed production in three of the maize growing regions in the Southern highlands (Ruvuma, Mbeya, and Rukwa). Prior to the mid-1990s, Tanzania Fertilizer Company, which was financed

by state-owned banks, imported and distributed the fertilizer as commodity aid to the farmers. At that time a relatively small group of rich farmers utilised most of the fertilizer.

In Tanzania, average annual agricultural sector growth of 4-5% for the past 10 – 15 years has contributed towards continuous economic growth averaging 6.0% (Robinson *et al.*, 2011), and there has been some modest structural change. The contribution of the agriculture sector to GDP has declined from 29% in 2001 to 24% in 2010, while manufacturing sector grows its share from 4.8% in 2000 to 7.9% in 2010 and services sector makes largest proportion with 43.9% of total GDP in 2010. Despite its declining share of GDP, agriculture nonetheless employs three quarters of the labour force (Research and Analysis Working Group *et al.*, 2011). The rural poverty rate decreased by 1.1% from 38.7% to 37.6% during 2000/1 and 2007 (National Bureau of Statistics Tanzania, 2002, Ministry of Finance and Economic Affairs and National Bureau of Statistics Tanzania, 2009). The national Gini coefficient has showed a little reduction from 0.35 to 0.34 during the period.

The reasons for high level of rural poverty include market failure in rural areas, lack of infrastructure, limited technical and financial support to agriculture, and low agricultural productivity (Mashindano *et al.*, 2011). An absence of adequate road networks, storage facilities, and credit and savings services have led to information asymmetries and non-competitive markets. Findings in rural Tanzania suggest that poor farmers have suffered from the suppression of producer prices by crop traders, whilst at the same time prices against input costs have declined and the cost of living have increased since late 1990s (Skarstein, 2005, Mashindano *et al.*, 2011).

Historically, agricultural input use has been very low in Tanzania, with only 13%[1] of farmers reported to use fertilizers in 2002/3 (National Bureau of Statistics *et al.*, 2006b, Minot, 2009). This is only slightly higher than the average for Sub-Saharan African countries (World Bank, 2007). The National Sample Census of Agriculture 2002/3 reports that the reasons for low input use are high prices (45% of the farmers), lack of purchasing power (10.5%), insufficient knowledge of the effects of inputs (7.9%) and how to use them (7.8%) (National Bureau of Statistics *et al.*, 2006b). The findings of Views of the People 2007 that farmers expect the state to provide better access to productive inputs (MKUKUTA Monitoring System *et al.*, 2007).

[1] 10.5% of farmers used chemical inputs in 1997/98 (Skarstein, R. (2005) Economic Liberalization and Smallholder Productivity in Tanzania. From Promised Success to Real Failure, 1985 - 1998. *Jounal of Agrarian Change,* Vol. 5 (No.3) 334-362.

2.0 THE INPUT SUBSIDY PROGRAMME (NATIONAL AGRICULTURAL INPUT VOUCHER SCHEME)

Facing the food and inputs prices spikes of 2008, Tanzania introduced the Input Subsidy Programme (NAIVS: National Agricultural Inputs Voucher Scheme) in June 2009, with the assistance of the World Bank. The programme intends to achieve greater food security by increasing food production and providing social protection for the poor. It is a '(market-) smart subsidy', to the degree that it utilizes vouchers. '(Market-) smart subsidy' uses vouchers, matching grants and partial loan guarantees to encourage a private-sector-led approach as well as target poor farmers who would not otherwise have used the inputs (United Nations, 2005, Minot and Benson, 2009). It is targeted to Southern Highlands, Central Zone, and North where the inputs and hybrid seeds are expected to increase production. The programme has been piloted in limited areas since 2007[2]. The plan was for 2.5 million farmers in 65 districts to receive vouchers by the end of the programme in June 2012 (World Bank, 2009). The main targeted region was Southern Highlands (Iringa, Mbeya, Ruvuma, Rukwa), where it was reported that about 75% of the maize/rice farmers in the programme areas were covered[3]. The programme period was planned for five years; the first three years were to be financed by the World Bank, and the latter two years were by the government.

Input Vouchers include a 50% subsidy for the price of the mixed package of fertilizer and improved seeds (a package is suitable for 0.5 ha. of maize/rice cultivation)[4], targeting farmers who meet the following criteria: 1) who are full time residents in the village; 2) who are head of households cultivating less than 1 ha. of maize or rice; 3) who are willing to use provided inputs; and 4) who are able and willing to pay half the market price of the voucher (top-up). Among them the priority is given to the resource-poor farmers and female-headed households and the rice farmers with access to irrigation in the country. But according to World Bank officials[5], in practice

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2 It started in 2 districts in 2007 and expanded to 53 districts in 2008.

3 Telephone interview with World Bank official in charge of NAIVS (on 4th Jul., 2012)

4 There are two options: 32 kgs of Nitrogenous fertilizer (N) and 23.3 kgs of Phosphorous pentoxide ($P_2O_{5)}$ (option 1), and 33 kgs of N and 25 kgs of P_2O_5 (option 2). The difference between these options is on Phosphate (P) source, either 1 bag of Di-ammonium Phosphate (DAP) or 2 bags of Minjingu Rock Phosphate (MRP) + 10N. World Bank document (2009) suggested that given the currently low level of input use (8 kgs per hectare) the programme is expected to increase yield significantly. Depending on the mix of the fertilizers and improved seeds, maize yields are projected to increase more than double, from 1,120 kg/per hectare in the base year to 2,450 to 3,200 kg/per hectare by receiving vouchers for three years. Rice yields are projected to rise from 1.735 kg/per hectare to 2,800 – 3,300 kg/per hectare by the end of the project.

5 Telephone interview with World Bank official in charge of NAIVS (on 4th Jul., 2012)

the rules for beneficiary selection vary depending on the districts and villages. And among these criteria, the top-up criterion is the priority for beneficiary selection. In this sense NAIVS does not directly address poverty reduction of the poorest. How to define the households also varies on the location. Several villages treat as a new household if a household member builds a new family and lives separately from the family, while other villages don't. And the number of voucher allocation to the regions, districts and villages varies each year, depending on the political decisions, the expected rainfall in the regions each year, etc.

As an exit strategy it is expected that after maximum three years of receipt of vouchers, programme beneficiaries would have gained by then enough income to purchase these inputs in market price without subsidies. This, however, may be difficult given that the actual value (Tsh. 61,000) of the subsidy is about 1.7 months' rural household income[6]. Farmers need to pay double of this amount if they want to continue to use the same amount of inputs. This implies that the poorest can't afford to pay the top-up. Given that this value of subsidy is about 40% of the value added of harvested maize price from cultivation of 0.5 ha.[7] (Patel, 2011), if farmers afford to pay the top-up, even without subsidy they gain 20% net profit. Assuming that there are not so high other costs for production farmers might find profitable to use this inputs even without subsidy.

In order to enhance the effective and sustainable use of fertilizer through vouchers, arrangement was also made to promote integrated soil fertility management practices, verification on fertilizer recommendations and plant nutrition, and provision of extension services for conservation farming practices. In coordination with the Alliance for a Green Revolution in Africa (AGRA), NAIVS supported to scale up agro-dealer training. AGRA also provides funding credit guarantees for agro-dealers, which helps to expand the agro-dealer network in support of NAIVS.

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6 Compared to the rural household monthly income of 28,418 Tsh. reported in Household Budget Survey 2007 (2007 Ministry of Finance and Economic Affairs & National Bureau of Statistics Tanzania (2009) *Household Budget Survey 2007.* Dar es Salaarm, Tanzania. With the annual average inflation rate of 10.3% and 12.1% in 2008 and 2009, respectively, the rural household income in 2010 is roughly estimated as 35,000 Tsh.

7 In case of maize. Mid-term evaluation of NAIVS reports that the average maize yield per acre using subsidized inputs is 822 kg (Patel, 2011). The yield for farmers who do not use improved inputs is 332 kg/acre. The additional 490 kg/acre using improved inputs is consistent with the agronomic principles that estimate approximately 15 kg of additional maize per kg of nitrogen fertilizer used. Assuming the maize price of 260 Tsh. / kg, the average value added of maize per acre is 127,400 Tsh. Compared to 61,000 Tsh. of subsidy, which was intended for 1.2 acre (=0.5 ha.) of maize production, it is about 40% of the value added of the harvested maize per acre with subsidised inputs.

The mid-term evaluation of NAIVS conducted in 2011 shows positive effects on maize/rice yields in 2009/10 agricultural season (Patel, 2011). One particular issue highlighted by the evaluation report is the high inclusion error: 62.3% of the beneficiaries appear to be not eligible neither in the targeting criteria of land area nor being able to pay half the amount of input package. The rules are not enforced fully. Beneficiaries were on average wealthier than non-beneficiaries in terms of housing construction materials, assets and land ownership. Impact evaluation study of NAIVS is now underway. Its results are expected to be published later this year (2012).

Cooksey strongly comments on NAIVS that: NAIVS is the target of vote- and rent-seeking by policymakers and local politicians; its inefficient incorporation of the private sector lessens the impact of the programme; and meeting lending targets was prioritized by World Bank to the policy content, despite strong concerns on economic efficiency and capacity of the Tanzanian government (Cooksey, 2012). The MDG country report in 2010 (Tanzanian government, 2011) also referred to high leakages and favouritism of the programme.

2.1 Role of agricultural productivity for poverty reduction in Sub-Saharan Africa

The role of agriculture for poverty reduction has long been debated in the literature. The structural transformation process which was observed in most developed countries during the 18^{th} -20^{th} centuries was associated with labour shifts from farm to off-farm activities and decline in the share of agriculture in GDP total. Agricultural productivity growth had a catalytic role in starting these processes (Mellor, 1966). At low level of economic development its large share in GDP means that strong growth in agriculture is crucially important for the country's development. But during the structural transformation, the persistent gap between its low share in total GDP and its high share in total employment of agriculture remains. It suggests poverty is concentrated in agriculture and rural areas, and as non-agricultural sector develops, many of the rural poor remain poor. This has been evidenced in many empirical studies (Ravallion *et al.*, 2007, World Bank, 2007). Improved labour productivity in agricultural sector is needed for large scale poverty reduction but smallholders and the institutions which support and sustain them are weak agents for labour productivity growth in Africa. Collier and Dercon suggest that the successful migration from agriculture and rural areas is needed for labour productivity growth in agriculture (Collier and Dercon, 2009).

Poverty-reducing effect of farm sector also depends on the food prices, the price elasticity of food demand and the net-marketing position (whether they are net-buyer (they purchase food more than they sell), net-seller or mixed buyer and seller) of the poor (Sarris *et al.*, 2006). The food prices depend on their supply and demand within

the country and on their international prices. If the production of particular food is increased, price of the food may become lower. If the price elasticity of the food demand is lower, its demand may not increase and the price may stay the lower price. Net-buyers benefit from lower food prices, while net-sellers lose the benefit. Increased productivity which causes lower food prices reduces poverty of net-buyers of food. Rural population tends to be net-sellers of food who do not benefit from increased productivity. However, in Ruvuma region which this research focuses on 56.9% of rural farmer households are net-buyers of food (Sarris *et al.*, 2006).

The hindering factors for rapid agricultural growth in Sub-Saharan Africa are low agricultural productivity and rapid soil degradation. One of their main reasons is low input use. In order to increase the levels of input use, market failure such as credit and insurance market failures, information asymmetries and non-competitive market needs to be addressed. Therefore, there is good reason to believe that solving this market failure would also contribute to poverty reduction.

2.2 Adoption of Technological Innovation

Why farmers adopt or do not adopt technological innovation (such as use of improved seeds and fertilizers) has been widely studied in relation to various issues such as farm size, input availability, information and education, risks, incentives, profitability and credit constraints (Hiebert, 1974, Gerhart, 1975, Herdt and Capule, 1983, Feder *et al.*, 1985, Lipton and Longhurst, 1989, Sanchez *et al.*, 1997, Lee, 2005, Duflo *et al.*, 2007, Dercon and Christiaensen, 2011). It depends on the net gain of the farmer from adoption, inclusive of all costs of using the new technology (Foster and Rosenzweig, 2010). Meanwhile, various economic incentives such as price, labour and exchange rate also matter for adoption behaviour (Feder, 1980, Zilberman and Just, 1984, Lee, 2005, Kelly, 2006). Under these conditions farmers are assumed to maximize their profits on technology adoption (net gain subtracting cost of technology adoption) subject to these constraints (Janvry *et al.*, 2011).

Adoption behaviour varies by farm size. There are findings that suggest that the larger the farm size, the larger the share of modern crops (Feder, 1980, Harriss, 1982, Herdt and Capule, 1983). It seems that very small farmers are less likely to adopt new technology initially, unlike larger farmers (Ruttan, 1977, Feder, 1980, Just *et al.*, 1980, Feder and O'Mara, 1981, Shalit and Binswanger, 1984, Beyerlee, 2000). However, risk-aversion behaviour of small farmers impedes adoption only if there are fixed costs of adoption irrespective of amount of inputs, such as in transaction and in information acquisition. If not, farmers could test for yield and net profit gains on a tiny area of land and decide future input use, or not, based on the results. Without fixed cost of adoption, once small farmers have adopted new technology, they tend to rely on it more than bigger farmers (Feder and O'Mara, 1981, Lipton and

Longhurst, 1989, Duflo *et al.*, 2008). Adoption behaviour also changes over socioeconomic characteristics such as the number of active labour force in the household, farmers' age and experience, and the level of education of household head. It also changes over time (Feder *et al.*, 1985, Lee, 2005). A favourable environment in terms of water and soil increases the likelihood of adoption.

Information, learning and resource accumulation promote adoption of new technologies. As farmers learn, they adjust their perception of profitability of inputs and are more likely to adopt them (Hiebert, 1974, Feder *et al.*, 1985). However, it takes time for the farmers to change their perceptions on new technologies and to adopt them (O'Mara, 1971, Lindner and Fischer, 1979). Extension service and level of farmers' education usually facilitate this process (Feder *et al.*, 1985). In rural India famer's profitability of new technology increases with the number of neighbours who utilize it. The source of learning includes extension services and other informal social networks (Foster and Rosenzweig, 1995). Pretty suggests that the ways farmers internalize their learning process also matters to adopt technology (Pretty, 2004).

2.3 Input Subsidy Debate

Whether input subsidies are effective tool for increasing production has also long been debated (Ellis, 1992, Sachs, 2003, Crawford *et al.*, 2006, Fan *et al.*, 2007, World Bank, 2007, Dorward and Chirwa, 2011). The arguments 'for' the input subsidies are that they: 1) increase access to inputs for the poor farmers; 2) increase productivity and production; and 3) provide food security, poverty reduction and economic growth. The arguments 'against' the input subsidies are, they: 1) have huge costs; 2) tend to benefit elites and wealthier farmers; 3) might cause market distortion; and 4) may crowd-out commercial inputs. The relative costs and benefits between input subsidies and other complementary measures such as food aid, output price support, credit subsidies, and/or inputs delivery programmes are also analyzed. These studies however, generally conclude that whether input subsidies are effective and efficient in food security and poverty depends on the specific cases, because there are so many other factors affecting to achieve food security and reduce poverty. Input subsidies to tackle the risk aversion of poor farmers who face constraints on income or credit access could be a solution for low input use in Sub-Saharan Africa (Crawford *et al.*, 2006).

Referring to the input/crop price ratio on the farmers' response curve, Ellis suggests that input subsidies provide incentives for the farmers to increase negligible levels of input use to a level closer to the economic optimum levels of yields enabled by the new technology (Ellis, 1992). Input subsidies therefore could increase production and productivity of the targeted crops if farmers utilize the subsidized inputs in proper manner. Through increased production and productivity subsidy-recipient (later,

recipient) farmers could increase income if the prices do not drastically fall because of increased availability of the crop and of other factors such as weather and international market prices.

Due to that subsidies could hinder private market development, several (United Nations, 2005, Minot and Benson, 2009) have advocated '(market-) smart subsidies'. Advantages of market-smart subsidies are that they: could develop private-sector distribution network; and could provide training and information to farmers and input suppliers on efficient use of input use. Their disadvantages are that they: require high administration cost; do not benefit the target group if the beneficiaries resell the vouchers to others; require long time to achieve intended private sector development (Minot and Benson, 2009). However, smart subsidies' impacts have not been well-studied, neither in terms of cost benefit analysis nor in terms of economic impacts (Crawford *et al.*, 2006).

Though input subsidies aim to target the poor, empirical studies suggest that they tend to benefit wealthier farmers and the ones connected to politically powerful groups (Holmen, 2005, Pan and Christiaensen, 2011). If the subsidy beneficiaries are wealthier farmers who have utilized inputs, these farmers tend to displace their inputs purchase with the subsidized inputs (Xu *et al.*, 2009, Ricker-Gilbert *et al.*, 2011). Baseline survey for NAIVS suggests that there may be displacement of commercial inputs for the recipient farmers who were previously utilizing commercial inputs. This point requires further research (Patel, 2011).

Proper targeting sometimes requires huge administration costs. Recent input subsidy programmes decentralize the recipient selection to the local entities such as village voucher committees, farmers cooperatives, etc., which could substantially reduce administration cost at the central level. However, decentralization leaves control and management of subsidies to the locally-managed institutions. This tends to be affected by local politics which draw the subsidies away from the targeted beneficiaries (Baltzer and Hansen, 2011/2).

3.0 KNOWLEDGE GAP – RATIONALE FOR RESEARCH

Though there have been an increasing number of input subsidy programmes in Sub-Saharan Africa, very few studies have been conducted on this issue. This research aims to fill this gap by providing evidence to answer whether the input subsidies in Sub-Saharan Africa are effective for increasing production and productivity of maize/rice and poverty reduction of recipient farmers. The rationale for our research is based on the need to understand better the impact of input subsidies on poverty reduction in Sub-Saharan Africa, i.e. whether and how the subsidies reduced poverty.

It was suggested that the reasons for low input use in Sub-Saharan Africa are high costs, due to low volume of demand and high transport cost, because of lack of access to good road (World Bank, 2007). It has been debated whether agricultural input subsidies do contribute to poverty reduction and pro-poor economic growth (Crawford *et al.*, 2006, Fan *et al.*, 2007, World Bank, 2007, Dorward and Chirwa, 2011). By providing subsidies, facilitating information on inputs, providing training for the poor farmers and promoting private sector operation in the area, NAIVS aims to increase use of inputs, which could increase maize/rice productivity if they use the inputs in proper manner. This would increase income from maize/rice production and reduce poverty of recipient households, through which is affected by input and output prices, net-marketing position of recipient farmers and their poverty situation prior to the NAIVS. However, if there was elite capture, which has been seen in other cases in Sub-Saharan Africa (Banful, 2011, Dorward and Chirwa, 2011), the expected impact on poverty of recipient households would be limited.

Whether market-smart subsidies in Sub-Saharan Africa have reduced poverty and promoted (or not) pro-poor economic growth has not been examined in-depth, except in some studies such as that by Dorward and Chirwa (Dorward and Chirwa, 2011). The research provides evidence whether and how NAIVS reduced poverty of recipient farmers, by utilizing four rounds of panel data of ten years' period complemented by key informant interviews, a few focus group discussions and household semi-structured interviews. In order to do so, we will look at who were selected for and received vouchers of NAIVS, by looking at which factors affected the farmers' decisions on adopting technology, such as household assets and contextual risk factors, such as input and output prices and weather conditions. We will also look at whether NAIVS increased productivity and production of maize/rice through increased input use for maize/rice. Because of this increased income from maize/rice production we will then examine whether NAIVS reduced poverty of recipient households as opposed to non-recipients.

3.1 Research Questions

The main research question, sub-questions and hypothesis to be tested by the research are as follows.

***Main research question*: Did NAIVS reduce poverty of recipient households in Ruvuma region in Tanzania?**

This question will be articulated further into the following four sub-questions. To respond to these sub-questions, the research will test a series of hypotheses:

Sub-questions:

1. Who were selected for and received vouchers of NAIVS in Ruvuma?

We would first like to look at who were selected for the vouchers of NAIVS by the village voucher committees by classifying their socio-economic characteristics. Then selected households made decision to invest either on NAIVS or on other issues, such as other farm inputs or non-farm activities. If they are selected and decide to invest on inputs through vouchers of NAIVS, they would receive vouchers. We would look at what factors affected to make decisions to adopt inputs through vouchers, by looking at the characteristics of the recipient farmers. The factors include assets and contextual risk factors. Assets are composed of human, financial, natural, social, physical and political capital, each of which is represented in the following components:

Human capital	age, gender (binary variable), education level and health condition of household head, number of active labour force, information and training on input use gained
Financial capital	amount of savings, amount of cash income from previous year[8], access to credit
Natural capital	soil quality[9], land size for cultivation
Social capital	length of residence in the village

[8] Price adjustment between survey years would be considered. Refer to 9.3.4. 4).

[9] Farmer's own judgment.

Physical capital	access to roads and irrigation (binary), number of livestock[10], household semi-durable and durable goods[11]
Political capital	memberships of village assembly/village voucher committee/other local committees/village office (binary)

On this sub-question the research looks also at the contextual factors which may bring farmers risks to adopt technology. This includes change in input and output prices, irregular rainfall and other climatic shocks. All the above information is included in the existing panel.

Mid-term evaluation reports that recipient households are wealthier than non-recipient households in terms of assets and land size (Patel, 2011). We hypothesize that less poor households tended to be selected for and received vouchers of NAIVS, also that the farmers with more assets and less risks tended to receive vouchers of NAIVS.

Hence the hypotheses underlying this sub-question are:

i. ***Household who were less poor tended to be selected for and received vouchers of NAIVS.***

ii. ***Farmers with more asset levels and less risks tended to receive vouchers of NAIVS.***

2. Did NAIVS increase production and productivity of maize/rice of recipient households through increased input use in Ruvuma? And what makes difference in increase in production and productivity between recipient households?

Given the past low levels of input use in Tanzania, increase in input use is one of the crucial elements for increasing production and productivity. NAIVS intends to increase maize/rice production and productivity through providing farmers better access to inputs. We hypothesize that NAIVS increased input use for maize/rice of recipient farmers, although beneficiary selection at villages varies each year. We will consider the households who received vouchers may have ended up not having access to inputs due to management of input distribution.

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[10] Value for counting livestock variable varies depending on the types of livestock.

[11] Price adjustment of each item of goods between survey years would be considered. Refer to 9.3.4. 4).

Through increased input use because of subsidies we assume that recipient farmers increased production and productivity, if they use inputs for maize/rice and in a proper manner. The agricultural research centres conduct experiment on those inputs and estimate the increase in productivity of these crops per unit of increased use of these inputs. Since beneficiary selection varies each year, recipient farmers have different number of vouchers. By comparing expected productivity change with actual productivity by utilizing different number of improved inputs, we will analyze whether and how much NAIVS increased productivities of these crops of recipient farmers per inputs used, given that the voucher package is for cultivation of maize/rice for half a hectare. We will also look at how much NAIVS increased the amount of production of recipient farmers per unit of used inputs.

We would also look at what makes this difference in increase in production and productivity between recipient households, depending on different level of capital attained by them in such characteristics as considered in the above sub-question 1. We would also look at the reason for this difference in increase in production and productivity between who received vouchers, differentiating the characteristics of the person, such as gender, age, education level, etc. in order to look at in targeting whom and in which conditions input subsidies are more effective in reducing poverty.

We hypothesize that NAIVS increased productivity and production of maize/rice of the recipient farmers per unit of used inputs. And the recipient households with more assets and less risks did increase more in productivity and production than the ones with less assets and more risks. Considering that the productivity increases as learning increases, we also hypothesize that with longer experience of receipt of vouchers the more increase of productivity and production they achieved.

The hypotheses underlying this sub-question are:

i) NAIVS increased production and productivity of maize/rice of recipient households per unit of used inputs.

ii) Recipient households with more assets and less risks increased more production and productivity than the ones with less assets and more risks.

iii) The longer they received the voucher the more increase of production and productivity they achieved.

3. Did NAIVS reduce income-poverty of recipient households in Ruvuma?

We will also analyze whether NAIVS increased income from maize/rice production of recipient farmers in Ruvuma. Increased income from maize/rice production comes from increased land productivity and depends on the relationship between output and input prices, if not investing in agricultural capital in the respective year. Since majority of inputs are imports, input prices are affected by the international prices. Output prices are affected by many factors such as international prices, weather conditions, market integration of the area to the other areas, and price elasticity of the maize/rice demand. If these things held constant, we hypothesize that recipient households could increase income from maize/rice production because of increased land productivity.

In 2004 41.5% of total income of farmer households in Ruvuma comes from cash sources. Out of total cash income the share of wages and non-farm income was accounted as about 44% (15.5% and 28.2%, respectively) and the one of sales of crops as 53.2% (Sarris *et al.*, 2006). This suggests that less than 20% of total income of farmer households in Ruvuma comes from wages and non-farm income. We would also look into the effect of NAIVS on other sectors in this research. We will control for this off-farm income and other factors who affect differently between recipient and non-recipient households by using propensity score matching. With these factors held constant, we hypothesize here that NAIVS reduced income-poverty of recipient households in Ruvuma.

The hypothesis underlying this sub-question is:
NAIVS reduced income-poverty of recipient households in Ruvuma.

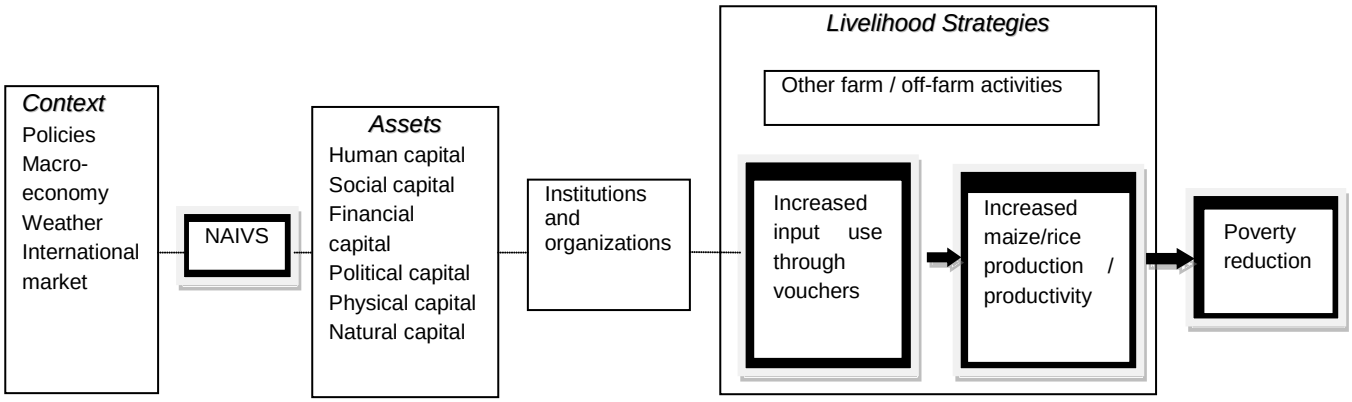
4.0 ANALYTICAL FRAMEWORK

We aim to explore whether and how NAIVS increased productivity and production of maize/rice of recipient households through increased input use, whether it reduced poverty of the recipient households in Ruvuma region in Tanzania.

The research adopts the following analytical framework which focuses on NAIVS and poverty reduction of recipient farmers (Figure 1). The framework is loosely based on the Sustainable livelihood framework. And it draws on the implicit theory of change of NAIVS: through increased input use farmers increase maize/rice productivity and production and reduce poverty; by focusing on the promising areas in the country the increased production would be large enough to bring macroeconomic growth. On this broad theory my research focuses on the impact of NAIVS on poverty of recipient farmers. More explicitly, the research focuses on implementation of NAIVS, increased use of inputs through vouchers, increased maize / rice production / productivity and impact, if any, on poverty reduction for recipient farmers.

In the context of policies, macro-economic situation, and weather conditions NAIVS was implemented. Recipient farmers with their assets decided to receive vouchers. For these processes institutions and organizations have the role. However, the research doesn't focus on it because the research focuses on the recipient farmers whose livelihood strategies and impact have reflections on this process. As one of the livelihood strategies recipient farmers increase input use for maize/rice through vouchers, and increase maize/rice productivity and production, if they use it in proper manner. This would have impact on reduction of income-poverty of recipient farmers through increase in income from maize/rice production. The reduction of income-poverty might be affected by income effect due to change in off-farm income, input and output prices and who received vouchers whether they are poor or non-poor, whether they are net food buyers or sellers. By matching households with same key characteristics we will control these factors to measure impact of NAIVS on poverty of recipient farmers.

Figure 1. Framework of NAIVS and poverty reduction of recipient farmers



Dotted line: there is possibility of relationship.
Bold arrow: there is causal relationship of the direction indicated by arrows
Bold box: Focus of my research

5.0 RESEARCH DESIGN AND METHODOLOGY

5.1 Research Design

5.1.1 Overall methodology

The research will rely essentially on quantitative research, using the Vulnerability Household Panel data of Kilimanjaro and Ruvuma (Pan and Christiaensen, 2011). These panel data were collected in three rounds (2004, 2005, and 2009 in Ruvuma) and will be complemented by a new round (2013) which I will collect as part of my fieldwork. The Vulnerability Household Panel Survey was implemented by the World Bank and FAO[12] to assess the potential for market based insurance instruments for mitigating household vulnerability of cash crop growers (Christiaensen and Sarris, 2007). This survey has an extensive data set, comprising of 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 items. The sample of the panel is representative of rural farmer households in each region. Also in the third round the section on input voucher of NAIVS was added in the questionnaire to see who received vouchers in the first year's distribution. I will collect a new round of panel data in 2013. The panel survey questionnaire will be utilized with some revisions made to address my research questions.

Prior to the panel survey, about 20 key informant interviews, 6 focus group discussions and 9 household semi-structured interviews will be conducted to grasp the contexts of input subsidies and obtain and record some verbal reflection from farmers about their experiences and perceptions of the subsidies, input use and poverty.

5.1.2 Research site

Given the limited time and resources, we chose Ruvuma region for this research site while panel data is available in Ruvuma and Kilimanjaro regions. The reasons are as follows. In 2008 when the pilot programme operated, larger proportion of vouchers went to farmers who own / cultivate more than 1 ha. of land in Ruvuma (88%) than in Kilimanjaro (59.2%). Though since 2009 the land criterion (less than 1 ha. of cultivation) was introduced, top-up criterion seems to be a priority. Since smaller farmer households tend to be poorer than larger farmer households, it is assumed that subsidies did not reach to the poorest group in Ruvuma. However, given that the

[12] Local implementation partner was Research on Poverty Alleviation (REPOA).

bigger proportion of farmer households per programme village received a voucher in Ruvuma (about 75%) than in Kilimanjaro (26%), more impact on poverty would be expected in Ruvuma. We will therefore use Ruvuma data set.

Ruvuma is the southernmost region and one of the poorer regions in the country with the second lowest population density. The basic needs headcount poverty rate for Ruvuma was 41% in 2000/1 compared to 36% for the mainland of the country[13] (National Bureau of Statistics Tanzania, 2002). The region has many agro-ecological zones and grows variety of agricultural products. Its population is 1.12 million and about 90 percent of them lives in rural areas. Agriculture constitutes 77 percent of the regional GDP. Average land holding size per farmer household in Ruvuma is 4.1 ha.[14] Proportion of land with maize production out of total planted area in the region is 51.4%. The yield of maize is 1.3 ton/ ha, which is the highest in the country. Ruvuma has the largest and highest proportion (37.1%) of planted area with inorganic fertiliser application in the country. Ruvuma has also the highest proportion (48%) of smallholders who use inorganic fertilizers (National Bureau of Statistics *et al.*, 2006a).

5.1.3 Field research activities and schedule

The research activities in the field will take about 6.5 months, with preparation for Panel survey for 1.5 months in U.K., as indicated in the following schedule:

Phase 1 (September – mid-October 2012): Preparation for Quantitative research (Panel survey) in U.K.

Sampling, cleaning, checking, analysis of data, elaboration of questionnaire (Swahili, English)

Phase 2 (mid- October – November 2012): Qualitative research in Tanzania

Key informant interviews, focus group discussions and household semi-structured interviews

Phase 3 (December 2012 – mid-April 2013): Panel survey in Tanzania

[13] Zanzibar is not included in the Survey.

[14] Author's calculation from National Sample Census of Agriculture, 2002.

5.2 Specific Research Methodology

5.2.1 Qualitative research (1.5 months)

In order to acquire contextual information on NAIVS and to grasp their experiences and perceptions of NAIVS, input use and poverty, about 20 key informant interviews, 6 focus group discussions and 9 household semi-structured interviews will be conducted.

5.2.2 Key informant interviews

About twenty key informant interviews will be conducted to acquire basic contextual information on NAIVS's implementation. The interviewees will include three village leaders (with different levels of average household income-poverty in sample), nine district/village voucher committee members, a few farmer association/cooperative members, a few agro-traders, three district/village government officials, a few extension workers, a few workers in the markets, and the officials of Ministry of Agriculture, Food and Cooperatives, the World Bank, and FAO. Questions will include the following points:

- How was NAIVS implemented? Did NAIVS target farmers properly?
- Has NAIVS made any changes on input use of farmers?
- Was inputs market of maize/rice made active and did inputs price lower after NAIVS started?
- Was output market of maize/rice made active and did output price lower after NAIVS started?
- Has NAIVS had any effects on the livelihoods of farmers?
- Has NAIVS had any other effects?
- How would NAIVS be evolved after 2012?

5.2.3 Focus group discussions and household semi-structured interviews

Focus group discussions and household semi-structured interviews would be conducted in the same villages as the ones for the key informant interviews. The focus group discussions will invite respondents to talk freely and enhance their reflection by talking each other of their thoughts and experiences on NAIVS. These will be conducted by forming two groups each of recipient households in the same three villages for the key informant interviews.

Through the household semi-structured interviews I will aim at recording some anecdotal facts and reflections from the experiences of farmers on NAIVS, input use and poverty. Questions vary depending on the characteristics of the households found in the panel data analysis. Prior to the interviews the research prepares for several questions, but questions would change according to the response (Bryman, 2008). I will also ask respondents to recall events from his or her past experiences and to reflect on them. Three households per village from three villages will be selected from farmers who have variety of socio-economic characteristics, such as in income poverty status, land size.

The key questions for focus group discussions and household semi-structured interviews are as follows:

- Why farmers decided to adopt / not adopt subsidised inputs and commercial inputs, in relation to their assets, risks and incentives to use inputs.
- How farmers think of the allocation of vouchers and the implementation process of NAIVS and its impacts on their poverty.
- How recipient households have changed their livelihood after introduction of NAIVS.
- How have poverty levels changed. What factors made their poverty levels change.
- Whether other factors impacted on their agricultural activities hence on poverty of farmer households.

Quantitative research (Preparation for 2.5 month (1.5 month in U.K. and 1 months in Tanzania), Pre-test for 0.5 month, Data collection for 1.5 months[15]: Total 4.5 months):

1) Research design

I will undertake the questionnaire surveys, utilizing the Vulnerability Household Panel data of Ruvuma (2004, 2005, 2009), CPI data (National Bureau of Statistics Tanzania, 2012) and international, national and local maize / rice market prices (FAO) to estimate the impact of NAIVS on increased productivity and production of maize / rice and reduced poverty of recipient households in Ruvuma. I will utilize the Panel survey questionnaire with some revisions made to address the research

[15] The field research would be conducted by hiring six research assistants for quantitative survey. 2 Households visits per researcher per day. 26 days are required to get 344 Households interviews by 2 x 6 researchers. 1 month is counted as 22 days.

questions. The panel survey will be composed of two parts: household surveys and village surveys. Household surveys will be conducted to track the data of each household, followed by village surveys with group of village council/assembly members or with group of knowledgeable community members to collect information of the village.

Utilizing panel data has the advantage that it enables to control for unobservable fixed effects on poverty, such as motivation, nutritional status, etc., and to measure differences of consumptions of households receiving different number of vouchers before and after introduction of NAIVS. Before conducting the survey, questionnaire with coding will be prepared (Swahili and English) and sample households will be identified with stratified random sampling. Short pre-tests will also be undertaken in order for the researchers to become able to ask questions in a proper way, easily understood by the respondents.

2) Research methodology

We will adopt Difference in Difference methodology (Wooldridge, 2009, Stock and Watson, 2012), to compare the changes in maize/rice production and productivity between household who received different number of vouchers (from one to four vouchers) in subsequent years and the household who did not receive any of them.

We will also compare between the production and productivity of each household group before 2008, the ones in 2008 and in 2011. Specifically, we will compare the production and productivity between i) the farmers of α 1 (= who got voucher in 2008) and α 0 (who did not get voucher in 2008) and ii) the farmers of α 4 (who got voucher in 2011) and α 0 (who did not get voucher in 2011) to see whether the receipt of voucher of 1 year produces any difference. And we will compare between the farmers who got only 1 year voucher (α1, α2 (who did get voucher in 2009), α3 (who did get voucher in 2010), α4) with the farmers who got vouchers of two, three, four years (combination of α_1, α_2, α_3, α4) to see whether the continuous receipt of vouchers gives difference in the production and productivity.

To see the impact of NAIVS on poverty of recipient households we will match households between recipient and non-recipient households by utilizing Propensity Score Matching to control observed characteristics which could affect on poverty but not the receipt of the vouchers, such as education level and health conditions of household head, ratio of off-farm income out of total income (Khandker *et al.*, 2010). By utilizing Difference in Different matching we could control for unobserved characteristics which do not change over time.

3) Sampling

Sampling of the Vulnerability Household Panel survey for Kilimanjaro and Ruvuma is representative of rural agricultural households in the regions. It uses stratified sampling[16] from 2002 Census and 1998/99 District Integrated Agricultural Survey data. The survey was originally designed to look at vulnerability of coffee farmers, and the sampling took special care for ensuring the coffee farmers' share in the sample is the same as their proportion in the total rural agricultural households which were reported in the 1998/99 District Integrated Agricultural Survey. Depending on the representativeness of the coffee households for maize farmer households, the sample in the Panel may be under-represented for maize farmers, which needs to be considered in the analysis. (Christiaensen and Sarris, 2007).

The panel has four rounds. The first round was conducted with 892 households in Ruvuma in February – March 2004, the second round was conducted with 838 households in February – March 2005 and the third round was composed of 831 households in March 2009. The attrition was caused because some households with only one elderly were lost with the death of the person, and some households were not surveyed because they moved out of the place or they were working far away home. The households enumerated after the first round do not include the households newly created after the first round. Among the 831 households surveyed in the third round 685 households own/cultivate land. These households are the genuine panel households for the research. The fieldwork planned here will generate the fourth round.

Beneficiaries can be varied each year. Therefore we will obtain samples of the recipient farmers in 2008 (144 households) and the control group randomly selected from other households in the same villages. Since even non-recipient households in pilot distribution in 2008 may have obtained the vouchers after 2009, we will take more number of samples (200 households) as control group. During the survey if we find that there is not enough number of samples as control group, we would take more samples from non-recipient households in 2008 from same villages. Tentatively total sample size for the panel survey is 344 households.

4) Measurement of income poverty

In order to measure income-poverty of households we will utilize consumption aggregate. Measuring poverty by consumption is better than income in developing countries, because of practicality. Since income, especially agricultural income can be extremely variable, in order to get at least annual income we have to visit many

[16] With three strata of districts, wards and villages.

times for survey and use recall data. Meanwhile, we could measure data of consumption over the previous few weeks (Deaton, 1997).

Since the Vulnerability Household Panel of Ruvuma and Kilimanjaro attempted to be comparable with the Household Budget Surveys 2000/1 and 2007 in Tanzania, the questionnaire and data manipulation of the panel survey follow the ones of the Household Budget Surveys[17]. We will collect information on consumption expenditures by items, by recall methods over the past 7 days, which is already included in the previous panel data. The longer period of diary, monthly or several months, would be better, in order to grasp the consumption smoothing behaviour during these periods. However, in order to make consistence with the previous panel surveys, this method would be undertaken. In order to reduce the seasonal difference in consumption the fourth round is conducted at the same time of the year with the past rounds.

In order to see changes in poverty of farmer households, poverty line is calculated based on the cost-of-basic-needs methodology. The focus of the research is not to define how many poor are in a static sense, but the research focuses on the changes in poverty because of receipt of vouchers of NAIVS. Utilizing poverty line is a way to look at these changes in poverty. Household Budget Surveys 2000/1 and 2007 in Tanzania define the poverty line as the minimum expenditure to meet the basic human needs, comprising of the expenditure to eat sufficient (2,200) calories for survival[18], and of other essential items[19] (National Bureau of Statistics Tanzania, 2002, Ministry of Finance and Economic Affairs and National Bureau of Statistics Tanzania, 2009). The consumption expenditure is based on the adult equivalent, which counts necessary caloric and other consumption requirement depending on the age and sex, for assuming that the caloric and other consumption requirement of children and elderly are smaller and are different between sexes according to age. Meanwhile, elderly spend more expenditure on health, which also needs to be considered for counting minimum necessary expenditure in the research. We will consider different consumption patterns over time by using regional CPIs (National Bureau of Statistics Tanzania, 2012), if regional CPIs are not available, I would

[17] But the Household budget surveys take information on consumption from monthly diary data and annual recall data. And the calculation for the own consumption is different.

[18] It is based on the food consumption pattern of the poorest 50% of the household (Ravallion, M. & Bidani, B. (1994) How robust is a poverty line? . *World Bank Economic Review,* Vol. 8 (1) 75-102. Ravallion, M. (1998) *Poverty lines in theory and practice*. *In* Bank, W. (ed.) *Working paper No. 133.* Washington: World Bank.). Based on the median quantity consumed per day per adult equivalent of the food items reported in the survey was adjusted to make 2,200 calories per day.

[19] It is done by calculating the share of expenditure that goes on food in the poorest 25% of the population. Hence the food share was about 75% of the total expenditure.

utilize rural CPIs. I would also collect the change in the amount of consumption of basic foods to measure change in poverty by measuring consumption amount of basic food items.

5) Questionnaire

The questionnaire will utilize most part of the Vulnerability Household Panel survey[20] with revisions made to address the research questions. It will be composed of two parts: household questionnaire and village questionnaire, which include the following sections, respectively:

a) Household questionnaire: household socio-demographic characteristics, activities of household members, non-farm income, agricultural data (crop/livestock production and sales, land size, inputs, hired farm labour, extension), input voucher and its time preferences, shocks, access to credit, non-farm income, household assets and consumption expenditure

b) Village questionnaire: agricultural seasons, shocks and major events, socio-economic information, local average wage and average market prices

Village questionnaire would be asked to a group of village committee/council members or a group of knowledgeable villages. The research adds new questions on the number and types of received vouchers of each year after 2009 and on their general perceptions on NAIVS (open question).

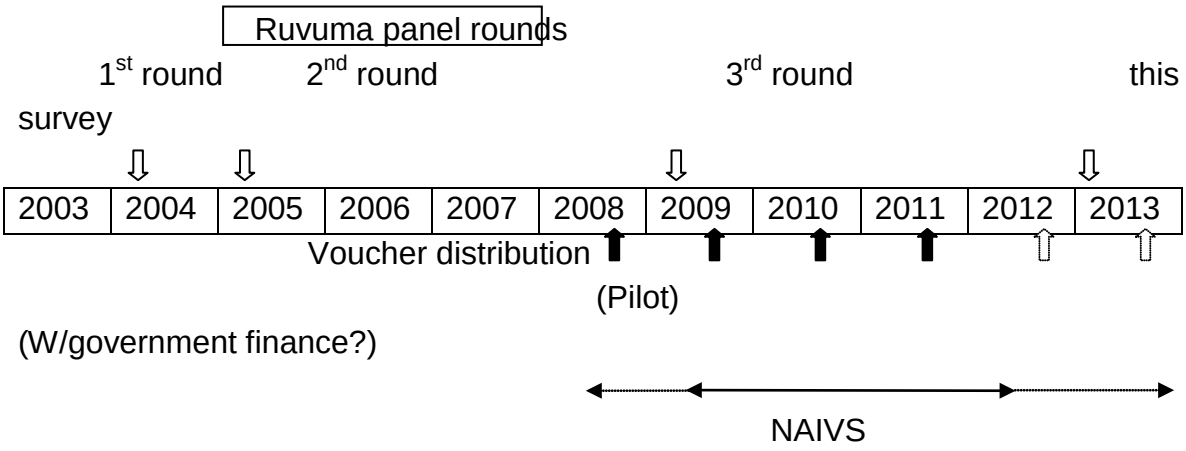
6) Timing

Considering the seasonal differences in poverty of rural farmer households, the timing for conducting this survey should be matched to the past rounds (February to March). The quantitative survey in the field would be conducted in late January – March 2013. NAIVS plans that vouchers are to be distributed in time for the farmers to prepare for planting in unimodal rainfall area[21], which accounts for about 80% of the annual grain production in Tanzania. This means that vouchers are distributed by September - October. Hence by the time of my panel survey, farmers experienced four agricultural seasons with vouchers, which would have impact on their consumption after the harvest of the year. It is not certain at the moment whether and in how big scale NAIVS would continue after 2012/13.

[20] Refer to Appendix 2 in Christiaensen and Sarris (2007).

[21] The period of long rains of unimodal rainfall area, where Ruvuma is located, is from December to April, with planting in November, and harvesting from June to July.

Figure 2. Schedule of NAIVS voucher distribution and panel survey



5.3 Research Schedule

Research activities	Time
Field work (including preparation in UK)	September 2012 – April 2013
Phase 1: Preparation for panel survey (in UK)	September – mid-October 2012
Phase 2: Qualitative research	Mid- October – November 2012
Phase 3: Panel survey	December 2012 – April 2013
Writing thesis	April 2013 – September 2014
Completion	

6.0 PRELIMINARY FINDINGS FROM THE QUALITATIVE RESEARCH

On the preliminary analysis of the qualitative research, in some villages where the voucher was distributed somehow according to the guideline of the programme, the farmers and key stakeholders mentioned that there was positive impact of agricultural input voucher where recipient farmers have increased maize/rice production and increased income and improved living, while in other villages this impact is really unseen because of the corruption where the benefits of the voucher were captured only by powerful people, such as government officers, village voucher committees, agro-dealers, financially-able farmers, and politicians. In the latter case, the implementation is influenced by power and corruption.

In the villages where vouchers were distributed to farmers mostly according to the guideline, recipient farmers in Ruvuma increased maize/rice production substantially. On average they have had about 5 or less bags of maize per acre before the programme. But with the voucher they could have about 10 to 25 bags per acre, depending on the weather, places, and their production practices.

Because of increased production the life of farmers in the villages was improved after the programme introduction, e.g. enough maize/rice now for their own consumption, improvement of the house either from mud to bricked, or thatched roof to cement, buying beds, mattress, and bicycles, paying school fees for children.

But there are several issues that might have hindered the effective impact of voucher on maize/rice productivity and poverty.

The first one is the late delivery of vouchers. Vouchers have come late in agricultural season in the area in 2010/11 and 2011/12, which made sometimes difficult the use of inputs for farmers and made less use of inputs. The farmers who had already planted with 1st application of fertilizers by the time of delivery of vouchers sometimes use the fertilizer for other crops or use the seeds for next year.

The second is about targeting. Implementation of targeting criteria for beneficiaries of vouchers and farmers' knowledge about targeting criteria slightly differ among villages, which sometimes made targeting of vouchers to the people who were not intended by the programme. And some informants in a village in Songea DC reported that a few power people, e.g. the village voucher committee members, have 4 or 5 vouchers in 1 household. Though the number of allocation of vouchers to that village in last year was 3 times of the number of farmers in that village, there are

other people who have not received any vouchers in the village. It seems that there is an allocation bias of vouchers toward powerful households.

The third is increase of input price. The input market price increased so much since 2010/11, meanwhile the voucher price maintained almost the same price, which made difficult the continuous uptake of vouchers by poor farmers and their lives. The input price was high in 2008/9 due to the high prices in international market. After that it reduced once in 2009/10, it has been increasing again since 2010/11. For example, the price of UREA in Tunduru district increased more than 2.2 times in 2011/12 since 2009/10. The one of DAP increased more than 1.4 times during the same period. Meanwhile, the voucher price of UREA and DAP during the same period decreased by 1,000 Tsh. per 2 bags and increased only 3,000 Tsh. per bag, respectively.

Informants mentioned that the reasons for increasing input prices were: exchange rate; increase of fuel prices; and that some agro-dealers want to maximize profit in monopolistic situation. TFC, who has about 25-30% share in fertilizer market in the country informed that international fertilizer prices change substantially during a year.

The fourth is selling vouchers to agro-dealers by farmers. This collusion between farmers and agro-dealers occurred especially in the first years of programme since farmers were not aware of the importance of using inputs for their production. Farmers often sell signed vouchers back to the agro-dealers with cheap prices, where agro-dealers could receive redemption of full price as if they had sold inputs. But as the years of the programme go, farmers have become aware of the importance of the inputs, this tendency has reduced.

The fifth is cheating by agro-dealers. Many small agro-dealers did not have enough capital, so that they could not deliver inputs to the area after being contracted by the government and getting loans from the input supplier companies. And some agro-dealers have sold either fake fertilizers, e.g. mixing it with sold, etc. or less amount than indicated in the bag. District officials in some districts in Ruvuma and Ministry of officials informed that they have been making monitoring visits to the villages and caught some cheating cases. They brought some cases to the court and put them in jail.

In other villages the vouchers were used not according to the guideline. In some villages when the vouchers were so few, almost no farmers in the village get vouchers except for village leaders and government officials. For example, vouchers were captured firstly by the village leaders and village voucher committees, in order for them to get more vouchers they write the names of dead person or children as beneficiaries, and even they sold vouchers to agro-dealers to get some profits.

Farmers in the village know about the situation, but they are not willing to report the situation to the government, for they say that even higher level of government officials know the situation and even they are involved in this situation. Farmers fear about the disturbance to come from these powerful people after they report about the situation.

I would like to see how many villages would be in the former type of village and the latter type of village in order to analyze the impact of power and corruption in implementation which distort the programme impact on poverty and productivity.
The final conclusion would be developed after all the analysis of data is made.

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