Graduate School of Development Studies

Agricultural Subsidies, Productivity and Rural Assets:

The effect of Farmer Input Support Programme (FISP) on small scale farmers in Mwembeshi-Chibombo District of Zambia

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Dedication

To God be the glory

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List of Acronyms

AC	Average Cost
ACMP	Agricultural Credit and Marketing Programme
AFC	Agricultural Finance Company
AHM	Agricultural Household Model
AMS	Aggregate Measure of Support
CAP	Common Agricultural Policy
CSO	Central Statistical Office of Zambia
CUSA	Credit and Savings Union of Zambia
EU	European Union
FAO	Food and Agriculture Organisation
FISP	Farmer Input Support Programme
FRA	Food Reserve Agency
GDP	Gross Domestic Product
GRZ	Government of the Republic of Zambia
IFAD	International Fund for Agricultural Development
IMF	The International Monetary Fund
IRDP	Integrated Rural Development Plan
ISI	Import Substitution Industrialisation
ISS	International Institute of Social Studies
LIC	Low Income Countries
MACO	Ministry of Agriculture and Cooperatives
MDGs	Millennium Development Goals
MES	Minimum Efficient Scales
MNC	Multi-National Corporation
NAMBoard	National Agricultural Marketing Board
NAP	National Agricultural Policy
NCZ	Nitrogen Chemicals of Zambia
NEPAD	New Partnership for Africa Development
OLS	Ordinary Least Squares
PAE	Principal Agricultural Economist
PRSP	Poverty Reduction Strategy Paper
Q	Output Quantity
RNFE	Rural Non-Farm Economy
SAP	Structural Adjustment Programme
SGS	Societe Generale de Surveillance
TC	Total Cost
TIP	Targeted Input Programmes

UNCEF	United Nations Children's Fund
UNDP	United Nations Development Programme
US	United States of America
WDI	World Development Indicators of the World Bank
WDR	World Development Report
WTO	World Trade Organisation
ZCF-FS	Zambia Cooperative Federation- Financial Services

Abstract

In this study, we consider the effect Farmer Input Support Programme (FISP) on asset accumulation for small-scale farmers in Mwembeshi (Chipwili), Chibombo district of Zambia. Further, we estimate the determinants of maize productivity among the farmers in this area. Data collection was through a well-structured questionnaire administered on 150 respondents selected through random sampling technique resulting into two equal samples of beneficiaries and non-beneficiaries of the FISP. Same questions were administered on both groups (appendix 1) and resulted into a data set used in the analysis. The methods of analysis used were descriptive statistics for each sample group, gross margin analysis (GMs) for national data and linear/log production function analysis using the Ordinary Least Square (OLS) criterion applied on the whole sample.

Major findings indicate farmers were middle aged (43) with average experience of 13 years in maize farming. There was high level of illiteracy as about 50% of total respondents had primary education while 31, 15 and 4% had secondary, no formal education and tertiary education respectively. About 98% of farmers grow maize but mainly on subsistence level as the mean cultivated size was 1. 9 Ha. Less than half of the sample possesses oxen; a critical asset. Maize was their major source of income averaging ZMK1 250 000 per annum. There was distress selling at ZMK 42 000/50Kg bag. Maize farming was not profitable for small scale farmers in the study based on 2008 figures.

Results further showed that incomes are determined by output while the latter is determined by output/Ha. Fertiliser and oxen in turn determine the productivity of the farmers though price may also play a bigger role. Membership to FISP may lead to a 29% growth in productivity than otherwise. Similarly, access to oxen may change output per Ha by 28% while 1 Kg of fertilizer per Ha may lead to 0.52 % change in productivity. Farmers in this area are less productive by 6-10 times of world average and they apply less fertiliser averaging between 11-41% of the Zambian recommended rate. The beneficiaries enjoy extra output of 13X50Kg bags/Ha. The group average output per Ha is 17X50Kgs. There are significant differences in production related activities between the groups.

The majority of small-scale farmers demonstrated low access to assets hence the perpetual poverty. On top of that, they are also food insecure. However, through its mode of transmission - the fertiliser subsidy which is used in larger quantity by the beneficiaries- the FISP has effectively helped members accumulate assets though not sufficient enough to propel them out of poverty. The capacity for the small-scale farmers to purchase fertiliser from the private sector has remained low. Further, the structural inefficiencies reported using 2008 floor prices still engulf the small-scale farmers. Although not much can be said about the real effect of the programme in the absence of baseline information on the small scale farmers in the area, FISP is a necessary but not sufficient instrument in rural poverty fight that is accentuated by food insecurity.

Relevance to Development Studies

This study contributes to the little knowledge on the effect of government funded intervention measures on rural agricultural assets and consequently comprehending rural poverty in terms of access to assets and capabilities of the marginalized rural masses in the Zambian context. The knowledge would help in understanding lasting effects of such interventions since the possession of assets reflects the long term capabilities of the rural masses in terms of how they are acquired and used to further generate wealth. Current income-based measures may not reflect the actualities on the ground as this category of people does not earn steady incomes. This study 'goes beyond the averages'[1] that epitomize most researches. Coincidentally, agriculture is likely to be the new development paradigm for the Low Income Countries because of its potential and the opportunities it enjoys. Therefore, well targeted, sustainable and asset enhancing farmer input support programmes may just make a difference in the development of these countries whose meager government resources will be a larger part of this process for a long time to come. That is what this study has tried to show.

Keywords

Agriculture, subsidy[2], Farmer Input Support Programme, economic liberalisation, agricultural productivity, OLS, productive assets, economies of scale, poverty, Zambia

[1] United Nations Children Fund (2000: p 17)

[2] Used synonymously with fertilizer in this study but the FISP pack comprises of seed maize as well but our focus is on fertilizer only due to the fact that small scale farmers use traditional or recycled seed on most occasions. Therefore, the effect of seed may not be much on our analysis.

CHAPTER 1

1.0 Introduction

Fighting rural poverty in Low Income Countries (LICs) whose economic sectors facilitate dualism[3] in terms of economic growth and development remains a serious challenge to their governments. Compounding the problem is when such a country is in sub-Sahara Africa where poverty is accompanied by low asset possession (WDR[4] 2008). Even more difficult is the choice of policy to tackle this problem. As a compelling sector, agricultural policy is one obvious candidate for most LICs (de Janvry and Sadoulet 2000). This choice comes with a lot of challenges in that evaluation of such policies becomes difficult when it is done at farmer level. However, with well-structured asset-based methods, inroads are being made on estimating how effective such apprehensive agro-based policies could be. This research paper tries to assess the effectiveness of the Farmer Input Support Programme (FISP) in fighting rural poverty[5] through capacity building in Zambia. The capacity would mainly be in terms of agricultural productive assets. The programme was implemented countrywide in 2002 by the Government of the Republic of Zambia (GRZ 2009). A sub-Saharan country, Zambia is predominantly an agricultural and mining based economy.

Despite Zambia's agricultural potential that could help grow the economy and reduce poverty, not much has been done in practice. This could be true given that the sector's contribution to the Gross Domestic Product (GDP) has hovered around 20 % (CSO 2010) yet it could have been more (NAP[6] 2004). One of the challenges that may lead to under performance is low productivity especially by the majority producers who are the small-scale[7] farmers. Several factors might explain the low agricultural productivity including less access to assets which results in low capability, production and well-being of the small-scale farmers (Bebbington 1999).

Recognising the potential of the agricultural sector (PRSP[8] 2002) and in light of the production base, the Government embarked on a full time capacity

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[3] See consequences in Hayami and Ruttan (1985: p 25)

[4] World Development Report, World Bank.

[5] Poverty in the Zambian context can be defined as the lack of access to income, to employment opportunities, and to entitlements such as the freely determined consumption of goods and services, shelter and the other basic needs of life (Ministry of Finance and National Planning of Zambia, 2002).

[6] National Agricultural Policy-Zambia

[7] Unless where specified, emphasized and on comparative basis with other categories, the word farmer will represent small scale farmers in this paper, distinguished from emergent and commercial farmers

[8] Poverty Reduction Strategy Paper of Zambia

building effort for small-scale farmers in 2002 (GRZ 2002). This was in the form of an agricultural subsidy of which, it was hoped, would fight rural poverty by improving productivity in the sector. Consequently, the multiplier effects associated with agriculture would be fostered in the economy. Though other factors could have been at play, it became apparent that the small-scale farmers had decapitalized in the course of implementing the Structural Adjustment Programme (SAP) in 1991. Poverty plagued the rural masses and needed specific intervention measures (Mwanaumo 1999; PRSP 2002).The country was also faced with food shortages that were accentuated by recurring droughts thereby underutilising the potential.

The study gathered data on two samples of small-scale farmers in Chibombo's *Chipwili*[9] agricultural camp in Mwembeshi (appendix 2). In an effort to understand rural poverty in terms of asset possession, socio-economic characteristics of the beneficiaries of FISP were studied in order to assess the programme's effect on rural poverty in terms of agricultural productive assets. A comparative analysis was done between beneficiaries and non-beneficiaries of the programme. The findings indicate that the FISP is a necessary but not sufficient programme for fighting rural poverty in Zambia. This is because it has not significantly improved the small-scale farmers' productive capacity both in terms of assets and fertiliser use. Partly as a consequence of this, the small-scale farmers have not applied much fertilizer leading to low productivity and consequently perpetual poverty. The cost of production remained high despite the programme due to the low scale of production. Nevertheless, incomes from maize sales improved. Despite the shortfalls, the programme had a partial effect on productive assets. However, this paper has argued that given the manner in which the FISP is designed and implemented, it is unlikely to have a significant impact on small-scale farmers in various socio-economic aspects.

1.1 Background

Africa may be the only continent that has been highly associated with peasant farming in the history of development (Havnevik et al. 2007). She has suffered numerous policy interventions on several occasions too. The continent has the highest number of rural dwellers of approximately 70% (Minde et al. 2008b; WDI[10] 2011). Uninformed, most agricultural policies in the continent would have been deployed on an experimental basis, even those proposed by the World Bank (Havnevik et al. 2007). As such, they needed to be evaluated from time to time to assess their effectiveness. The same may apply at country level.

Policy design and implementation in Zambia has generally not benefited from well-designed evaluations to measure their effectiveness. Partly as a consequence of this, policies and programmes such as FISP are designed to handle more than one problem and address often conflicting objectives at a time, thus

[9] Mwembeshi will be used in this paper.

[10] World Bank Development Indicators www//data.worldbank.org/topic/agriculture-and-rural-development(accessed 05/09/11)

lumping huge expectations on outcomes of each policy. Evaluations could result in enhancing performance and discarding policies that are failing. African rural dwellers are faced with problems of food shortage and poverty simultaneously (ibid.). This has led to the continent's low economic growth and high poverty. A link between policy design and evaluation may be crucial in Zambia.

Despite huge demand on resources, one of the commonest policies in rural poverty alleviation has been agricultural input subsidisation. Zambia has used a variety of subsidies from independence such as food, price and fertiliser (Hodges 1978). Though the subsidies may have continued to date, they financially stressed the Zambian Government in the past and had to be abandoned mid 1980s (Simatele 2006). This was under the demand by the International Monetary Fund (IMF).[11]

Though controversial, agricultural subsidies could be an effective tool to bringing economic and social changes to a developing country. This is because they act as social safety net transfer from wealthy urbanites to poor rural dwellers (Morris et al. 2007). Arguably, subsidies breed perpetual dependency among recipients if continuously used (Mwanaumo 1999). The subsidies could impact positively on the nation's food security, national income and export earnings by improving the productivity of recipients. On the other hand, savings could help the poor improve their human and material capacity. However, the subsidies would only be effective if well targeted and complemented (Duflo et al. 2010). Moreover, being cash transfers, the government could recover them in future. This implies benefit-cost, sustainability issues and the need to prioritise. Among prioritised areas is the small-scale farmer subsector in Zambia.

The Zambian small-scale farmers the majority of whom reside in the rural areas are faced with high poverty levels that peaked around 1991 and have only declined marginally over the past two decades (fig 1). This has been a source of concern especially that they constitute a high percentage of the population[12]. These farmers produce 60%[13] of total maize in Zambia and it is their main source of income. Intuitively, poverty has become synonymous with the small-scale farmers in Zambia. While poverty breeds the inequality that may be bad for economic growth (Rodrik and Alessina 1994), it is bad in its own right as it reduces effective demand in the economy and dignity of the afflicted. Although the factors behind persistent rural poverty may not exactly be well identified, some measures to reduce it have been instituted by the Zambian Government. They include agricultural input subsidies, alongside non-farm subsidies such as youth empowerment, Food Security Packs (FSP) and cash transfers to the mostly vulnerable persons (PRSP 2002)[14]. This suggests agricultural subsidies could be one of the solutions to the problem facing the small-scale farmers. This research paper tries to find out whether FISP which is administered by the Ministry of Agriculture and Cooperatives (MACO) under

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[11] Plans by Government to cut back on subsidies hatched in 1975 Hodges (1978)

[12] Estimated at over 65% of total population

[13] http://www.odi.org.uk/work/projects/03-food-security-forum/docs/zambia.pdf(accessed 16/05/11)

[14] Administered by Ministry of Community Development and Social Welfare

which the subsidised fertiliser and seed is provided to the market oriented farmers have had an effect on asset levels among Zambia's rural poor. According to Wiggins and Brooks (2010: p 4): thereby [...] "creating a virtuous circle of higher yields, higher incomes, more food, less hunger and poverty"

The agricultural sector employs 85% and contributes on average 20% to the country's GDP (CSO 2010). If fully utilised, the sector has the potential to contribute to the nation's food security, export earnings and improve rural incomes (NAP 2004). Like many other sectors of the economy, agriculture has suffered the political and natural turbulence. The potential of the sector could greatly benefit the Zambian economy if fully tapped.

1.1.1 The Zambian Economy and Policy Implications for Agriculture

Zambia's economy is a dichotomy of modern urban mining commercial-oriented sector and a rural agricultural based sector. The economy manifests the pre-independence rural-urban structure which has lived on for the four decades of independence in 1964 (Crehan and Oppen 1988). Typical of this are the three categories[15] of farmers ranging from the small-scale farmers (<5Ha), emergent farmers (5-20 Ha) and large scale producers (50-150 Ha). Large scale producers occupy fertile land that is relatively better serviced with modern infrastructure while small-scale producers are predominantly economically isolated on marginal lands. The classical development paradigm imposed by the coloniser emphasising comparative advantages led to a specialised production structure. The main outcome was too much reliance on the copper for exports and on the maize to feed the miners.

The class structure is explicit at all levels up to the lowest economic unit; the farmer. Poverty levels have patterned along with the richest in the urban and the poorest in the rural areas (CSO 2011). The impact of the changes in the mining sector has often spilled over to agriculture. While mining has been important for the generation of employment and the foreign exchange, agriculture goes beyond that hence making it a strategic industry. As such, different regimes have used different policies to counter the negative effects of the mining sector's poor performance on the economy which have affected agriculture and consequently the rural poor. Demographic dynamism that happened soon after independence from Britain did not move a lot of rural farmers into urban areas and by 2000, two thirds still lived in rural areas (ibid). The problems in agriculture's rural majority have continued to the extent that poverty is now synonymous with rural people.

Copper mining has been the country's main economic activity. This is because of its huge contributions to the economy. Between 1965 and 1970, the sector contributed about 95% of export earnings. This amounted to 45% of government revenue (Hawkins Jr 1991). With too much reliance on copper exports and oil imports, the simultaneous copper and oil price shocks of 1973

[15] Another category of corporate producers operating more than 1000 Ha is emerging in Zambia

hit Zambia's economy hard (Arrighi 2002). As attempts were being made to diversify the economy into other sectors, Zambia experienced declining foreign reserves for importation of capital and consumer goods. This called for structural change in the economy and marked the first phase of such major changes in the economy in 1980 (Simatele 2006). Whilst practicing import substitution industrialisation (ISI), the regime also subsidised consumption. This exacerbated the foreign exchange shortage and negatively affected local firms as they could not recapitalise. Both mining and production in the economy plummeted leading to more foreign exchange induced economic woes (Hawkins Jr 1991).

The agricultural sector suffered from such policies and one of the major casualties was the only fertiliser plant in the country called Nitrogen Chemicals of Zambia (NCZ) [16](Banerji et al. 1996). This disrupted fertiliser supply. Equally, the first phase of the structural adjustment programme (SAP) in 1980 failed to alter the economy structurally (Simatele 2006). The GDP growth fell and remained negative until 1992, translating into a fall in GDP/ca[17] of 16% over the decade (WDI 2010). This worsened the poverty among the majority of Zambians. The poverty levels are currently estimated at 64% overall and 78% rural or between 4-6 million people being classified as poor (CSO 2010). A practical solution to the declining economy had to be found in order to arrest the situation.

1990 ushered in a new pro-market regime under the neoclassical paradigm influenced by the International Monetary Fund (IMF) and called for austerity measures owing to high debt. The agricultural sector was no exception. Government's role in the sector both as input supplier and output buyer reduced. Instead, it would have to create an enabling environment through predictable policies in the sector and provision of infrastructure to encourage private sector participation (GRZ 2007). In principal, Government agricultural institutions had to pave way for a more efficient private sector.

A major player, the pre-1990 Government provided credit for farmers through Lima Bank, the Credit Union and Savings Association (CUSA) and Zambia Cooperative Federation-Financial Services Limited (ZCF-FS Ltd) (Copestake 1998). It also bought off the produce from farmers through National Agricultural Marketing Board (NAMBoard) (ibid.). This eased farmers input acquisition and output marketing problems. The liberalisation of the economy reversed this and worsened the farmers' problems. The withdrawal was sudden and the impact negative. Seshamani (1998: p 539) summarises what liberalisation meant for the agricultural sector:

> The main elements of agricultural market liberalisation in Zambia have been the dismantling of the state institutions for the marketing and distribution of agricultural produce and inputs, the abolition of agricultural subsidies, the liberalisation of import and export trade and the market determination of input and output prices.

Government withdrawal from agricultural support was indeed sudden. Beginning 1992, full implementation of liberalisation was under way and state

[16] Not meeting demand, much of fertilizer imported

[17] Share in value for each national

supported marketing boards were dismantled. "By 1993, the Zambian agricultural sector was one of the most liberalised in the continent" (UNDP 2007: p 68; Chiwele et al. 1996) and all agricultural subsidies were officially removed by 1994 (Simatele 2006). This meant the private sector taking over the purchase of agricultural output. On the other hand, the credit from the Lima Bank, ZCF FS and CUSA and subsidised loans from commercial banks also stopped (ibid). Commercial credit would have to be obtained for the farmers to continue production (Jayne et al. 2007). Uninsured and lacking collateral to obtain loans from commercial financial institutions, farmers turned on assets. Moreover, the farmers had developed a lax attitude towards loan repayment (Mwanaumo 1999) and could not be trusted by the financial lenders anymore. The sudden act exposed the farmers to a financial shock.

The farmers would have to buy unsubsidised inputs off the markets out of pocket. To do that, they must have had a steady source of income. The incomes would only come from sale of maize output. When the maize market failed and, without insurance, farmers would turn on their assets. This would lead to decapitalisation and further poverty traps. The poverty incidence hence rose from the pre SAP level of 81% to 90% (Seshamani 1998). In 1992, the cooperatives that were 'buyers of the last resort' also collapsed leading to discontinuity of the programme (Mwanaumo 1999). The implication was that farmers would have to find their own markets for the first time, a serious shock.

In 1995, floor prices were also withdrawn marking total withdrawal by the government from grain marketing as well[18]. The same year saw the total collapse of the Government supported credit organisations namely Lima Bank, CUSA and ZCF-FS (Copestake 1998). Though there was an effort by Government to continue providing credit to rural farmers through the Agricultural Credit Management(ACMP) programme through Cavmont Merchant bank and Societe Generale de Surveillance(SGS)[19]-Zambia, it failed (Fletcher 2000). By 1996, maize sales had dropped by 53 % due to low coordination by the market (Seshamani 1998). This subjected the farmers to exploitation following distress selling. Despite low recorded sales, there was a widespread food insecurity (Mwanaumo 1999) implying leakage of sales at shadow prices. Due to the market failure, the farmers could neither sell their produce to generate income and neither could they buy fertiliser (IFAD[20] 2003). It is clear the Government of Zambia was heavily involved in the agricultural sector and such were problems of its withdrawal.

Poverty level peaked soon after 1991(Seshamani 1998) and key indicators of rural household livelihoods such as values of crop output, output per hectare, capital stocks (farm assets and animals), and area cultivated declined during the first half of the 1990s (Jayne et al. 2007). There was a remarkable drop in fertiliser use as well (Kodamaya 2011). This partly aggravated rural poverty

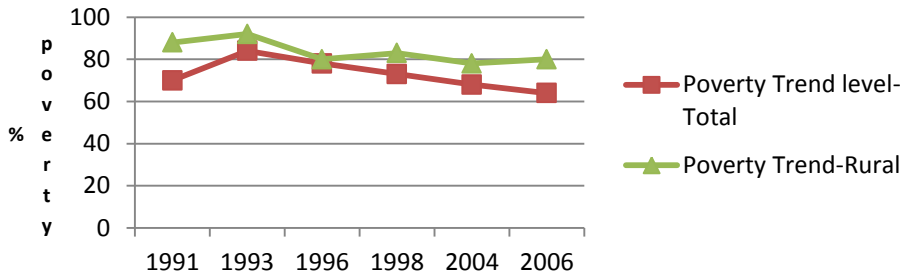
[18] Though another government marketing agency (FRA) comes up same year, see p 14

[19] SGS Zambia was a subsidiary company of Societe Generale de Surveillance of Switzereland

[20] International Fund for Agricultural Development

which remained relatively high and only the Government could help recapitalise their asset base. Fig 1 shows trends of poverty over time in Zambia.

Figure 1 Poverty trends 1991-2006



Source: Data from Central Statistical Office (2009), Graph by author using *excel.* **Note**: no access to before 1991 data

Poverty is aggravated by lack of employment in the formal sector. This is because the industrial sector has not grown to absorb excess labour from the agricultural sector. Instead we see an increase in the number of farmers benefiting from the agricultural subsidies (Govereh et al. 2006; table 2). This puts agriculture in the driving seat for growth in the economy and may have prompted the Government to draft in the subsidies. Having instituted this choice in 2002, the Government still had options such as dealing directly with the suppliers of or fertiliser manufacturers, supporting more efficient farmers, or providing better information to farmers on the use of fertilisers. According to Minot and Benson (2009), the choice is driven by the context and the availability of resources. It is thus critical to pin down the causes and solutions to poverty in our context.

Though input subsidies may be an ideal approach to alleviating rural poverty and ensure food security, they come at a cost. There is evidence that most governments implementing such policies spend a good percentage of their budget on them. Some suggest expenses have led to near financial bankruptcy of some governments (Crawford et al. 2005). On average, governments spend well above 10% of total annual expenditure. India, Malawi and Sri Lanka spend 10%, 15% or more budgetary allocations (Wiggins and Brooks 2010). Zambia witnessed subsidy-related financial stress in the 1980s (Simatele 2006). It is therefore, prudent to weigh both the effectiveness and efficiency of the policy options that governments undertake.

Intermittently on and off between 1991 and 2000, the full implementation of the FISP begun in 2002 (GRZ 2007). It operates as a matching grant at 50% rate. The farmer meets the cost half way with a possibility of being weaned off in the coming farming seasons if they progress. Prior to that, the farmer must meet the cost at 75%. Depending on the situation, there is a possibility by Government to upscale the rate beyond 50 % (GRZ 2002). The initial dis-

bursement assisted over 120 000 small-scale farmers with 48 000Mt of fertiliser accompanied by 2 400 Mt of maize seed[21]. By 2005/06, the programme had grown by 75% in all three aspects (ibid.). A check at the office of the Principal Agricultural-Economist (PAE) at MACO which oversees some of the FISP activities, revealed that about 891 000 out of the total 1.3 million small-scale farmers in Zambia are being targeted currently[22].The selected[23] main objectives of FISP are:

i) To increase private sector participation in the supply of agricultural inputs to small-scale farmers and contribute to increased household food security and income.
ii) To serve as a risk-sharing mechanism for small-holder farmers to cover part of the costs for improving agricultural productivity.
iii) To expand markets for private suppliers and increase their involvement in the distribution of agricultural inputs in rural areas thereby disengaging government from the activity.

1.2 Problem statement

Poverty has continued to suppress the economic progress of most Zambians, especially the marginalised rural majority leading to further inequality such that it may be termed 'vicious'. The effectiveness of intervention measures equally leaves much to be desired. In an effort to alleviate the poverty, the Zambian Government has been running a national agricultural input support programme for farmers since 2002. Beside implementation hitches that have been cited by some researchers (Lumba 2009), no major attempt[24] has been made to evaluate the effect of the programme on small-scale farmers. However, periodic income based measures of $1.25/day (Simler 2007; WDI[25] 2010) being carried out by the CSO indicate high poverty levels among these farmers despite the FISP in place. This may suggest the programme has not been so successful in tapping into the sector's potential and thereby reducing poverty. With asset-based measure, a new insight as to why the programme may not be achieving its objectives at a desired rate has been highlighted by the study.

[21] Most farmers use traditional maize seed and is less than 5% of total consignment

[22] Representing 68% coverage

[23] Check FISP implementation manuals(2002-2009)

[24] Not to the author's knowledge

[25] World Development Indicators of the World Bank

1.3 Research Objectives and Questions

1.3.1 Research Objectives

(i) To assess the effect of the FISP on asset development for rural small-scale farmers

(ii) To determine whether FISP has managed to reduce cost of production for small-scale farmers thereby overcoming their structural inefficiencies.

1.3.2 Research Question

To what extent has the FISP improved productivity and built the productive assets of small-scale farmers?

1.3.3 Sub Questions

(1) Have farmers bought more fertilizer?

(2) Did they actually apply more fertilizer?

(3) Did this lead to higher output and reduced cost of production?

(4) Did this lead to higher incomes?

(5) Did this lead to productive asset building?

1.3.4 Hypothesis

While many LICs have tried to use agro-based policies to fight rural poverty, the effectiveness of such policies still remains to be comprehended. Ineffectiveness is aggravated by singleness of such policies against a host of problems that are associated with rural poverty. Subsidies have often been used as pro-poor policies. The hypothesis states that since subsidies reduce the cost of production, they should enable the farmer to maximise the output, income and consequently improve the asset base. This would in turn reduce rural poverty in the long term as assets generate more wealth. There should be a direct positive correlation between subsidies and asset levels. We therefore, expect significant differences between beneficiaries and non- beneficiaries. However, given the manner in which the FISP is designed, funded and implemented and, drawing lessons from successful countries, it is unlikely to have a significant impact on farmers' assets or indeed any other outcomes.

1.4 Study Limitations

A number of limitations were encountered during the course of this study. First, time and financial resources ranked the highest in hampering the smooth execution of this research. Second, poor record keeping by the farmers and accessibility to data in bureaucratic offices proved to be a stumbling block. Third, the methodology is not best suited for impact analysis due to its cross sectional nature, small sample size and lack of baseline socio-economic condition by the beneficiaries. But this could have been overcome by backdating the

questions on farmers. However, they could neither remember past production figures nor attach any value to their assets. Nonetheless, the farmers were able to attribute acquisition of certain assets to the FISP while we assigned a weight of 1 for each. Whereas the research was designed on the basis of poor targeting as the major cause of not benefiting from FISP (Lumba 2009), there were problems of self-selection which may bias the findings. Measurement error and wrongly specified model coupled with unobserved factors may have distorted the research findings.

1.5 Organisation of the Paper

This paper is divided into six chapters. Chapter one looks at the background of the Zambian economy and the policies that have affected the agricultural sector in the past. Chapter two is about literature review done by other scholars in the field of study. Chapter three looks at the overview of the subsidy programme in Zambian agriculture. This is followed by methodology under chapter four while chapter five presents the findings of the research. Within chapter five are the analyses and discussions of the findings. Finally, chapter six summarises the major findings and concludes.

CHAPTER 2

2.0 Literature Review

2.1 Introduction

Although subsidies are meant to help the recipients, the benefits may vary depending on the type of subsidy, how well it is implemented and the affordability. Generally, the economic justification for the use of subsidies is to support infant industry, to offset temporal negative shocks and to protect the environment from degradation (FAO)[26]. They are meant for short term measures. While subsidies may have an economic effect on beneficiaries, disengaging government from them may be difficult once started (ibid). However, governments forge ahead with implementation despite the problem. This section reviews the literature concerning use of subsidies and draws a conclusion at the end.

2.2 Extent of subsidy use

Agricultural subsidies have been in use from the 1930s (ibid.). They have been widely used since and as much as US $58 bn was spent by the United States (US) Government in 1997 (Young and Westcott 2000). A huge allocation can also be seen under the Common Agricultural Policy (CAP) in the European Union (EU) representing 48% of the EU's budget at €49 billion (Borrell and Hubbard 2000). Other small economies have also been using agricultural subsidies extensively. Not only have subsidies been in use for a long time but have actually spread to other countries and have been up scaled especially by the major economic blocks of the world.

Some Sub-Saharan Africa countries like Zambian, Malawi and Kenya have been actively involved in input support programmes (FAO Policy brief No. 3 2009). This is no surprise given that farmers on their own in sub-Saharan Africa use less fertiliser as compared to farmers of other regions leading to low food output. Sub-Saharan Africa applied the least rates of fertiliser (9 kg/ha) among the other regions of the world's average of 102 kg/ha in 2003[27] (Crawford et al. 2005). Deviation from optimal levels may lead to extremely low returns while getting it right has high returns of approximately 36 % (Duflo et al. 2008; Minde et al. 2008b). Better use of fertiliser has resulted in high yields in advanced countries of about 8 tons/ha of maize (Prabhu and Pandey, undated). Denning et al. (2009) report even higher yields in rain fed areas of the US equal to 10 tons/Ha. However, there was a general decline in fertiliser use be-

[26] http://www.fao.org/docrep/006/y4647e/y4647e05.htm(accessed 13/05/11)

[27] Zambia requires approximately 170 kgs/ha (Deininger and Olinto 2000)

tween 2001 and 2003 in most parts of the world (ibid.). The general reasons for low fertiliser use in Africa are costs, lack of irrigation and seed varieties that may not require fertiliser use (ibid.).

Zambia has tried to reduce the cost of fertiliser by subsidising the inputs at 50% but does not have a well-developed irrigation programme yet[28]. Considering that 85% of income is spent on food by the farmers in Zambia (Hazel and Hojjati, undated), 50% sharing may still be costly to them. With only 15% to spend on 'other' merchandise, the farmers may not offer effective demand for fertiliser too. Consequently, they may ration its use which could result in low output and low incomes for them. However, some countries have gone round this problem and have attained better achievements.

Kenya has achieved the participation of the private sector in the supply of fertiliser because of the improved income levels for the farmers (Minot and Benson 2009). With increased incomes, the capacity of farmers to buy from the private sector was enhanced. Malawi is credited for improved use of the subsidy that resulted in increased output in that country's maize harvest from 2005 (Dugger 2007) leading to about 53% food surplus in 2007(Denning et al. 2009). This was barely two years after implementation of the programme. She overcame implementation hitches that have dogged other African countries running similar programmes. One of the key instruments used in Malawi are 'smart'[29] subsidies through the use of vouchers (Minde and Ndhlovu 2007). These are targeted input programmes (TIPs)[30] which improve coverage tremendously and have been in use in that country since 2000. Over and above that, the Malawian programme was well funded and diversified too (ibid; Lumba 2009).

While Malawi could have used targeting well, the FISP ignores the Rural Non- Farm Economy (RNFE) by design. This notwithstanding the fact that the less developed an economy is the bigger would be the RNFE (Lanjouw and Lanjouw 2005). The Zambian agricultural analytical report (2000) identifies four main activities in rural areas namely agriculture, hunting, fishery and forestry. Zambia does not have another functional rural development policy since the abandonment of the integrated rural development programmes (IRDPs) that had begun in 1979 (Crehan and Oppen 1988). In both the African and Asian scenarios, the successful countries have gone beyond implementing a mere subsidy by supporting the policy in many other aspects. The successes have renewed calls for more subsidy use in Africa since 2006.

The call coincides with the World Bank's rethink that agriculture needs to take a leading role in the development agenda ahead of industry (WDR 2008)[31].

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[28] Fifth National Development Plan(FNDP 2006) emphasizes this

[29] "(**S**)pecific targeting to farmers, (**M**)easurable impacts, (**A**)chievable goals, (**R**)esults orientation, (**T**)imely duration of implementation"

[30] May cause secondary fertiliser markets(Dorward 2009)

[31] Criticised for ancientising Africa, Havnevik et al. (2007: p 5)

This is contrary to the Rostow linear development model[32]. Prominent figures and organisations have equally joined the profile calling for more input subsidies among them Jeffrey Sachs, Alliance for the Green Revolution in Africa, New Economic Partnership for Africa Development (NEPAD) and Steven Carr[33]. For example, Carr as quoted in Dugger (2007: p 1) said:

> The rest of the world is fed because of the use of good seed and inorganic fertilizer, full stop. This technology has not been used in most of Africa. The only way you can help farmers get access to it is give it away free or subsidize it heavily.

Subsidies could only be effective under certain conditions such as complementing them and offering implementation support (Duflo et al. 2010). This is because on their own, they affect only a small part of the whole process. China, Malawi and some green revolution member countries are a few that have used subsidies effectively (Denning et al. 2009). While improving productivity of farmers, China also depeasantised the rural sector by ensuring there was a functioning industrial base to absorb the labourers (Havnevik et al. 2007). To attain this, China made several revolutions in the agricultural sector between 1950 and 1984 namely land reform (1950), household responsibility system (1979) and the market reforms of 1978-84 (Huang 1998). The market reforms culminated into price support for the farmers (Denning et al. 2009; Dorward 2009). The subsidies resulted in improved productivity growth from 63-96 % (Huang 1998) because they were sustained (Dorward 2009). With high productivity, the farmers were so empowered they could hardly get prices below the marginal cost of production (ibid.).

The lowly priced agricultural products did not only enhance industrialisation but also facilitated exports. China also promoted public investment in high yielding varieties ideal for poor farmers (WDR 2008). The other green revolution countries supported the agricultural sector for a long time and that they were not plagued by food insecurity as was the case with Africa (Abalu and Hassan 1999; ibid.) and Zambia in particular (Kalinda et al. undated). The complementing aspect of subsidies is echoed by Duflo et al. (2010: p 3):

> There is evidence that fertilizer is complementary with improved seed, irrigation, greater attention to weeding, and other changes in agricultural practice that farmers may have difficulty in implementing.

The food and agriculture organisation (FAO) supports the need for complementing input subsidies in order to multiply the benefits. It identifies possible point of complementing as food price stabilisation and the provision of financial services such as credit and insurance. Below is a table showing different rates of returns from various public investments which could complement input subsidies.

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[32] Rostow (1960: p 4) five stages of development: traditional stage, precondition for takeoff, take off, drive to maturity and the age of high mass consumption

[33] Stephen Carr, former World Bank specialist on Sub-Saharan African agriculture

Table 1 Values of rate of returns to government investment in agriculture

IFPRI review of rate of return studies:

	Returns
Input subsidies	< 0 to 12%
Public Investments in	
- research & extension	35% to 70%
- roads	20% to 30%
- education	15% to 25%
- communications	10% to 15%
- irrigation	10% to 15%

If we believe these findings, they have major implications

Source: Jayne et al. (2009)

Deininger and Olinto (2000) using panel data on Zambia estimate the rate of return to fertiliser at between 7-12%. This is consistent with the IFPRI[34] estimate shown in table 1. In the same estimation however, return to cattle asset was much higher with expected increase in income of 18% and implicit increase on land cultivation of 25%. In contrast, they find no formidable impact on productivity by the public services. This may call for rethinking of generalised approaches to solving problems of rural poverty. The World Bank blames failure of earlier subsidies in Africa on generalised applications (Denning et al. 2009). This implies analysis of rural poverty problems to the micro level; the household. Policies developed from nationally generated data, though representative and seemingly cheaper to formulate, may no longer be generally applicable.

A close look at FISP reveals that there has neither been effective support beyond production nor diversification of the policy within the production system. Yet empirical evidence suggests that intervention in output markets is much more important than at input level (Singh et al. 1986). However, a Food Reserve Agency (FRA)[35] has been put in place to cushion the producer price by setting floor prices and buying the produce. But due late opening of agricultural market, farmers have not been able to benefit much. For example, the marketing season has opened late this year in order for grain to have right moisture content at 12.5 % (www.fra.org.zm). The producer price has equally and often been below the production cost of small-scale farmers (table 3). Without access to world markets (Chapoto et al. 2010; Govereh et al. 2006) despite liberalisation being a Government policy objective (Mwanaumo 1999), the farmers may operate at a loss. In instances of imperfect knowledge, the Agricultural Household Model (page 22) predicts a breakdown in separability and farmers may only produce for consumption and not profits.

[34] International Food Policy Research Institute

[35] Zambian Government funded crop marketing agency created by an act of parliament in 1995. Due to late opening of the market, farmers become distress sellers

2.3 Debates on subsidies use

Considering that subsidies may only benefit a small section of society and that externalities in terms of secondary[36] fertiliser markets and cheap products may spill beyond national borders (Doward 2009), they are highly debatable both internally and internationally. This is because they attract a wide range of interests in global agribusiness. We turn to the debates of subsidies in agriculture. The section concludes with a view that favours the use of 'smart' subsidies in agriculture.

Arguments in favour of subsidies have often been based on the economic benefit they contribute to the farmers; high output and reduced cost, incomes etc. The rationale for subsidies is economic efficiency, i.e. where markets fail and also the redistributive affects i.e. equity (Wiggins and Brooks 2010). On a technical note, Minde et al. (2008b) argue fertiliser subsidies are needed to mineralise poor African soils which have negatively affected the productivity of small-scale farm. While organic manure could substitute inorganic fertilisers, its nutrient level was too low (Denning et al. 2009). African agriculture was becoming more intensive due to land pressure as a result of increasing population (ibid.). Subsidies may overcome this.

McMichael (2009) views subsidies as a way of countering the heavily subsidised products from the North that outcompete those of the South under the auspices of the World Trade Organisation (WTO) and neoclassical competitive models. The consequence of this infiltration has been the driving of farmers off the land because of the cheap imports. This could be a serious threat to farmers especially with the onset of land grabbing that characterises the multinational corporations (MNCs) (Borras and Franco 2010; Von Braun et al. 2009). The exposure of farmers at the insistence of World Bank structural adjustment policies has resulted in loss of market share to more efficient global producers (Havnevik et al. 2007). With subsidies, the productivity of farmers could be enhanced and may enable the farmers to compete favourably through empowerment.

Sachs (2005)'s millennium development goals (MDGs) project is optimistic that it is possible to halve poverty with intensified use of subsidies (Denning et al. 2009). Reflecting on the success stories on Malawi of which they hope to turn into an "African Green Revolution", Sachs joins a group of other authors into rekindling the optimism from subsidy use.

Paradoxically, the WTO has shown concessional efforts in allowing agricultural input subsidies under what is termed as "green box":

> [...] Domestic support is further classified into five categories: (a) aggregate measure of support (AMS), which includes product-specific and non-product specific support, (b) green-box support [...] (Chand and Phillip 2001: p 3014)

[36] 'Markets where recipients of subsidized inputs sell their inputs to others, normally at prices that are discounted as compared with unsubsidized inputs […]' (Doward, 2009: p 25)

Further, under the ministerial conference on agreement on agriculture, the WTO urges the members to exercise restraint towards challenging the measures taken by developing countries in the green box. Related to the subsidies, preferential treatment for countries with GDP/ca below $1000 would be given until such economies achieved a higher per capita income (WTO 2001). Moreover, the use of subsidies is becoming more irresistible because not only are they politically attractive but are also easy to implement (Crawford et al. 2005).

Most debates focus on how effective and practical the alternatives maybe relative to subsidies. Intuitively, subsidies look as though they provide a ready solution to otherwise difficult problems of developing input markets and associated financial services to small farmers. While other ways of overcoming such problems are complicated, with success uncertain, a subsidy is a relatively easier way of overcoming the difficulties associated with other policy measures. The simplicity view is echoed by Wiggins and Brooks (2010: p 9):

> Yet perhaps the greatest attraction lies in the apparent simplicity of a single measure, a subsidy, to meet a wide range of objectives: economic, social and political [...].

Finally, in a rare gesture, the World Bank supports the use of subsidies as an effective instrument for using agriculture to develop the LICs (WDR 2008). However, given the polarity of views on social, political and economic aspects of life, the use of agricultural input subsidies has not gone without criticism.

The market fundamentalists; the neoclassical and neoliberals argue against use of subsidies and contend that subsidies may not be used on the ground that they distort the free operation of market fundamentals of demand and supply. The implications of free market notion are that resources should only flow to profitable sectors. If farmers are not able to buy inputs, government should not help; they should be employed instead of being producers themselves and this may entail migration out of agriculture. With such internal dynamics in the sector, resources would be efficiently allocated (Shiferaw and ISS[37] 2005).

Most of the criticisms about agriculture input subsidies have been prominent in the 1980s and 90s[38]. The major claim had been that the subsidies were not efficient and effective government instruments to address the problems in the sector (Dorward 2009). In the forefront are the neoliberals under the Washington consensus. According to the 1981 Berg Report of the World Bank as in (ibid: p 8):

> [...] report criticised input subsidies as a major element in fiscally and economically unsustainable policies that were highly inefficient, ineffective and expensive in Africa. These policies distorted market incentives, blunted competitiveness and farmer incentives, and undermined the growth of private sector services.

[37] International Institute of Social Studies

[38] The neoliberal era built on good governance/state minimalism

It is further argued that subsidies are characterised by targeting problems which may result in leakages to non-intended beneficiaries or even cross the borders (ibid.).

2.4 Conclusion

Given that most evidence points to the fact that there is increased need for government to foster development in LICs, this paper takes the position in favour of 'smart' input subsidisation in order to harness the potential that the sector enjoys in Zambia. But this is not to overlook the important role markets play in the production, distribution and consumption of maize.

Sustained government support in countries that have succeeded is seen to be crucial. Moreover, Zambia is plagued with food insecurity which may threaten her sovereignty. Zambia's manufacturing[39] and service sectors are too weak to absorb the labour surplus in the rural areas or indeed to foster the necessary linkages between the primary sector and the manufacturing itself (PRSP 2002). Moreover, fertiliser and food prices have skyrocketed since the 2007 world food crisis well beyond the reach of farmers (Doward 2009; ZFSM[40] 2008). In view of the globalized nature of agribusiness, some form of shielding may be important until such a time when the players in the sector developed the necessary skills to withstand competition from mostly subsidised international products (Chang 2000). Moreover, the private sector may not be motivated to support farmers due to market failure. Further, at 20% option rate of asset depletion per year as a coping strategy (appendix 3; CSO 2004), it would require a lot of resources to enable rural poor to retain assets. Only the government could afford this.

In addition, government must deliberately amplify its role in a weak economy (Moyo 2009; Simatele 2006). A neo-Keynesian perspective has to counter the consequences of the neo-classical policies of 1991. However, it is important to note that socio-economic policies must be coined according to the prevailing situation (Minot and Benson 2009); i.e. they should borrow from both neo-Keynesian and neo-classical perspectives and must be curtailed if ineffective at the earliest possible time. Policies must be flexible.

2.5 Conceptual framework

This section outlines the definitions of key concepts that are used in this paper. The linkages between the input subsidy and other social economic factors are explained. The key concepts are: subsidy, agricultural productivity, the agricultural household model, and productive assets.

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[39] Averaging 10% of GDP and employs about 11% of the formal sector (PRSP 2002)

[40] Zambia Food Security Monitor

2.5.1 Subsidies

We use the concept of subsidy to explain the linkage between agricultural productivity and asset base build up for the small-scale farmers. This is because the subsidy is central to the FISP. We could then link it to poverty alleviation in rural households, the main objective of the FISP. We begin by looking at the logic behind use of subsidies and the link to rural assets and how they are funded. Finally we theoretically analyse their impact on cost of production and form expectations.

The theoretical argument behind this research in relation to subsidies is that the beneficiaries should possess more assets because:

a) They save more due to reduced input cost. They have an added advantage. Imagine a situation where the farmer must sell an asset in order to invest in maize production but instead gets the inputs at half the price. Their assets are then spared while it is the opposite for another farmer not benefiting.

b) They would be less risk averse as part of the risk is shared in the subsidy. This should enable them to venture into more risky and profitable undertakings such as acquisition of innovative assets or diversifying into high value crops.

c) They should have a wider profit margin and should therefore be able to acquire more assets, whatever the source of money.

FISP being government money transfers, they could be funded through taxation, private and donor[41] funds. Komives (2005) categorises subsidies into two; funded and none funded. Funded subsidies are ones where the government uses own resources to finance the programme. For such, the author observes that while they may help, they take away from the poor in one way or other through taxation. The net effect for funded subsidies may not always be positive. On the other hand, the author observes unfunded subsidies (borrowed finances) may have serious future implications as they transfer the subsidy burden to the future generations. Subsidies are not a free gift despite being government resources.

Subsidies can differ in terms of the point at which the subsidy is applied, the form and whether the subsidy is directly administered (Crawford et al. 2005). In the agricultural value chain, subsidies could be applied at any level starting with input manufacturers, suppliers, transporters and consumers of the product. Subsidies could be in form of cash, voucher, transport etc. while others could be in the form of conditional cash transfers (CCT) (Rawlings and Rubio 2005). The effect of input subsidies ends at output improvement. Beyond this point, it has little impact. Finally, subsidies could be administered directly or indirectly on the beneficiaries. FISP is a targeted[42] and direct input programme at farmer input level. What is a subsidy?

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[41] For LICs

[42] Truncated and financially sustainable programme that is targeted to selected farmers while allowing the private sector to freely distribute inputs on commercial terms.

The WTO[43] definition of subsidies contains three basic elements: (i) a financial contribution (ii) by a government or any public body within the territory of a member (iii) which confers a benefit. All three of these elements must be satisfied in order for a subsidy to exist.

A subsidy is an amount that government gives to consumers of a certain product (Varian 2003). The author classifies subsidies into two types namely per unit and advolerem. Per unit subsidy is calculated as: **p-s** where **p** is the cost price and **s** is the unit subsidy. The advolerem is calculated as **(1-σ)** $\mathbf{p_x}$ where **σ** is the rate of subsidisation; $\mathbf{p_x}$ is the actual cost of the input such as fertiliser/seed. For example, the final cost of the product with a subsidisation rate of 50%[44] would be $\mathbf{(1-0.5)p_x}$ or simply $\mathbf{0.5p_x}$. In this case, the government subsidy meets the cost half way. The higher the rate, the lower is the final cost of the input. This improves productivity of farmers which is here defined as output per hectare. FISP is advolerem and this is what the paper will work with.

Based on the above definitions, a subsidy is basically a transfer of cash from government to benefit a certain section of society. This definition is what this paper will use. It therefore qualifies to be a public good (Wuyts et al. 1992). An agricultural input subsidy is specific to the production of agricultural output. The main outcome is cost reduction and high productivity. Given that most inputs are costly, it helps farmers attain high productivity. Economic theory predicts entire subsidy incidence should be on producers (Kirwan 2009).

We reflect this incidence in fig 2. All the inputs constitute the total cost of production. When the total cost falls due to subsidy, there is a reduction in unit cost (AC) which results in either savings or increased output as shown below (Crawford et al. 2005).

AC=TC/Q where **AC** is average cost, **TC** = Total cost of producing the output **Q**.

Based on the theory of cost of production, the subsidy reduces the average cost thereby enabling the beneficiaries to maximise profit[45] and also allows the producers to "capture the economies of scale" (ibid.). With reduced cost of production, there is optimal use of input, the inputs are affordable and productivity is enhanced. Below is a graphical presentation of the impact of subsidy on cost and scale of production. There is positive supply response (fig 2).

[43] http://www.wto.org/english/tratop_e/scm_e/subs_e.htm(accessed 05/05/11)

[44] If rate= 60%, then cost= 0.4Px. Higher the rate is more costly to government but less so to beneficiaries

[45] Total Revenue-Total Cost

Figure 2 The effect of subsidy on average cost and scale of production

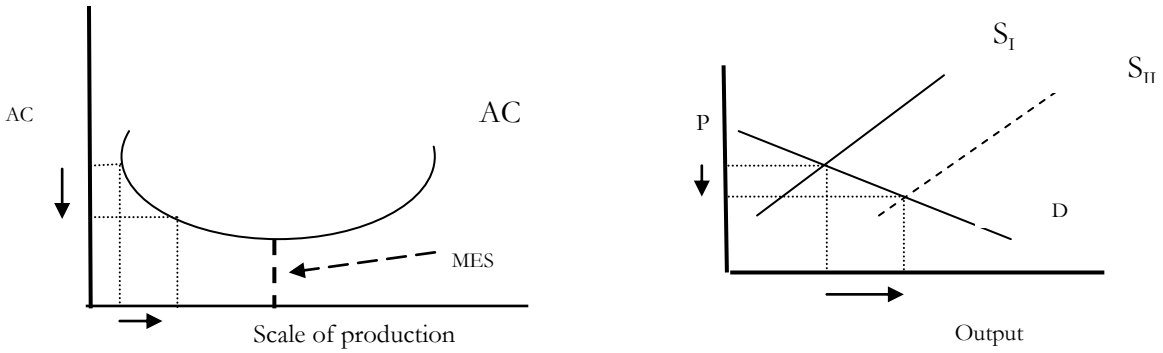


Fig 2 Average cost and supply curves: With subsidy, AC falls towards the minimum efficient scale (MES). MES is the lowest cost of production a farmer can achieve and at this point, profits are maximised as MC=0 (beyond MES, MC>0 and diseconomies set in). This occurs with optimal use of inputs. As scale increases, supply shifts to S_{II}. During harvest, the supply of maize increases to S_{II}. With constant demand (D) for maize, the equilibrium price falls from S_ID to $S_{II}D$ triggering fall in value of maize and consequently incomes for the farmers. Non-beneficiaries affected more due to higher cost of production (graph and elaboration by author based on theory of cost and supply).

2.5.2 Rural Agricultural Assets

Winters et al. (2002: p 4):

> Household assets are defined broadly to include natural, physical, human, financial, public, household and social capital. These assets are stocks, which may depreciate over time or may be expanded through investment.

Agriculture being a productive sector of the economy may require assets in order to be efficiently executed. This is because assets could allow farmers to access credit since they may act as collateral. Given that tropical agriculture is susceptible to vagaries, it may not be a priority for most insurers. Most farmers in LICs are uninsured due to the risky nature of their ventures which may attract high premiums. Lack of credit due to market failure may also affect asset generation ability (de Janvry and Sadoulet 2000). This leads to asset depletion each time they are faced with risk. With assets as coping mechanism, poverty becomes the order of the day. Majority becomes risk averse and may not venture out into new technology adoption. Subsidies may minimise risk aversion. Assets play other important roles in the livelihoods of rural farmers. They provide a better picture of long term standards of living because they have been accumulated over time and they last longer.

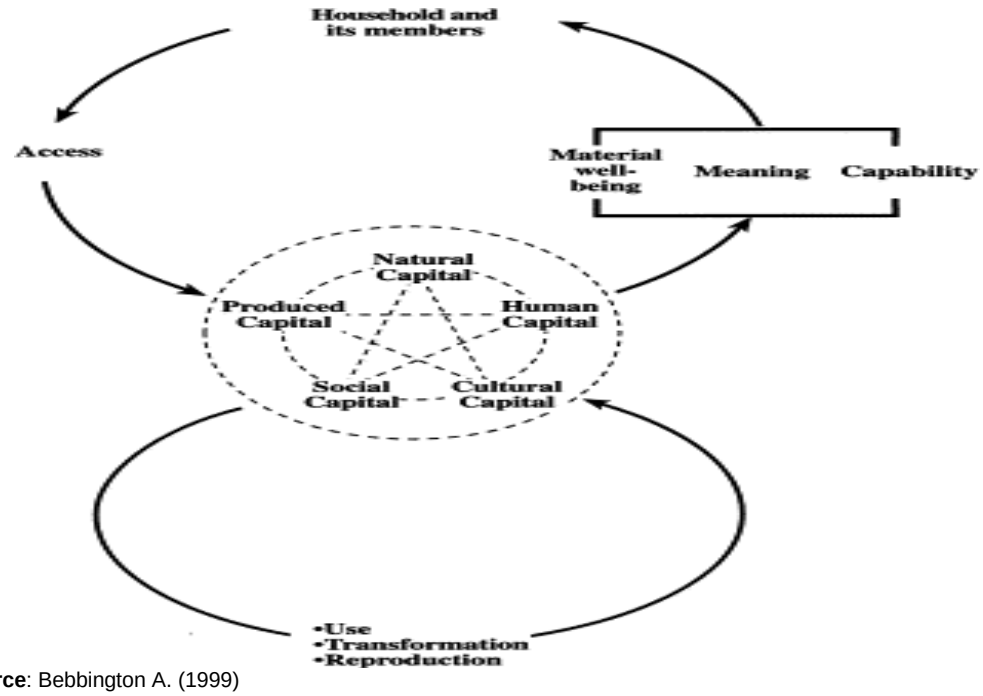
Bebbington (1999: p 2028) gives a summary of role of assets in rural livelihoods:

> [...] the diverse assets that rural people draw on in building livelihoods;—the ways in which people are able to access, defend and sustain these assets; and—the abilities of people to transform those assets into income, dignity, power and sustainability[...]

Fig 3 shows the relationships between assets and the wellbeing of farm households. Access to assets may lead to capabilities, freedoms and

wellbeing of farmers (Sen 1993). Some assets could be transformed into other forms which could help farmers deal with immediate needs that would not be easy without them. For example, an ox could be sold for money or battered for other items the household may desperately need in the present. Without access to assets, farmers suffer the chronic poverty.

Figure 3 Assets, livelihoods and poverty



Source: Bebbington A. (1999)

Common productive assets for rural farmers in Zambia may include draft power animals, ploughs, hand hoes, titled land[46], on-farm storage facilities, healthy and educated labour, concrete floored houses, iron roofed houses, tractors, experience etc. (Jayne et al. 2007). Accessing and using them is critical. We analyse some of these in the research. Understanding asset-based poverty may reflect the extent of poverty as income based poverty, which is a flow, is difficult to capture from small-scale farmers (Brandolini et al. 2010). Understanding the dynamics of assets in Africa is important because:

> Nowhere is the lack of assets greater than in Sub-Saharan Africa, where farm sizes in many of the more densely populated areas are unsustainably small and falling, land is severely degraded, investment in irrigation is negligible, and poor health and education limit productivity and access to better options(WDR 2008: p 9).

[46] Only because it may allow access to credit which may enhance productivity

2.5.3 The Agricultural House Hold Models (AHM)

Understanding the behaviour of farmers is important for policy intervention aimed alleviating their plight. This is because farmers are no ordinary producers. Using the AHM, it is possible, given the prevailing conditions, to predict the likely outcomes of a policy intervention (de Janvry et al. 1991; Singh et al. 1986). The AHM explains the behaviour of farmers both as producers and consumers at the same time (Udry and Bardhan 1999). Depending on the market conditions, decisions at production may or may not be associated with preferences. If market failure exists, separability between household and farm decision breaks down. This means farmers only produce for consumption. If markets are perfect, separability between farm and household decisions holds. Farmers maximise profits before maximising utility. With breakdown in seperability, allocation of resources may not be optimal. This equally enhances net-selling-net buying behaviour of peasants[47]. Net selling depresses prices thereby lowering the value of output. The smaller the agricultural holding, the more farmers tend to net buy and this may be exacerbated by market failure. The flow of information as well as farmer behavioural considerations is primary for good planning in agriculture.

Zambian crop agriculture is riddled with imperfect markets in that farmers never know the price of maize well in advance. The government funded FRA announces producer prices after harvesting. Unless the rural policies incorporate such behaviours of the intended beneficiaries, they may not be effective in the general sense. With such imperfections in the market, neoclassical policies are likely to fail hence requiring more government and stakeholders' involvement in the system.

2.6 Analytical Framework

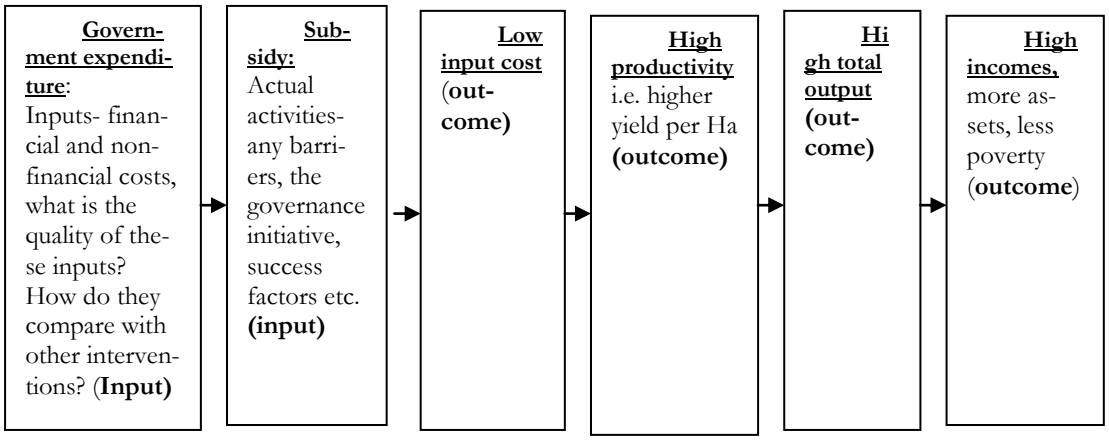
The framework of analysis borrows from the evaluation framework of Dickinson and Prabhakar (2009: p 8)[48] otherwise known as *logic* model. The model is based on community empowerment, an approach similar to the FISP. This model outlines the process of evaluating an initiative be it a project or a programme. In a nutshell, the evaluation process has five stages as: 1. Analysis of the contextual conditions; 2. Appraisal of strategic priorities programmes and projects; 3. Targeting and monitoring; 4. Evaluation 5. Impact and learning. This study encompasses all the stages in the quest for answers to the questions raised.

The basic relationships between the subsidy, productivity, output and asset levels can be outlined as shown in the *input-output* relation below. However, there seems to be no direct link between subsidy and assets. This link will only be established via incomes. The first two i.e. government expenditure and sub-

[47] Study discovers that nearly 89% of FISP beneficiaries sell their maize at the same time; good for net buyers

[48] www.communities.gov.uk/documents/communities/.../1412080.pdf(accessed 22/04/11)

sidies are inputs while the rest are outputs, outcomes and impacts. The outputs, outcomes or impacts could be characterised by long/short term, direct/indirect consequences on the beneficiaries and the community at large. For non-beneficiaries, the scenario would be different and such differences should be significant if the policy has any impact.



CHAPTER 3

3.0 An overview of FISP in Zambia

3.1 Introduction

This chapter introduces the origins and extent of the agricultural subsidies in Zambia. It opens with the history of subsidies, followed by the overview of the FISP and its impacts on maize output and cost of production on small-scale farmers. The chapter closes with a conclusion.

3.2 An overview of the FISP in Zambia

Historically, Zambian subsidies were more consumer-oriented than producer, on and off, declining and unpredictable. More so, the farmers did not benefit much from the subsidies as they favoured commercial producers (Fletcher 2000). Moreover, they covered a wider range of crops than maize. By 1970s, allocation of subsidies was more on maize and fertiliser accounting for more than 75% of total government agricultural subsidies and stood at 10 % of total government expenditure (ibid.). For the period 1977-84, maize and fertiliser subsidies accounted for 87.7% of all agricultural subsidies or nearly 7.4% of government expenditure. Though the allocation increased, total government expenditure slightly dropped from 10% in 1970s to 7.4% by 1984 (Fletcher 2000). Jayne et al. (2007) observe the allocation had dropped to 6% over the same period. As of 2007, only 2% of Zambia's national budget was for fertiliser (Duflo et al. 2010). This is way below the average expenditures observed in countries like Malawi or India which have recorded successes. There has been a general decline in the allocation towards producer subsidies as percentage of total government expenditure in Zambia.

Implementing since 2002, the overall objective of the programme was to increase private sector participation in supply of inputs to farmers in order to increase food security and income (GRZ 2002). The government would be involved because the market could not provide the service. Moreover, only 20% of farm households could access fertiliser while 30% accessed hybrid maize seed (ibid.). There was a general reduction in adoption of fertiliser due to liberalisation (UNDP 2007). The negative effect prompted government to stabilise the market through direct involvement. However, the government would disengage once the objective was achieved (GRZ 2002).

Though it started with a small number and quantity, the expansion of the programme was tremendous achieving nearly 75% rate over the four year period between 2002 and 2006. As at 2011, total coverage stands at 68 % (PAE). Below is a summary of the disbursement and coverage of the FISP since 2002.

Table 2 An overview of FISP at National level

Season	Budgeted/cost of programme (ZMK bn)**(a)**	Fertilizer in tons**(b)**	No. Of farmers**(c)**	Expected production in tons**(d)**	Cost sharing: rates payable by farmer(**e**)	Extra total output by beneficiaries[49]**(f)**	(**g**)Value of maize using 2008 floor price(K65000/50 Kg): **c x f**	(**h**)Net return ZMK bn**:(g-a)**
2002/3	100	48000	120000	360000	0.5Px	38X50 Kgs	296.4	196.4
2003/4	114.5	60000	150000	450000	0.5Px	38X50 Kgs	370.5	256.0
2004/5	112.6	50000	125000	375000	0.5Px	38X50 Kgs	308.7	196.1
2005/6	140	50000	125000	375000	0.5Px	38X50 Kgs	308.7	168.7
2006/7	252	84000	210000	630000	0.4Px	38X50 Kgs	518.7	266.7
2007/8	150	50000	125000	375000	0.4Px	38X50 Kgs	308.7	158.7
2008/9	492	80000	200000	600000	0.25Px	38X50 Kgs	494	2
Total	1361.1	422000	1055000	3165000	-		2605.8	1244.7
Averages	194.44	60285.7	150714	452143	0.46Px		1234.5	177.8

Source: columns (a)-(d) from GRZ 2002-2009 FISP implementation manuals, others are elaborations by the author based on the figures and research findings. The exchange rate USD: ZMK 5100 (MACO[50] Policy and Planning[51], December 2008).

Returns to Government investment in the FISP have been positive since its inception until 2006 using the 2008 floor price. As the number of beneficiaries increased and their cost share declined over time, the efficiency of FISP decreased. This is expected given the structural inefficiencies by this category of farmers and that the programme has just been around for a short while and that the effort is not market driven. Successful countries such as China have run these programmes for a long time (Huang 1998). The highest net return for FISP was 2006 while the worst was 2009.

This finding should be treated with a caveat since it is based on a constant 2008 floor price and small sample result. More so, handling costs are not discounted. However, benefit-cost studies on similar programmes in Malawi in 2006/7 have indicated positive returns to government ranging between 0.76 and 1.36 (Doward et al. 2008). On average, the subsidy to farmers has been below 50% and the number of beneficiaries has been under 160,000 in every farming season. Nonetheless, more than one million farmers have benefited from the programme since inception. 2006 recorded the highest output so far. Graphs in appendix 4 illustrate the trends based on table above while fig 5 below shows the trend in maize output over two decades in Zambia. Overall, the FISP has had a positive effect on maize production and may help break the vicious cycle of poverty.

3.3 Likely effect of FISP on poverty

In principal, agricultural subsidies if in right quantities could be used to break the 'vicious' cycle of poverty on the farmers. This is because they help improve

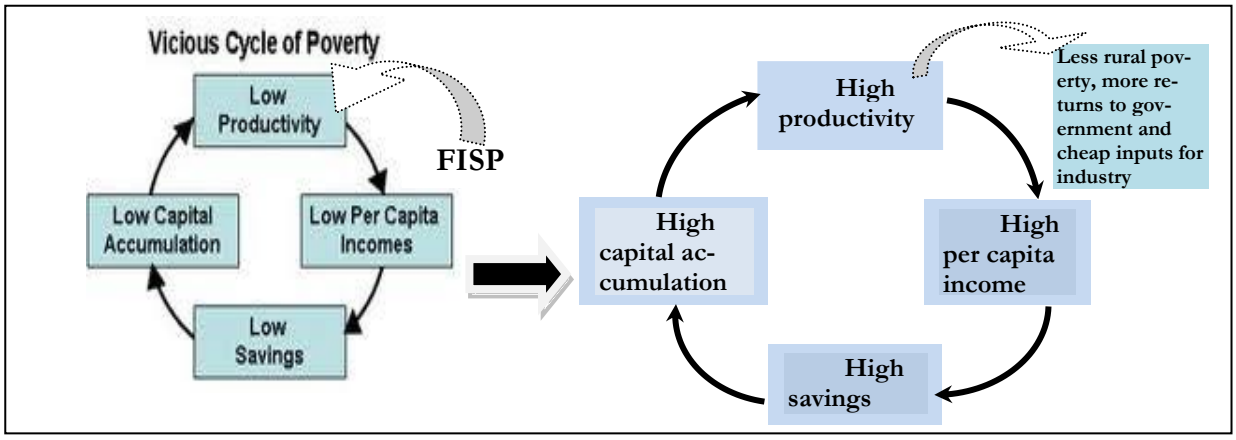
[49] Based on sample findings by the researcher whereby beneficiaries produce more by 38X50Kg bags. Calculation is done using extra, billion kwacha=000 000 000

[50] Ministry of Agriculture and Cooperatives of Zambia

[51] One of the key departments in MACO

productivity (Huang 1998) which is at the heart of this cycle. Fig 4 presents the point at which the FISP is being exogenously introduced in order to improve the productivity of the farmers. The end result is improved per capita income, savings and capital accumulations. High productivity may result into low cost inputs for industrial development (ibid).

Figure 4 Breaking the vicious cycle of poverty with FISP



Source: Original 'vicious poverty cycle' diagram from Google.com[52] , modifications by the author

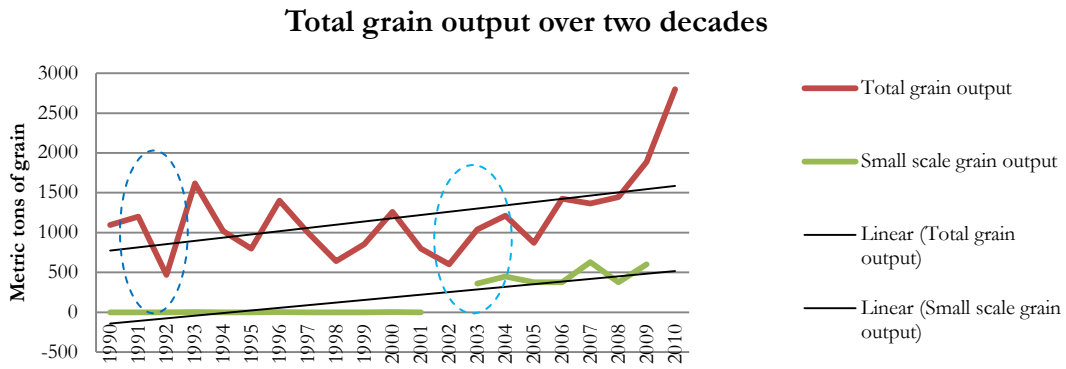
3.4 Maize output trends in Zambia

The production of maize has not been stable in Zambia. There have been fluctuations over the period. Of interest are the periods of liberalisation and the implementation of FISP in 1991 and 2002 respectively (fig 5). Soon after 1991, total maize production in Zambia drops to its lowest and does not fully recover until after 2008. This is despite an increase in the number of producers seen in table 2[53]. However, production improves after 2002 and has been growing since then. Surprisingly however, is the decoupling that is developing between small-scale farmers' contribution and total maize despite receiving subsidies. Could there be a spill over effect?

[52] http://knol.google.com/k/-/-/111qxhjw7qdff/xgem2n/cycle-of-poverty.jpg (accessed 31/08/11)

[53] Number of farmers grew by 45% between 2000 and 2010 www.aec.msu.edu/fs2/**zambia**/ACF_FSRP_MACO_August_16_2011_v5.pdf, (accessed 25/08/11)

Figure 5 Total corn output 1990-2010 and Comparison between total and small-scale grain output 2003-2009 in Zambia



Data source: Zambia Food Security Research[54], CSO agricultural statistical bulletins since 1987, graph by author using *excel*

3.5 Role of small-scale farmers in Zambian agriculture

Traditionally, this class of farmers has contributed on average over 60% of total production to national output. As major producers, they constitute a large portion of the output in the sector whose growth has been elusive for a long time. For example, the sector only recovered to the 1993 level nearly fifteen years later (fig 5) implying no growth at all in the decade and half. This may explain why poverty has remained high because agriculture and the economy in general can only reduce poverty if it is growing (Anne 2004; Datt and Ravallion 1998; Irz et al. 2001). The farmers could have been nipping their productive assets over this entire period in order for them to survive. They may have lost their share of market and income as well.

3.6 Gross margin estimations

To understand why the small-scale sector may not have done so well in the past despite receiving subsidies, we estimate their profitability in maize using minimum efficient scales (MES) and gross margins. The concept of economies of scale predicts that the smaller the scale of production, the higher the cost of production. However, the cost may be reduced if a cash injection (subsidy) is made available in the production process as this lowers the average cost (AC) and increases the scale of production. We test this logic with the following 2008 figures.

With floor prices obtaining six years after implementation of the programme, the sector turns out to be the least profitable among the three categories of farmers, according to the gross profits in table 3. This is not as expected.

[54] www.aec.msu.edu/fs2/zambia/(accessed 25/08/11)

Table 3 Estimation of gross profit per category of farmers using 2008 floor prices and maize output figures in Zambia

	Farmer Category		
	Small	**Emergent**	**Large**
Output/Ha(* 50 Kgs)	40	90	140
Price/50Kg bag(ZMK)[55]	65 000	65 000	65 000
Total value product[TVP](P*output)(ZMK)	2 600 000	5 850 000	9 100 000
Total variable costs(TVC)(ZMK)[56]	3 250 000	3 898 000	6 180 500
Gross margin/Ha(TVP-TVC)(ZMK)	-650 000	1 952 000	2 919 500
Breakeven price/ 50 Kg bag (ZMK)	81 250	43 311	44 146
Gross profit/ 50 Kg bag(ZMK)	**-16 250**	**21 689**	**20 854**

Data source: Estimations by MACO, elaboration by author

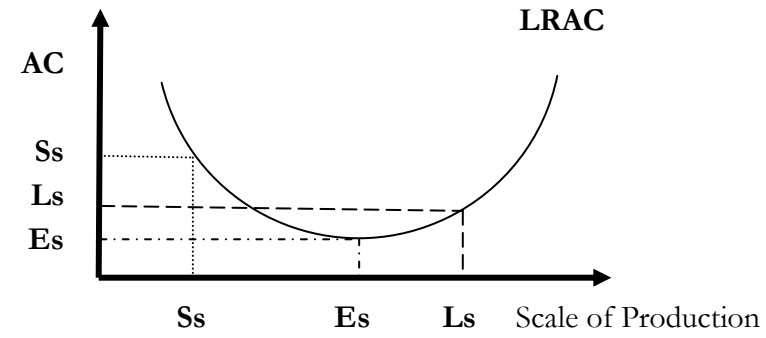
Despite the subsidy, the small-scale farmers operate the highest cost structure relative to output among the three categories of farmers (fig 6). As such, they seem not able to make profits from maize production six years after the implementation of the programme. And being the biggest maize producing group in Zambia, the grain may not be competitive on the world markets and may also be a threat to national food security.

We interpret their behaviours fig 6 and observe that farmers are not taking advantage of the subsidy to minimise their cost of production by expanding their scale. As a result, they need more output to breakeven and consequently require a higher price to make profit as compared to the other two classes of farmers. From the macro view point, it seems the small-scale farmers were not producing profitably by 2008 and this could have impacted negatively on their income levels. This indicates the programme could not have enhanced the incomes of farmers six years after implementation and has not overcome the structural inefficiencies of farmers. It may hence have limited impact on asset accumulation for the farmers.

[55] Zambian currency called Kwacha with an ex-rate of UD$1: 4940 http://www.xe.com/currency/zmk-zambian-kwacha,(accessed 03/09/11)

[56] For a new cost structure: http://www.aec.msu.edu/fs2/zambia/presentations.htm (accessed 25/08/11) titled 'smallholders cost of maize production'

Figure 6 Illustration of MES for the three categories of farmers in maize production



Key: **AC**=Average Cost of maize, **Ss**= Small scale, **Es**= Emergent scale, **Ls**=Large scale, **LRAC**=Long Run Average Cost.

Source: Interpretation based on Table 3, graph by author

3.7 Conclusion

The FISP has been expanding and consistent since inception in 2002 and has helped improve total maize output in Zambia. However, it has not overcome the structural inefficiencies of the small-scale farmers.

CHAPTER 4

4.0 Methodology

4.1 Introduction

This chapter discusses the methodology, data collection and analysis tools employed in the research. The data collection instruments, sampling methods and tools of analysis for both groups of small-scale farmers are presented here.

4.2 Data collection method

The study was non experimental as there was no treatment of samples. Both primary and secondary data were employed. A short interview was conducted with a zone leader, a private fertiliser supplier and the office of PAE at MACO.

A cross sectional survey was conducted on the farmers in Mwembeshi using a questionnaire. Cross-sectional survey is defined as a survey that uses a sample or cross section of respondents (O'Leary 2010). The goal is to be able to generalize the findings back to that population. The respondents were categorized into with- without groups since the programme is active and some farmers have been left out due to personal choice as well as targeting problems (Lumba 2009). This is a direct observation. The main reason behind using this method of gathering data is its cheapness, simplicity, and originality. However, the study recognizes the downside of the method which may include among others; the difficulty to capture the in-depth, getting representative samples, lack of accurate response from respondents etc. (O'Leary 2010).

4.3 Sampling technique

In order to capture the effect of the FISP, two samples of seventy-five farmers each were randomly selected in the Mwembeshi farm area in Chibombo district of Zambia. A farmer register[57] was used as a sampling frame. The samples composed of beneficiaries and non-beneficiaries who were subjected to similar questions. In order for the samples to be representative of the block population, at least 150 members were drawn out of 500. Randomization was important due to the ordinary least squares (OLS) deployed to analyse the data.

The main purpose of sampling is to cut on costs that would otherwise be incurred if the census was to be done. A sample may be defined as a subset of

[57]Official compilation of all farmers in an agricultural camp and may be used by Government for planning purposes

the population that is taken to be a representation of the entire population (Rudestam and Newton 1992); the process of selecting elements of a population for inclusion in a research studies (O'Leary 2010). Sampling therefore, is the process of selecting and drawing lessons from that representative population. Simple random sampling was deployed. This involves identifying all elements of the population, listing those elements, and randomly selecting from the list (ibid). This is to allow for equal chance to every element. Though the procedure might have problems identifying and listing all elements, the farm register overcame this. The author engaged the camp officer in the identification, selection, and location of respondents including aiding of the illiterate respondents. The officer also helped in the physical distribution and collection of questionnaires over three weeks.

Impact studies are goal oriented (ibid.). The main question would therefore be whether the initiative met the goals. As this study falls under such a category, it applied the methodology suggested by O'Leary. The outcome of the FISP was assessed from two perspectives: the provider (G R Z) and the recipients (the farmers). Primary data was collected on both beneficiaries and non-beneficiaries using field surveys. On the provider's side, the research gathered the necessary information indirectly through document review. Document review is here defined as a collection of, review, interrogation, and analysis of various forms of written text as a primary source of research data (ibid.). At macro level, secondary data included 2008 floor prices, production costs and outputs and were used to determine gross margins (GMs). These allowed us to estimate cost of production for maize by the farmers and assess whether FISP has enhanced productivity through reduced cost.

4.4 Choice of Variables and the Questionnaire

In order to do justice to the question, one questionnaire and personal interviews were used. This would allow us elicit answers from the farmers, farmer representatives and technocrats in relation to the research questions. Demographic, production, and socio-economic characteristics of the respondents in the area were addressed. The variables of interest are productivity (dependent), fertiliser and assets (explanatory) and how they interplay on each other. Output per hectare and capital stocks (farm assets and animals) are important indicators of rural household livelihoods (Jayne et al. 2007); the main objective of this study. Fertiliser is central to the FISP which is at the core of analysis for this study.

4.5 Conclusion

Both primary and secondary data were used by the study. Primary data was collected through a field survey while secondary data was done through document analysis obtained from MACO and other sources. Triangulation of data was done at analysis stage by way of descriptive analysis. Given that sample size is too small for national generalisation, this could only be done at district level. The findings therefore maybe restricted to that level.

4.6 Model specification

In most impact studies, there are basically three approaches widely used namely: before and after approach, counterfactual approach and the with-without approach (Simatele 2006). It has been argued that programme performance should be compared with the counterfactual. Counterfactual is here defined as the performance of farmers in the absence of FISP (ibid.). But due to the fact that counterfactual cannot be measured or indeed be observed, it can only be estimated. This makes it difficult to work with. The before-after approach could also be problematic due to cross sectional nature of data and the fact that farmers rarely keep records. Due to these short comings associated with the above mentioned methods, this paper applied the with-without FISP approach.

A comparison on the performance of FISP beneficiaries and the non-beneficiaries was done in various aspects. However, the method may be prone to failure in capturing the effect of other factors on assets, recognising the initial conditions of respondents and the circularity problem between assets and incomes. Changes over time due to individual fixed effects may be lost as well.

4.7 Estimation of model

The model is trying to estimate the relationship between subsidy and assets. But there is no direct link between the subsidy and asset accumulation. Instead, a three stage model was used by first estimating the determinants of productivity, then output and finally incomes to the farmers and leading to indirect estimation of the significance of existing assets on income. The acquisition of assets was descriptively estimated; i.e. whether the sources of incomes used to acquire those assets are associated with FISP, and how the level of the assets differed between the two groups. Model **(2)** was used to estimate the significance of fertiliser, assets and the other determinants of productivity in maize. As in most industries, the analysed relationships between dependent and independents are quantitative rather than value based. Due to compactness of the area under study, we assumed similar weather and soil patterns and held them constant. We also assumed FISP is the only major difference between the two groups. We therefore, concentrated on the variables of interest stated in **(2 and 3)** based on economic theory, logic and compatibility with apriori expectations (Griffiths el al. 1993).

Equation 1

$$Income = f(Y, P_m) \quad \ldots\ldots\ldots\ldots \quad (1)$$

Where:

Y= maize output

P_m = output price

An increase in price or output of maize or both has a positive effect on income and vice versa. The output is directly determined by the productivity while price is exogenous and only acts as an incentive to productivity. There-

fore, determinants of productivity indirectly determine income. From the linear[58] standard production model, we develop the following relationship between maize productivity and various independent variables explained below:

Equation 2

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \mu \ldots\ldots\ldots (2)$$

Equation 3 log-linear

$$Ln(Y) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \mu \ldots\ldots\ldots (3)$$

Where:
Y = Output per Ha (Kgs)
X_1 = Cultivated area (Ha)
X_2 = Education (Levels)
X_3 = FISP fertiliser (Kgs)
X_4 = Existing assets proxied by oxen (binary dummy)
X_5 = Labour (Number of labourers)
X_6 = Experience in years
X_7= Producer price (ZMK)
X_8= Belonging to FISP
β 1, …. β 8 = Parameters to be estimated
μ = Random error

Cultivated area($\mathbf{X_1}$) is measured in terms of hectares cultivated by the farmers. We expect it to be indirectly related to productivity because most evidence shows an inverse relationship between farm size and productivity. This is because farmers intensively use their fixed resources (Carter 1984).

Education($\mathbf{X_2}$) is captured as levels 0-3. Zero represents no education attained, 1 is primary, 2 is secondary and 3 is tertiary. We set a reference point of zero so that we capture different impacts of formal education (1-3). We expect it to have a positive effect on productivity, the higher one attains it. This is because education plays a major role in agricultural productivity directly and indirectly. Directly, education enhances the ability to acquire information through experience with technology; it complements farm experience (Sharada 1999). Indirectly, it allows someone access credit for agriculture by working for a wage elsewhere and also being able to interact with credit agencies, keep records for such, improved numeracy skills for simple arithmetic etc.(ibid). As for FISP, education would allow farmers enumerate benefits of belonging to cooperatives.

Fertiliser($\mathbf{X_3}$) increases crop yields and land productivity (Mwangi 1997). Given that the major component of FISP is fertiliser, we expect a positive rela-

[58] Log linear and log-log also tested

tionship between productivity and FISP membership. Fertiliser is captured as Kgs/Ha.

Existing assets ($\mathbf{X_4}$) is proxied by oxen[59]. It represents possession of the assets that were used in the previous season. We expect owners to be more productive than non-owners because it allows them to cultivate more area within a short time. Early planting in maize is crucial. Usually an oxen owner is highly likely to own implements such as ploughs and ox-carts which facilitate maize production directly. Deininger and Olinto (2000) find that a pair of oxen increases area cultivated by 25% and has higher returns than fertiliser in Zambia. Owners may also hire out their oxen for more income and be less risk averse. They could also cut on labour bottlenecks that hamper good maize output.

Labour($\mathbf{X_5}$) is measured in terms of the number of family workers on the farm in the previous season. Below the diminishing point, we expect labour to be positively correlated with productivity. However, beyond a certain number of workers on a fixed land, labour output begins to diminish. Larger households have a tendency of being more productive than small households because they are able to overcome labour bottle necks that characterise maize production at the critical time (Deininger and Olinto 2000). Maize can be negatively affected by weeds.

Experience in agriculture ($\mathbf{X_6}$) is captured by the number of years the farmer has been growing maize. We expect no explicit relationship between productivity and experience because it is usually a quadratic. In agriculture, experience matters most when there are innovations as it helps 'overcome barriers' (Rosenzweig and Foster 1995). However, experience may improve productivity in uncertain circumstances through learning overtime and also learning from others. But returns to experience do diminish over time (ibid). Given that FISP is not new, there could be less effect of experience on productivity.

Price($\mathbf{X_7}$) was captured as the current selling price for maize and varied due to distress selling behaviour. It may have no direct effect on productivity but does so through incomes that accrue to farmers. This is because higher incomes lead to higher demand for urban- produced goods (Bale and Lutz 1981) which may include fertilisers. Fertiliser may in turn improve productivity. Higher farm prices may also motivate farmers to be more productive. We therefore expect a positive relationship between productivity and price but non-explicit. In Zambia, farmers are free to sell their maize within the country at any price or may wait for the FRA later in the marketing season to sell at floor price. As such, we may see variations in prices despite being a cross sectional survey.

FISP membership ($\mathbf{X_8}$) is a dummy for belonging to FISP and zero otherwise. By virtue of accessing more fertiliser, this category is likely to be more productive. We expect a positive correlation with productivity (Buresh et al. 1997).

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[59] The only significant asset in pair wise correlation with productivity and also most preferred asset

4.8 Conclusion

Both primary and secondary data was used in this study. Primary data was collected through a small field survey and personal interviews with a zone leader and the office of the PAE at MACO. The data was triangulated at analysis stage using exploratory, descriptive and inferential techniques. Given the cross sectional nature of data and the sample size, generalisations to the entire population may not apply.

CHAPTER 5

5.0 Data Analysis and Discussion of the Results

5.1 Introduction

The chapter presents the discussion and analysis of the findings of the research beginning with descriptive analysis and ends with econometric analysis. This is in order to try and answer the research questions the study is addressing. A comparative analysis is done with respect to the nature of the samples that were surveyed i.e. beneficiaries and non-beneficiaries. This analysis is based on the 2010/2011 farming season. A report on the personal interview opens the chapter; followed by socio-economic characteristics, data analysis and the chapter closes by showing that FISP beneficiaries are relatively better off in several aspects and therefore the programme is effective.

We begin by reporting an overview of the FISP and the general socio-economic situation in one of the zones in Mwembeshi known as *Chipwili* based on the leader's perception. A personal interview conducted by the researcher on the zone leader[60] on 16th July, 2011 revealed he had a positive perception about FISP. The leader argued that the programme had generally improved the economic situation of the beneficiaries on two fronts namely food security and start-up capital. He acknowledged the programme was especially good for those with the [agricultural] skills. The leader observed most non-beneficiaries had already run out of food[61] by the time of this interview. He concluded the beneficiaries were better-off.

On why some farmers did not benefit from FISP, the leader disclosed they were generally not interested and that some felt the registration process was cumbersome. He ruled out affordability saying it was very cheap and was done only once for membership. The leader added some farmers lacked the knowledge about cooperatives. But contrary to his view, data shows about 55% feel they never had the money at the time of registration for membership while only 26% expressed personal choice. There could be issues of self-selection where only those who can afford become members. This, coupled with lack of baseline socio-economic indicators, may bias the research findings in that they may underestimate the effect of the FISP. However, there was a general willingness among the farmers to join the FISP in the zone but it seemed the programme had reached its allocation ceiling thereby denying them such an opportunity, he observed. This may raise the issue of targeting[62] which could disadvantage some, leading to further biases in findings of this research. FISP only deals with cooperatives and not individuals. What seems procedural

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[60] Is getting a copy of this report

[61] A sign of food insecurity accompanying poverty

[62] But FISP allocates inputs based on information from the field

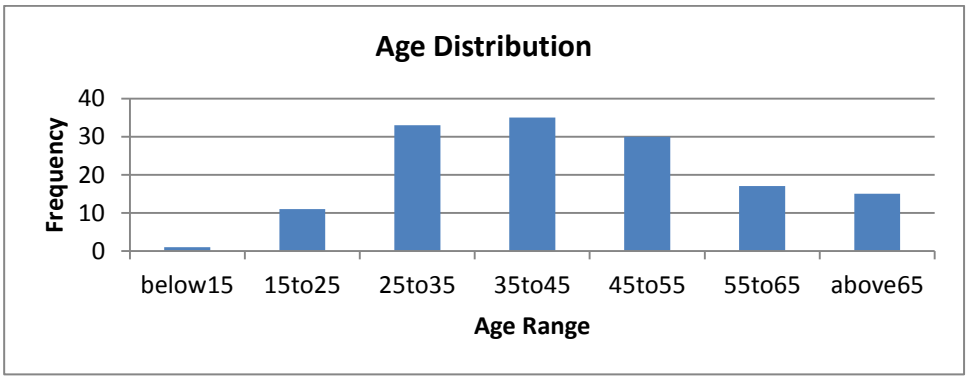
is registration of a new cooperative with the registrar of societies in MACO. However, members are free to join existing cooperatives at a minimal fee instead of forming new ones though they still have to pay the 50% input cost share.

The leader bemoaned the lack of competitive urge[63] among the farmers as far as maize production was concerned. He implored government to diversify the programme into livestock, fish farming and irrigation. The leader stressed possession of draft animals was very important for the farmers because they were a great utility[64] despite the disease and rustling problems he associated it with.

5.2 Demographic characteristics of Respondents

A total of 150 respondents were served with questionnaires. We got 143 responses of which 89 were male while 54 were female representing 62% and 38% respectively. On average, 15% of the respondents did not attain any formal education while only 4% had tertiary education among them only one female. Males are more likely to attain higher education than females (table 4). Below are the demographic summaries. Fig 7 shows a right skewed age distribution among the farmers implying more old farmers who may be less productive. However, all are economically active. The farming community is gender biased with males dominating the activity (fig 8).

Figure 7 Age distribution among the small-scale farmers in Mwembeshi

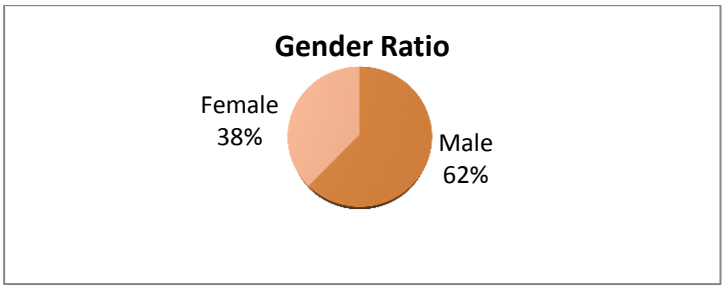


Source: own computation using *excel*

[63] Some farmers are too lazy; do not treat maize production as a business

[64] Without which they have to hire at approximately US$1/step irrespective of length

Figure 8 Gender Ratio



Source: own computation using *excel*

Table 4 Gender and education probabilities

gender	education 0	1	2	3	Total
0	10	30	13	1	54
1	11	42	31	5	89
Total	21	72	44	6	143

Source: own computation using *Stata*. For education 0 ='never been to school', 1 = 'primary education', 2='secondary' and 3= 'tertiary'. For gender, 0 = 'women' and 1= 'men'

5.3 Socio-economic Characteristics of respondents

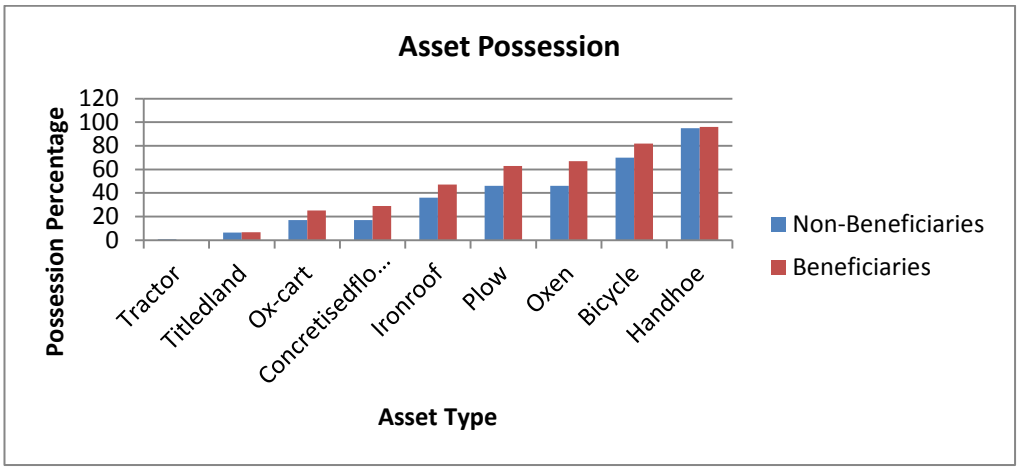
We present the various socio-economic indicators pertaining to assets and production. Possession of an asset has a weight of 1. The evidence favours FISP beneficiaries hence the need to carry out further investigations to understand why. We start by looking at differences in asset possession, year of asset acquisition, t-tests and finally run regressions.

Table 5 Asset possession by category

Asset type		Titled land	Concretized floor	Iron roofed house	Oxen	Tractor	Plough	Ox-cart	Hand hoe	Bicycle
Percentage of holders	Beneficiaries	6.7	29	47	67	0	63	25	96	82
	Non-beneficiaries	6.3	17	36	46	0.7	46	17	95	70
	Difference	0.4	12	11	21	-0.7	17	8	1	12

Source: field survey by author.

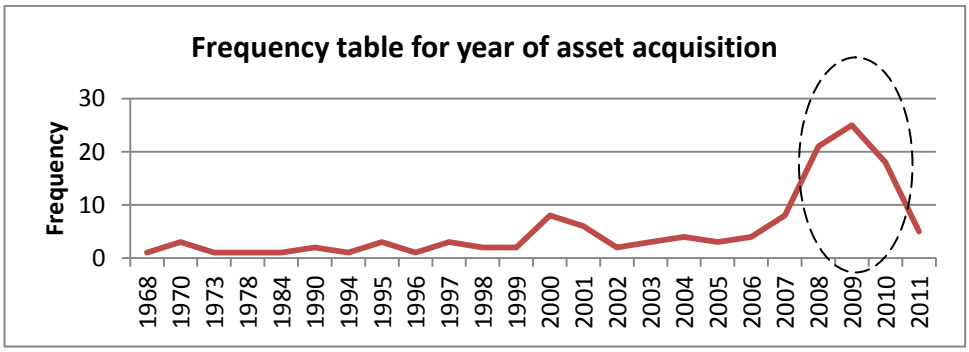
Figure 9 Comparisons of assets between FISP beneficiaries and non-beneficiaries in Mwembeshi



Source: own computation using *excel*

Fig 9 bar graph compares asset possession between beneficiaries and non-beneficiaries of the FISP in absolute terms. We used descriptive analysis to examine who possessed more assets between beneficiaries and non-beneficiaries of FISP and the result favours beneficiaries.

Figure 10 Year of asset acquisition by Mwembeshi farmers



Source: own computation using *excel*

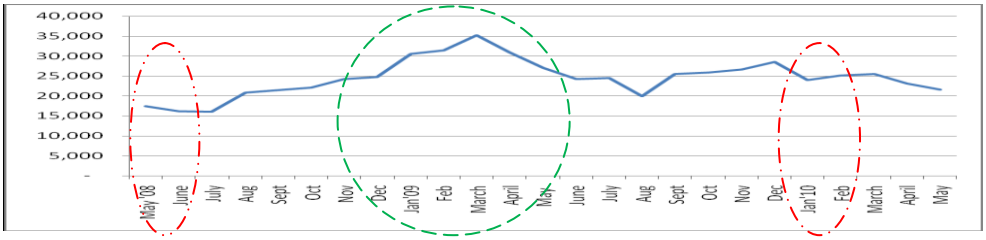
Few assets were acquired in the past as we see an increase in the acquisition of assets[65] after 1999 though falling again three years later. More farmers acquired assets after 2007 specifically in 2009 (fig 10). However, the sequence of asset accumulation seems to be a five-year cycle (e.g. 1968-1973, 2002-2007) which resonates well with depreciation and acquisition of most agricultural assets. However, given that unprecedented asset acquisition levels have been registered after the implementation of the FISP(fig 10, table 6), one may be tempted to attribute such to the programme though high prices in Lusaka[66] could

[65] Not by value but as entities

[66] The nearest grain market

have played a role in (fig 11) and not necessarily owing to high output which may be directly linked to FISP. When the grain prices were low, so was the asset accumulation (2008 and 2010). Coming of age of new farmers may also play a part. However, this study is not able to establish the cause of rise in asset accumulation in the past. Descriptive analysis favours FISP beneficiaries hence the further examination that included t-tests (table 7) and regressions (table 11) to understand why.

Figure 11 Maize retail prices for urban areas - Lusaka (ZMK/18Kg)



Source: FEWSnet[67]

Table 6 Year of asset accumulation percentiles in Mwembeshi

Percentiles	*10%*	*25%*	*50%*	*75%*	*90%*
Year	1995	2001	2008	2009	2010
Change		15	25	25	15

Source: own computation using *Stata*

The higher the value of the asset, the less it is owned (fig 9). Due to its cheapness, the hand hoe is commonest among the farmers while the tractor is least. This pattern may imply inability by the farmers to acquire high value assets. However, apart from the tractor, beneficiaries seem to possess more assets at all levels than non-beneficiaries. The t-tests on critical variables indicate significant differences between the groups as well (table 7).

67 http://www.fews.net/pages/countryarchive.aspx?pid=500&gb=zm&loc=2&l=en(accessed 05/09/11)

Table 7 Difference of means between the groups of farmers

Variable	Means		Difference	t-test
	Non-beneficiaries	Beneficiaries		
Income(ZMK)[68]	246 250	1 842 432	1 596 182	3.54
Fertilizer application(kgs/ha)	18.6	71.4	52.7	8.75
Output/Ha	9.7	23.3	13.5	6.14
Total output(X 50 kgs)	14.4	52.6	38.3	5.67
Access to oxen	24%	67%	42%	5.56

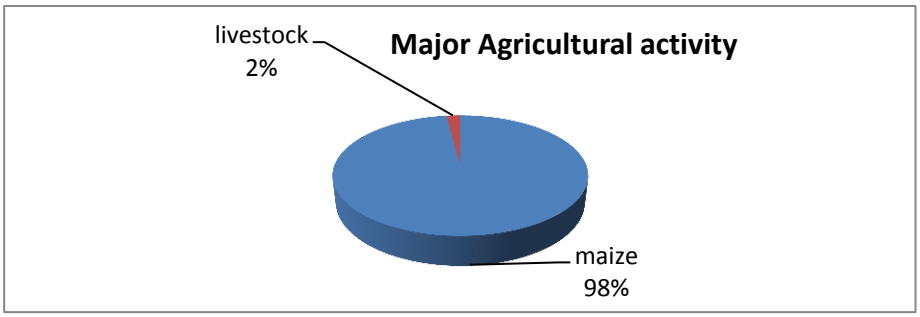
Source: own computation

Critical conclusions could only be drawn with further analysis in form of econometrics which is presented later. This is in order to detect the sources of discrepancies between the groups and the persistent poverty. We begin by exploring the production characteristics being their major activity.

5.4 Production characteristics of Mwembeshi Farmers

There are two prominent sectors among these farmers. Maize is by far the more preferred agricultural activity followed by the livestock (fig 12). This basically indicates the tendencies of monoculture which may have detrimental consequences on soil nutrients as highlighted by Minde et al. (2008b). However, this is no surprise given that maize is both a cash crop as well as a staple food for Zambia. The lack of diversification in agriculture may also be due to the continuous supply of pro-maize in-puts by the FISP. However, there are plans to diversify the programme by introducing rice packs into areas that have the comparative advantages, as revealed by the office of the PAE at MACO.

Figure 12 Major agricultural activities by share



Source: own computation using *excel*

We compare the farmers' maize production characteristics with what obtains elsewhere. This helps identify the disparities which may help explain the persistent poverty. Table 8 summarises the findings.

[68] Income is based on reported sales by the respondents

Table 8 Comparison between World and Zambian agricultural rates

	Beneficiaries	Non-beneficiaries	Group average	World average	Zambian Recommended Rate
Total Output(X50kgs)/Farmer	52	14	34		
Tons	2.6	0.7			
Income(K65000/50kg)	K3380000	K910000	K2 145 000		
Output/Ha	23(1.2 t)	9.7(0.5 t)	16.7	8 t-10 t	
Cultivated Area(Ha)	2	1.9	1.95		
Fertilizer Application(Kgs/Ha)	71	18.2	45.5	102	170

Source: own computation, others figures from Duflo et al. (2008), Minde et al. (2008a)

On average, beneficiaries have 13 X 50kg bags[69] extra output/Ha. This is due higher productivity given that the average cultivated area is almost equal. Consequently, the beneficiaries have more incomes as well earning over two million kwacha more. This is consistent with descriptive results presented much earlier. Why has rural poverty persisted given the explicit influence of the programme on incomes? Explanations may border on both structural (low capacity) and non-structural (exogenous) problems.

First, structural problems continue to hamper the progress of farmers. This is because only small percentages of farmers are well educated. For example, only 4% of respondents had tertiary education[70]. 50% who are the majority only had primary education (table 4). Going by the demands of maize production, as cited by the zone leader and Duflo et al. (2010), it is not possible for farmers to apply state of the art techniques and skills given such low levels of education. Such techniques are responsible for the much needed efficiency and enhancement of productivity. Without such, low capacity results.

One major indicator of low capacity is the variation between land possessions and area cultivated. Data shows at least 98 % (appendix 5) of farmers control more than 2 Ha of land and yet only 1.9 Ha is cultivated on average. This may reflect lack of capacity as the farmers could resort to working on other farms for rewards instead of doing own work (Alwan and Siegal 1999).

Fertiliser purchases and application may also indicate low capacity of farmers. For example, only 16%[71] bought from the private sector[72] in the season in question. The low rate of fertiliser purchase is no surprise where fertiliser inputs are provided because it has been found that such activities have a displacement rate of between 20-50% for every Kg of fertiliser given under the programme in Malawi and Zambia (Dorward et al. 2008). However, the authors observe that the crowding out may reduce when fertiliser is targeted to the poorer who cannot otherwise afford the inputs. But at 16%, crowding rate is very high for the private fertiliser suppliers implying the targeting may not

[69] 17 x 50 Kgs below national average indicated in table 3

[70] No women

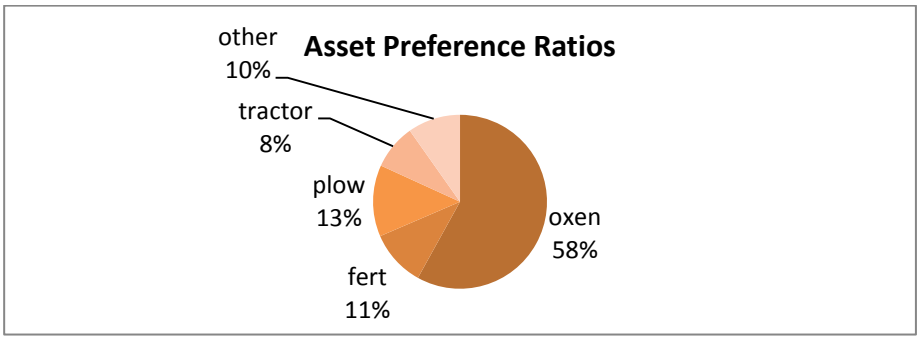
[71] Only transporters stand to benefit in the supply chain

[72] A check at a private fertilizer outlet in Lusaka revealed that small scale farmers may only buy to mark-up the deficit

have been fairly good in the past. The FISP has not improved the capacity of farmers to buy fertiliser from the private sector.

Low capacity could also be observed in absolute terms through assets. Beneficiaries seem to have an upper hand with more assets and more than 50% attribute acquisition of these assets to FISP. This could be possible given that the beneficiaries are less risky averse and hence market more of their produce and earn more. For example, only 11% of non-beneficiaries market their produce compared to 89% of beneficiaries. Nevertheless, only a handful farmers in both groups have enough poverty reducing assets such as titled land, oxen, ploughs and tractors (fig 9). Following is an asset preference chart and one would expect the possession pattern to be similar but this is only wishful thinking.

Figure 13 Asset preferences among farmers in Mwembeshi



Source: own computations using *excel*

Though oxen are most preferred, there is a variation between preferences and actual possession (table 10, fig 13). This may indicate low capacity amongst these farmers that may have vicious implications on perpetuity of poverty (Deininger and Olinto 2000; de Janvry and Sadoulet 2000). Unaffordability of essential services from oxen may aggravate poverty. For example, hiring oxen costs $1US per human step regardless of length; an expense that is echoed by the zone leader. Ironically, only handful respondents mentioned of irrigation equipment as a preference despite the majority (32%) being involved in off season gardening. Oxen are highly preferred due to the major agricultural activity being maize (fig 12) which demands ploughing, cultivation and transportation of inputs and produce around the farms and to the market. There is high demand for ox-renting as well in the area.

Second, FISP has limited rural coverage[73] hence the difficulty in fighting rural poverty in the current setting. Not only is the rural setup in Zambia made up of farmers but there are also other occupations as mentioned earlier by the 2000 agricultural report. An understanding of the RNFE (Lanjouw and Lanjouw 2005) in this aspect may help policy makers institute effective anti-poverty measures.

[73] Currently at 68%

Third, the quantity of fertiliser allocated per farmer is too low to move them out of the trap. Currently, most recipients get about 200 Kgs of fertiliser of which half is basal and the other top dressing. At the recommended rate, this may only be enough for 0.6 Ha and yet on average, the farmers cultivate at least 1.9 Ha. It has been discovered by this study that few farmers buy extra fertiliser but they instead apply what is provided by FISP despite cultivating varying areas. As such, there is a tendency to dilute the rates. For example, the recommended application rate in Zambia is around 170Kgs/Ha (Duflo et al. 2008; Minde et al. 2008a), but only 41% utmost is applied (table 8). According to these authors, any diversion from recommended fertiliser rates may have serious consequences on output; especially if on the lower side.

Low fertiliser application resulting from low allocation is affecting the maize output in Zambia resulting in very low productivity[74] , yields and low incomes. Further, it has not enhanced economies of scale among this category of farmers (fig 6; Deininger and Olinto 2000) leading to high cost and low incomes. For example, the research established that average annual income is ZMK 2 145 000 against a reported annualised food expenditure of ZMK 6 000 000 implying a huge deficit. As such, farmers may continue depleting their assets as their ultimate income source[75]. This may explain the low possession of productive assets seen in fig 9 above. The problem of low income is further compounded by low selling prices. To breakeven or indeed earn abnormal profits, the farmers need a price above the usual K65000/50Kg being offered by the FRA (tables 3, 9). Only abnormal profits may overcome poverty in the short term. Most successful countries allocate more than 10% of their annual budgets to subsidies while Zambia's allocation is below 5 % (Duflo et al. 2010; PRSP 2002). Table 9 presents what this research recommends as minimum[76] parameters if farmers would have to take off from the poverty trap using agricultural subsidies, *ceteris paribus*. And unless we ensure majority of farmers meets those criteria and are taken on board, the programme may not achieve much in terms of empowering the farmers. Structural inefficiencies coupled with low fertiliser support have led to low incomes and rendered the programme less effective in the fight against rural poverty.

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[74] Nearly seven times less than world average

[75] Option rate found at 19.3 % (appendix 3), national average stands at 20%

[76] We use breakeven calculation to come up with the recommendations:
BEQ=TVC/P=50 Kgs bags to breakeven at current price and output by Mwembeshi farmers: K3250000/K65000= 50X50Kgs. But these farmers produce only 23 X50Kgs/ Ha. So they need more than 2 Ha to breakeven. TVC/Ha is an estimation by MACO

Table 9 Breakeven recommendations for effective poverty reducing in maize production in Zambia

Current setting		or	Alternative	
Output/ha	50		Output/ha	>50
Quantity of fertilizer[77]/farmer	140 Kgs		Quantity of fertilizer/farmer	340 Kgs[78]
Land	>2 Ha		Land	<2 Ha
Price/50 Kgs	K65000		Price/50 Kgs	K65000

Source: field survey and MACO, own elaborations

Due to a restrictive marketing structure that does not permit access to world prices (Govereh et al. 2006; Mwanaumo 1999), the farmers may not produce profitably due to low local prices and distress selling. Unless the current second line of intervention by the FRA is applied with an up scaled producer purchase price as a strategic measure, the FISP alone may not reduce poverty because the farmers are always in deficit- a situation that may perpetuate poverty traps. However, the poverty maybe fought effectively by understanding the most important determinants of maize productivity in Mwembeshi. This is because 98% of the farmers engage in maize production (fig 12). This coupled with good market structures may enhance incomes.

Fourth, the sector does not seem to have had enough growth in the past. This is because it took nearly two decades for the sector to recover from the 1993 levels (fig 5) despite a 56% increase in the number of farmers between 1990 and 2001(CSO agricultural statistical bulletins since 1987). And while the sector degenerated, rural population maintained a high growth rate at 2.5% on average (WDI); a rate that required more than threefold growth (7.5%) in the sector to reduce poverty. Benefits from the agricultural sector can only be realised if there is growth (Anne 2004; Datt and Ravallion 1998; Irz et al. 2001). However, there is a high growth rate after recovery but we see a decoupling effect between total output and that of small scale farmers beginning 2006. The decoupling that is resulting shows the small-scale sub-sector may no longer play a leading role in maize output in Zambia. Low growth in the sector and the small-scale in particular could have resulted in market share loss and may be responsible for continued poverty due to lost income in rural areas.

Given that some of the assets may not be directly related to maize production, we isolate them by pair wise correlation tests on output/Ha[79] using *Stata* and pick the most important one as proxy (appendix 6). This is to allow us to deal with critical assets only in the model. Oxen stand at 35%, are significant and most preferred. Given these two qualities, we include them in the regression model as assets proxy dummy. We examine the implications of our determinants for better understanding because:

> [...] it is often a messy business of decisions that have to be taken in difficult circumstances on the basis of inadequate knowledge, reac-

[77] Basal fertilizer only, provided by FISP and currently applied by the farmers in Mwembeshi

[78] 170 Kgs/Ha

[79] Productivity by the small scale farmer and takes care of variations in cultivated area

> tions, counter-reactions and compromises and it always constitutes a learning process for all involved (Crehan and Oppen 1988: p 114).

Using OLS at 95%[80] confidence interval, we run a series of multiple regressions seeking explanation of variation in productivity[81] and its relationship with income among the farmers in Mwembeshi. We present the results in table 11. We also present the summary statistics and standardised coefficients in tables 10 and 12 respectively. The model analyses the combined sample and suffers from heteroscedasticity[82] (appendix 7) hence the robustness check. Stronger in terms of relationships and explanatory power[83] we opt for log-linear[84] results in column (**4**) which are also consistent with linear output (**3**). We determine variability in output per hectare (productivity) using fertiliser rate, maize output price, FISP membership and access to assets (oxen), *ceteris paribus*. We get output (**4**) in table 11. Of the four regressors, membership to FISP has the strongest correlation with productivity while maize output price has the weakest. This suggests that benefiting from FISP may lead to a 29% (exact difference 33.7%)[85] growth or change in output per Ha than otherwise. Similarly, access to oxen may help change output per Ha by 28% (exact difference 32.6%) while a kilo of fertilizer per Ha may lead to 0.52% change in output per Ha. For oxen and fertilizer results, the signs are consistent with the earlier findings in Zambia by Deininger and Olinto (2000) and Jayne et al. (2009). The effect of price is almost negligible despite imposing the highest though inelastic response on productivity (appendix 8). All the results on productivity are consistent with theory.

An unexpected significant inverse relationship between fertiliser application and maize total output (column **2**) could be explained from three angles namely application rates, wrong type of fertiliser and measurement error. Fertiliser may negatively affect output if over used or underused. If used beyond optimal point, diminishing returns occur (Duflo et al. 2010). If under used due to dilution, its impact is equally diminished. In our study, the farmers suffer from the later. Wrongly formulated recommendations that may not apply to the farmers' practices and soil characteristics may lessen the impact of fertilizer on maize output (Buresh et al. 1997).

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[80] Selected due to small size of the sample

[81] May be used interchangeably with output per ha

[82] We used White's general test in Stata

[83] Coefficient of determination R^2=48%, adjusted R^2 =44% with equal number of variables and close together (Appendix 10, Gujarat 2003)

[84] $\beta = \frac{\text{relative change in regressand}}{\text{absolute change in regressor}}$, or percentage if multiplied by 100 (Gujarati 2003)

[85] In case of log-linear specification, generally for dummies, the approximation error occurs as the change in log(y) becomes larger. Thus, the exact percentage change=100*$[e^{\beta} - 1]$ (Wooldridge, 2009: p 233)

Table 10 Summary statistics of key variables

Variable	Observations	Mean	Std De-viation	Min	Max
Total output	143	33.95105	44.54201	0	400
Output/Ha	143	16.77573	14.78164	0	100
Access To Oxen	142	0.464789	0.500524	0	1
Education	143	0.846154	0.362069	0	1
Age	143	43.4965	14.55968	15	65
Experience	143	12.83916	10.04332	1	50
Price/50kg	143	42405.59	24601.97	0	75000
Gender	143	0.622378	0.486497	0	1
Fertilizer applica-tion/ha	143	45.59601	44.58575	0	200
FISP membership	143	0.517483	0.501451	0	1
Workers	143	4.342657	2.423782	1	13
Area Cultivated (Ha)	143	1.983916	1.479563	0	12

Source: Author's own computations

Table 11 Summary of regression results

VARIABLES	(1) Income	(2) Total output	(3) Output/ha	(4) Log-linear output/ha
Output/ha		2.313***		
		(0.696)		
Gender		10.19**	-0.0706	-0.136
		(3.922)	(1.835)	(0.106)
Fertilizer application/ha		-0.285***	0.137**	0.00519***
		(0.0596)	(0.0527)	(0.00171)
Experience	-29,387***	0.364	-0.0421	-0.00261
	(8,347)	(0.220)	(0.0851)	(0.00577)
Membership to FISP		19.43**	2.536	0.291**
		(7.634)	(2.920)	(0.141)
Workers	-64,030**	1.650*	-0.322	-0.000154
	(31,377)	(0.851)	(0.389)	(0.0263)
Price/50kg maize	6.952	2.52e-05	0.000119***	8.01e-06***
	(5.826)	(8.60e-05)	(3.38e-05)	(2.09e-06)
Education	247,860	-3.383	-0.101	-0.00246
	(196,084)	(4.082)	(1.744)	(0.137)
Age	15,236***	-0.0798	-0.0954	-0.00691*
	(5,764)	(0.144)	(0.0632)	(0.00417)
Total output	47,060***			
	(8,273)			
Area cultivated			-0.480	-0.0482
			(0.852)	(0.0464)
Oxen			4.408**	0.282**
			(2.121)	(0.116)
Constant	-1.045e+06***	-14.82	9.261**	2.186***
	(334,041)	(12.22)	(4.141)	(0.244)
Observations	118	143	142	140
R-squared	0.853	0.609	0.398	0.481

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: own computations using *Stata*

Table 12 Standardized regression coefficients

Variable	Coefficient	Standard deviation	Dependent standard deviation	Standardized β Coefficient
Gender	-0.0706	1.835	14.78164	-0.00876
Fertilizer	0.137	0.0527	14.78164	0.000488
Experience	-0.0421	0.0851	14.78164	-0.00024
FISP Membership	2.536	2.92	14.78164	0.500967
Workers	-0.322	0.389	14.78164	-0.00847
Price	0.000119	0.0000338	14.78164	2.72E-10
Education	-0.101	1.744	14.78164	-0.01192
Age	-0.0954	0.0632	14.78164	-0.00041
Area Cultivated	-0.48	0.852	14.78164	-0.02767
Access to Oxen	4.408	2.121	14.78164	0.632499

Source: own computation check appendix 9, oxen most important explanatory variable for the model

5.5 Conclusion

We used the econometric model to determine relations between productivity and other variables (column 3, 4). There are indications that even econometric results seem to favour FISP beneficiaries. This may explain the stark differences between the beneficiaries and non- beneficiaries observed much earlier with descriptive analysis and the positive perceptions by the zone leader. We also observe that incomes are indirectly influenced by the determinants of productivity which are fertiliser, oxen and the output price through total output (fig 4; table 11; appendix 6). This suggests using more fertiliser (Mwangi 1997); oxen (Jayne et al. 2007; Deininger and Olinto 2000) and a higher output price (Bebbington 1999; Denning et al. 2009; Dorward 2009) simultaneously (Duflo et al. 2010) may improve incomes of farmers. Though it may be difficult to distinguish the real effect of FISP on beneficiaries and claim that it has made them better based on regression results, it is clear beneficiaries are using more fertiliser and oxen (Table 7). This may give them an edge in incomes over non-beneficiaries and propel them into higher brackets of assets possession (fig 9) leading to more yields, higher incomes, more food, less hunger and reduced poverty (Wiggins and Brooks 2010). This is expected given that maize, a fan of fertiliser and oxen, is the most important agricultural activity in the area. However, the price for maize, exogenous to FISP, seems to play an important role in asset acquisition (figs 10, 11). Access to oxen is the most important variable in the maize production function (table 12). Fertiliser can directly be linked to FISP. Low utilisation of fertilizer, partial coverage by FISP and less access to oxen may explain why poverty has not relented in this area.

CHAPTER 6

Conclusion

This paper has tried to assess the effect of the FISP on productivity and asset accumulation by small-scale farmers. A comparative analysis was done between subsidy beneficiaries and non-beneficiaries. A cross sectional dataset was created based on the responses from the field survey and personal interviews conducted in Mwembeshi by the author for the 2010/2011 farming season. This was in order to capture the variables of interest namely output per hectare, fertiliser and assets. The empirical data employed was both descriptive and inferential.

The findings indicate that the FISP is a necessary but not sufficient programme for fighting rural poverty in Zambia. This is because it has not significantly improved the farmers' capacity to buy more fertilizer. Instead, they have used what they received from the programme. For example, only 16% of beneficiaries bought from the private sector in the farming season under review. Partly as a consequence of this, the farmers have not applied much fertilizer leading to dilution. In this area, they only applied 41% utmost of the recommended rate. However, despite dilution, beneficiaries had extra output of 13X50Kgs/Ha hence being more productive. The cost of production remained high despite the programme mainly due to stagnant scale averaging 1.9 Ha since 2000 (Deininger and Olinto 2000). Consequently, the high cost would have eaten into the farmers' profits and incomes despite the extra output. Nevertheless, incomes from maize sales improved. Finally, the programme had a partial effect on productive assets going by the significant differences between the two categories of farmers being analysed in this study. Both qualitative and quantitative methods show common findings.

Further, this study discovered that food insecurity, poor governance structures, distress selling, lack of personal motivation and property rights to land were compounding factors for the persistent poverty among these farmers. Hardly two months into post-harvest season had some farmers run out of food stocks. Confusion for FISP Membership reflects poor governance structures on the ground. A walk through the area showed no individual maize storage shades. This makes it difficult for the farmers to manage their output ahead of better prices and hence the distress selling behaviour. Though the farmers may control enough land by their standards, it is not titled thereby falling short of private property rights. Property rights encourage investment which promotes growth in the sector; the growth that reduces poverty. While the FISP could have attempted to play its role in poverty reduction through asset accumulation, it may have not succeeded due to its single handedness against the multiple causes of poverty in the area (Duflo et al. 2010; Alwang and Siegal 1999).

To a larger extent, the FISP has had a positive effect on asset accumulation and maize productivity for farmers in Mwembeshi. While the effect may have been underestimated due to self-selection bias, it would also not be totally

correct to attribute it to FISP alone in the absence of baseline socio-economic indicators which this study failed to establish.

Owing to the foregoing, any instruments that may simultaneously and positively influence fertilizer use (e.g. FISP membership), facilitate access to assets (fig 3; preferably oxen, ploughs and ox-carts); complemented with effective extension services (table 1) and a good output price (appendix 8) would help fight poverty in this area. A consideration on supporting the more efficient emergent farmers (table 3) or indeed fertilizer manufacturers (make it affordable) may also help. This would entail up scaling resource allocation to the sector by the stakeholders. It will require an alloy of long term efforts to succeed in fighting rural poverty using agriculture in this area.

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Appendices: Unless where stated, all tables are based on the author's own computations from field work

APPENDIX 1 Research Questionnaire

Dear Respondent!
My name is **Nalishiwa M. Lister**, a student from the **Institute of Social Studies in the Netherlands** but working for the Ministry of Agriculture and Cooperatives (MACO). I am conducting a research study on the effect of the Farmer Input Support Programme (FISP) on agricultural assets as part of my dissertation leading to the award of Master of Arts in Development Studies specialising in Economics of Development. Your responses will be treated with high confidentiality and will only be used for academic purposes.
I have here a **29 Question** Questionnaire of which you are required to answer all the questions to the best of your knowledge. Where additional knowledge may be required, feel free to provide it.

Questionnaire for small scale farmers in Mwembeshi

Please **tick** or **encircle** your answer in the boxes or choices provided in this questionnaire. Where space is provided, give a brief but precise answer. Answer **box** is always placed to the **right** side of question.

Q1: Do you benefit from fertiliser support? **Yes/ No**. If yes, for how long?.....Years.

Part A: Demographics Survey

Q2 Gender of head of house: Male ☐ Female ☐

Q3 Age of head of house: below 15 ☐ 15-25 ☐ 25-35 ☐ 35-45 ☐ 45-55 ☐ 55-65 ☐ above 65 ☐

Q4 Marital status: Married ☐ Unmarried ☐ Widowed ☐ Divorced ☐

Q5 What is your Education level: Never been to school ☐ Primary ☐ Secondary ☐ Tertiary ☐

Q6 For how long have you been farming?.....Years

Q7 What is your major agricultural activity? Maize ☐ Livestock ☐ Other ☐

Q8 Family size: 1 ☐ 2-5 ☐ 6-9 ☐ More than 10 ☐

Q9 How many worked on your farm last season?.....

Part B: Socio-economic indicators

Do you **possess any** of these and **how many**? At what **price** would you sell each? (**Please tick in the box what you have, put number of items and price below the box**)

Q10 Titled land ☐ Concretised floor ☐ Iron roofed house ☐ Concretised storage shed ☐

Oxen ☐ Plough ☐ Tractor ☐ Hand hoe ☐ Oxcart ☐ Bicycle ☐ Other asset you consider important in your agriculture:.....

Q11 If you posses any assets in **Q10**, When did you buy/ acquire it? Specify the year.....
Q12 Where did you get the money to buy your assets from? Sold maize ☐ Sold another asset ☐
Inherited it ☐ Worked ☐ Money lender ☐ Other ☐

Q13 Would you attribute the funds used to purchase the item(s) to FISP? Yes ☐ No ☐

Q14 If your land is not titled, what is your tenancy occupancy?
Customary ☐ Sharecropping ☐ Rent ☐

1 | Page

Q15 How big is your farm? Less than 1 Ha ☐ 1-5 Ha ☐ More than 5 Ha ☐

Part C: Production characteristics

Q16 How much land did you cultivate under maize this year in hectares?.....(Ha) 2010..... (Ha) 2009..... (Ha) 2008..... (Ha) 2007..... (Ha) 2006..... (Ha) 2005..... (Ha) 2004..... (Ha) 2000(Ha).....

Q17 Do you wish to expand your land? **No/Yes**. Give one reason.....

Q18 How much maize did you harvest **this year**(X 50 kgs bags) ☐ 2010 ☐ 2009 ☐ 2008 ☐ 2007 ☐ 2006 ☐ 2005 ☐ 2004 ☐ 2000 ☐

Q19 How much maize do you intend to sell this year?.....X 50 Kgs

Q20 At what price do you normally sell your maize?.....**Kwacha**/meda/bucket/50kg.(**please tick**)

Q21 Where did you get your fertiliser for last season from? Fill in the table that follows:

FISP	Private sector	Total(Kgs)

Q22 How much [basal] fertiliser did you apply last season?.....Kgs In 2009..... Kgs 2008..... Kgs 2007..... Kgs, 2006..... Kgs 2005..... Kgs 2004..... Kgs 2000.....Kgs

Q23 If you had a lot of money today, what agricultural productive assets would you buy? Please rank in order of priority:
1st.....2nd ....3rd .....

Q24 If you had financial problems today, how would you solve them**? (Please tick in box)**

Sell assets ☐ Borrow from friends/relatives ☐ Nothing ☐ Money lender ☐ Other ☐

Q25 What are your major sources of income?.....

Q26 After harvesting, what do you do to earn money?.....

Q27 Do you think fertiliser support should continue, expand or reduce its quantity?

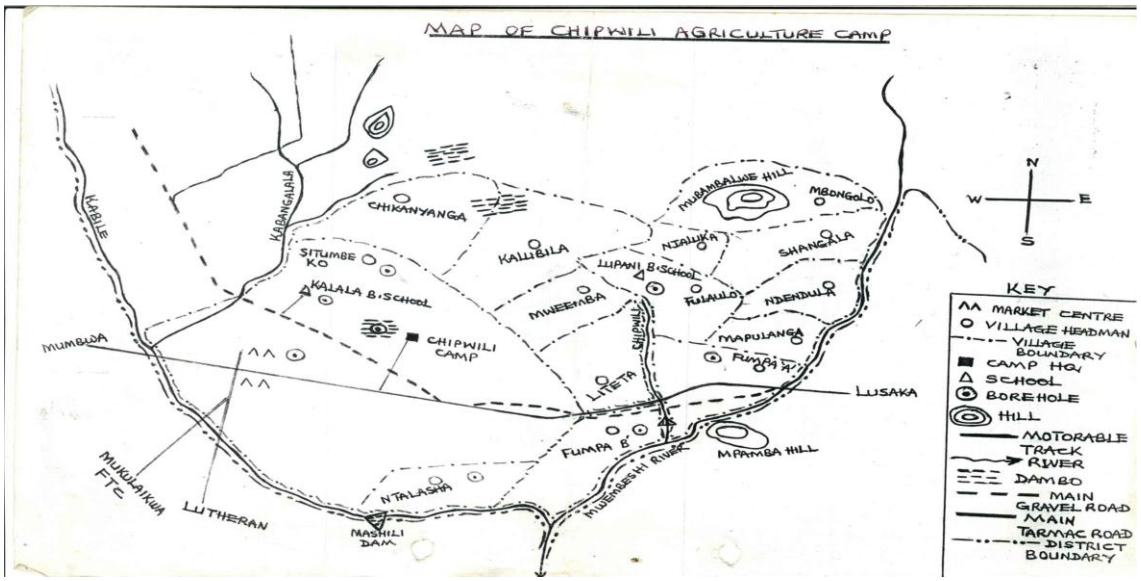
Give one reason for your answer.....

Q28 Why aren't you benefiting from fertiliser support?.....

Q29 How much money do you spend on food per day?.....**Kwacha**

Thank you for your cooperation

APPENDIX 2 Map of Chipwili Agriculture Camp



Source: Office of Chipwili camp extension officer

Located along Mumbwa road and 65 km west of Zambia's capital city-Lusaka- is Chipwili agricultural camp. It comprises of 14 village headmen and 21 cooperatives. To date, the camp has changed ownership several times. It was established by the Tobacco Board of Zambia (TBZ) in 1971. However, a decade later, the TBZ phased out its activities in the area but the tobacco scheme continued under the new hands of the Zambian government. But this was not for long before another firm known as National Tobacco Company (NATCO) took over the camp's operations in 1985. This parastatal firm engaged in full time tobacco production until 1992. In 1994, the camp was established for the first time as an agricultural camp, the status it has maintained to date.

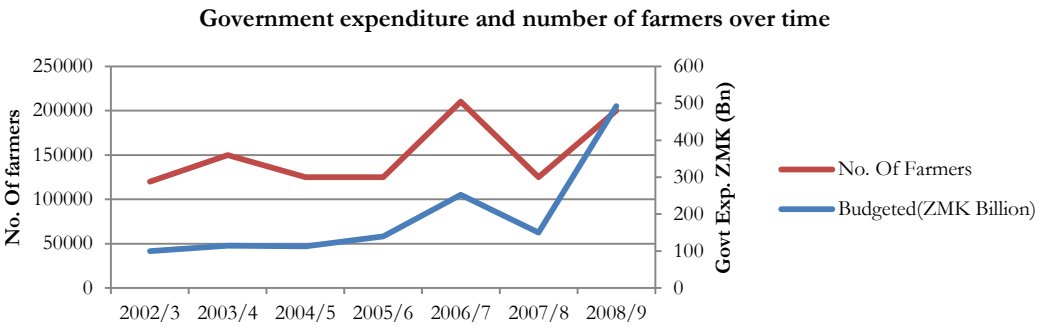
APPENDIX 3 Option rate

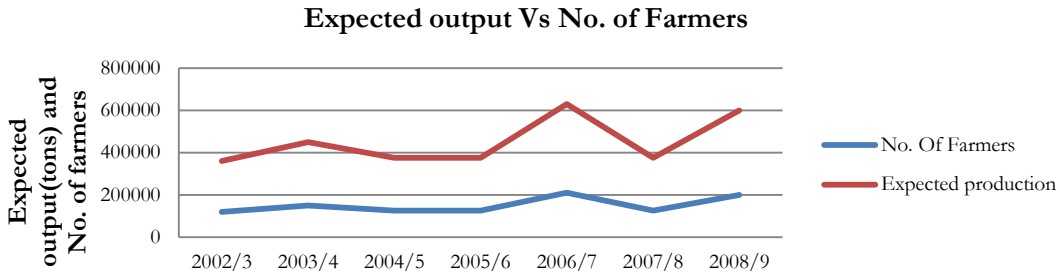
Q: If you had financial problems today, how would you solve them**?**
(Please tick in box)

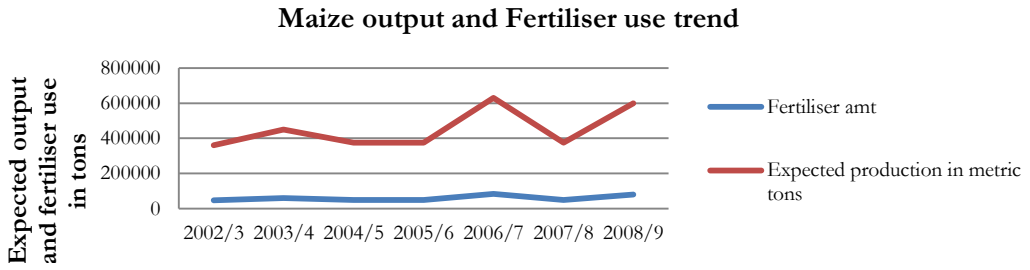
Preferred Money Source	Freq.	Percent	Cum.
Asset sale	27	19.29	19.29
Borrow	63	45	64.29
Moneylender	19	13.57	77.86
Nothing	4	2.86	80.71
Other	27	19.29	100
Total	140	100	

Source: author's own computation

APPENDIX 4 A graphical overview of FISP based on table 2







Source: MACO policy and planning, 2008, graphs by author using *excel*

APPENDIX 5 Farm size

Q: How big is your farm?

Farm Size	Freq.	Percent	Cum.
<1Ha	3	2.1	2.1
1-5Ha	87	60.84	62.94
>5Ha	53	37.06	100

APPENDIX 6 Pair wise correlations significant tests for assets on productivity (output/ha) and multi-co linearity tests on determinants of total output and income

	Output/ha	
Variable	Coefficient	P-Value
Titled Land	0.044	0.6016
Concretized Floor	0.279	0.0007
Iron roofed House	0.2778	0.0008
Oxen	0.3559	0.0000
Oxcart	0.3225	0.0001
Tractor	0.037	0.6616
Bicycle	0.2665	0.0013
Plow	0.2927	0.0004
Hand hoe	0.0391	0.6429
Other	-0.1194	0.157

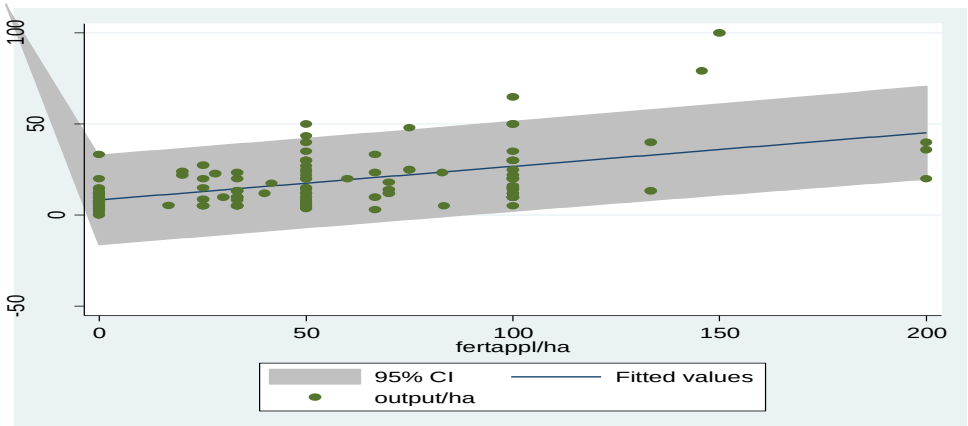
In order to understand our reduced form relationship between productivity and income, we highlight the major determinants for each in the following tables and show that Fertilizer rate + [FISP membership + Oxen] = Productivity=total output=income (see scatter plots below). Colour intensity indicates strength of relationship.

Variable	**Output/ Ha**
FISP Membership	0.4598
Oxen	0.3559
Fertilizer application/ha	0.5561
Area cultivated	0.0303
Gender	0.0692
Experience	-0.1373
Workers	0.1665
Price/50kg	0.3532
Education	0.1713
Age	-0.21

Variable	Total Output
Output Per Hectare	0.7266
Area Cultivated	0.5601
Gender	0.1766
Experience	-0.0395
Workers	0.2238
Price/50kg	0.3282
Fertilizer Application/Ha	0.2951
Education	0.1135
Age	-0.1492
FISP Membership	0.4268

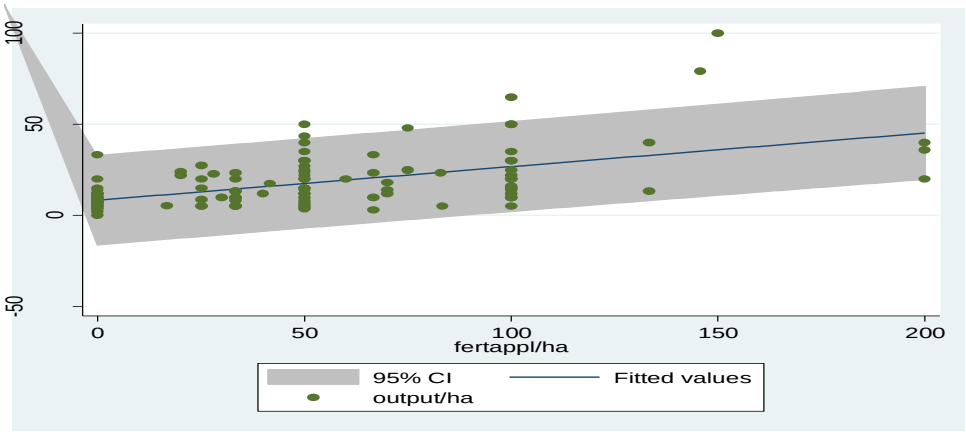
Variable	Income
Total Output	0.9146
Area Cultivated	0.3848
Output/Ha	0.6741
Gender	0.1077
Experience	-0.1152
Workers	0.1289
Price/50 Kg	0.4094
Oxen	0.1968
Education	0.1263
Age	-0.116
FISP Membership	0.3119

Determinant of productivity



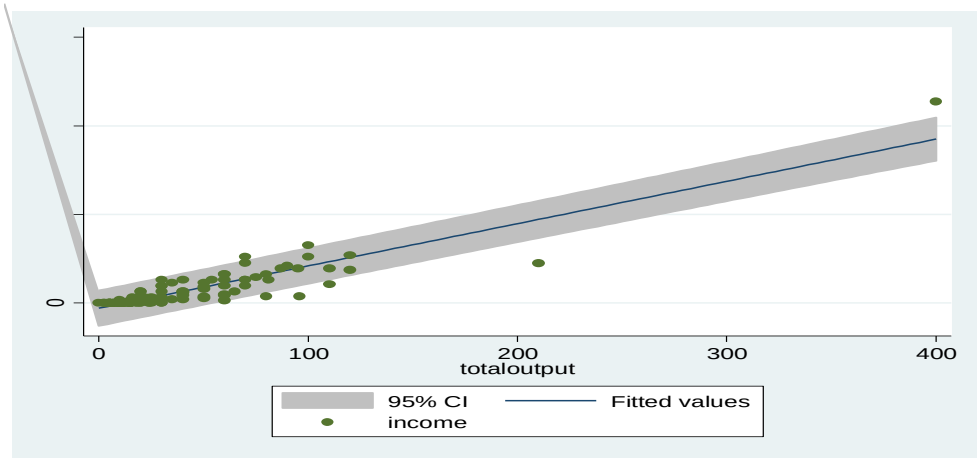
Source: own computation using *Stata*

Determinant of Total output



Source: own computation using *Stata*

Determinant of Income



Source: own computation using *Stata*

Multi-co linearity exists if the variance inflation factor (VIF) is above 10 or 1/VIF> 0.05 (Gujarati 2003).

Variable	VIF	1/VIF
Fertilizer application/ha	1.92	0.520058
FISP membership	1.8	0.555517
Output/ha	1.65	0.607181
Age	1.6	0.626465
Experience	1.49	0.671448
Price50kg	1.3	0.767942
Workers	1.18	0.847412
Education	1.16	0.863515
Gender	1.05	0.948393
Access to oxen	1.5	0.666667
Mean VIF	1.46	

Variable	VIF	1/VIF
Age	1.58	0.633883
Experience	1.5	0.66593
Price50kg	1.33	0.753367
Total output	1.21	0.829692
Workers	1.17	0.857051
Formal education	1.09	0.918034
Mean VIF	1.31	

APPENDIX 7 Heteroscedasticity test on model (3) using Stata

We reject the null hypothesis:

```
White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(61)     =     91.86
         Prob > chi2  =    0.0065
```

APPENDIX 8 Elasticity calculations

VARIABLES	**Ln(output/ha)**
Ln(area cultivated)	-0.153
	(0.139)
Gender	0.00193
	(0.154)
Ln(experience)	0.0971
	(0.0691)
Ln(price/50kg)	0.457**
	(0.174)
Ln(fertilizer application/ha)	0.330*
	(0.181)
Education	-0.0409
	(0.172)
Ln(age)	-0.606**
	(0.252)
Membership to FISP	0.341*
	(0.177)
Access to oxen	0.278*
	(0.155)
Constant	-1.725
	(2.169)
Observations	87
R-squared	0.376

APPENDIX 9 Manual calculation of standardised beta coefficient

$\beta_i = (\lambda_i * \theta_i)/s_d$

Where:

β_i = the standardised coefficient for each independent variable

λ_i =individual independent variable coefficient

θ_i=individual independent variable standard deviation

s_d=standard deviation of the dependent variable

APPENDIX 10 Coefficient of determination (R^2) and the Adjusted R^2 of the model using Stata (No robust command, results may slightly vary)

Source	SS	df	MS	Number of obs =	140
				F(10, 129)	11.97
Model	39.2325043	10	3.92325043	Prob > F	0
Residual	42.2683658	129	.327661751	**R-squared**	**0.4814**
				Adj R-squared	**0.4412**
Total	81.5008701	139	.586337195	Root MSE	0 .57242

Log-Output/Ha	Coef.	Std. Err.	t	P>t	[95% Conf.Interval]
Gender	-0.1364988	.1062346	-1.28	0.201	-.3466865 0.073689
Fertilizer Application/Ha	0.0051935	.0015145	3.43	0.001	.002197 0.00819
Experience	-0.002615	.0060538	-0.43	0.666	-.0145925 0.009363
FISP Membership	0.2907327	.1428392	2.04	0.044	.0081218 0.573344
Workers	-0.0001536	.0227915	-0.01	0.995	-.0452471 0.04494
Price/50kg	8.01E-06	2.24e-06	3.58	0.000	3.58e-06 1.24E-05
Education	-0.0024645	.1447745	-0.02	0.986	-.2889044 0 .283975
Age	-0.0069136	.0043062	-1.61	0.111	-.0 154336 0.001606
Area Cultivated	-0.0482018	.0384894	-1.25	0.213	-.1243541 0.027951
Aces To Oxen	0.2821481	.1206977	2.34	0.021	.0433447 0.520952
_Constant	2.186066	.2439595	8.96	0.000	1.703387 2 .668746