CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Tropical AgriSciences

Access to Input Subsidies through Cooperatives: Does it Improve the Economic Performance of Cooperative Members in the Western Province of Zambia?

MASTER'S THESIS

Prague 2021

Author: Gospel Ayodele Iyioku

Chief supervisor: Jiri Hejkrlík

Declaration

I hereby declare that I have done this thesis entitled "Access to Input Subsidies through Cooperatives: Does it Improve the Economic Performance of Cooperative Members in the Western Province of Zambia?" independently. All texts in this thesis are original. All the sources have been quoted and acknowledged by means of complete references and according to Citation rules of the FTA.

In Prague, 23rd April 2021

.....

Gospel Ayodele Iyioku

Acknowledgements

I would like to express my sincere gratitude to my supervisor, Jiří Hejkrlík, for his enormous contribution to this research's success. His guidance and continuous supervision regarding this research were terrific.

I want to express my gratitude to the Faculty of Tropical AgriSciences, Czech University of Life Sciences Prague, for the mobility grant to students for research. I also appreciate the effort of the Cooperative Research Group for the contributions made throughout this research. I also recognize the contribution of Caritas Czech Republic, Mongu, for their support with the data collection.

Abstract

Input Subsidy Programs (ISPs) have been receiving a great deal of recognition among farming households. These programs are means of making inputs readily available to farmers and increase their production. Literature suggests that Farmer Input Support Program (FISP) might be inadequate to improve the economic well-being of smallholder farmers as the poverty rate in rural areas in Zambia (currently at 82%) has been increasing over the years. Agricultural cooperatives serve as channels for the Government of Zambia to reach and assist smallholder farmers. Even though the FISP essentially targets smallholder farmers, it is claimed that only the more surplus scale farmers benefit from it. The study's main aim was to analyse the inclusion of members in farmers groups and input subsidies through cooperatives on their economic performance. Maize farmers and the current FISP was studied in the Western province of Zambia. Specifically, the study centred on evaluating how cooperatives internally managed input subsidies, analysis of the determinants that influence access to input subsidy through the cooperative and analysis of the effect of the input subsidy on the economic performance of beneficiaries and non-beneficiaries. One hundred eighty-seven maize farmers (111 – beneficiaries; 76 – non-beneficiaries) were selected from Limulunga and Mongu districts. The result of the Probit regression model showed that household and farm characteristics (farm size; cooperative experience), linkages within the cooperative (share investment; active participation) and social characteristics (reciprocity of relationship) had a significant positive influence on access to input subsidy in the cooperative. The Propensity Scores Matching (PSM) algorithms for analysing the effect of input subsidy indicated that beneficiaries of input subsidy among maize farmers in the cooperative reach significantly higher economic benefits than non-beneficiaries.

Key words: Zambia, agricultural cooperatives, yield, fertilizer productivity, propensity scores matching, sensitivity analysis.

Contents

List of tables

List of figures

List of the abbreviations used in the thesis

ATC – Authority to Collect

ATD – Authority to Deposit

ATT – Average Treatment Effect on the Treated

CAC – Camp Agricultural Committee

COVID-19 – Coronavirus Disease

FAO – Food and Agriculture Organisation

FISP – Farmer Input Support Program

FSP – Fertilizer Subsidy Program

GES – Growth Enhancement Support

GRZ – Government of the Republic of Zambia

IAPRI – Indaba Agricultural Policy Research Institute

IPWRA – Inverse Probability Weighted Regression Adjustment

ISP – Input Support Program

MACO – Ministry of Agriculture and Conservation

MAL – Ministry of Agriculture and Livestock

NGO – Non-Governmental Organisation

PSM – Propensity Score Matching

SD – Standard Deviation

SPSS – Statistical Package for Social Sciences

SSA – Sub-Saharan Africa

WPI – Western Province Information

ZKw – Zambian Kwacha

1. Introduction

A significant percentage of poor individuals worldwide still depend on agriculture either directly or indirectly for livelihoods, most of which operate on small-scale farms. Aside from building up production capacities for these small-scale farmers, improving their access to resources beyond individual reach has become a key element in promoting rural areas and poverty reduction. To encourage rural areas' development and reduce poverty in these regions, development programs must address the challenges confronting these small-scale farmers (Jayne et al. 2010). Literature reported that small-scale farmers (defined as those cultivating less than 2ha) produce 70-80% of the world's food (ETC 2009; Maass Wolfenson 2013). However, many smallholder farmers are the world's poor who depend on agriculture as the primary source of employment, food, and income. Small farm sectors face several constraints that prevent them from accessing market opportunities existing around them. These constraints include improved technologies and productive assets that are integral to stimulating small-scale farmers' market participation to bring them out of the poverty trap (Barrett 2008).

Modern agricultural technologies are recognized for being a critical factor in improving smallholder agricultural productivity. To increase the rate of adoption of technologies that increase the yield and productivity of farmers, several countries in Sub-Saharan Africa (SSA) introduced universal large-scale input subsidy programs. The introduction of input subsidy programs happened between the '70s and the '80s of the 20th century (Jayne et al. 2013; Jayne & Rashid 2013; Mason & Ricker-Gilbert 2013). Despite the significant reduction of global subsidies between the 1980s and 1990s, the World Bank recommended that the countries in SSA should cut back on input subsidies based on the premise that private sectors can supply subsidies more efficiently through market-based strategies (Ricker-Gilbert et al. 2011; Ricker-Gilbert 2014). Nonetheless, between the late 90s and early 20s, input subsidies were re-introduced on a larger scale to replace the old universal input subsidy programs (Jayne & Rashid 2013; Jayne et al. 2013; Ricker-Gilbert et al. 2013).

Cooperatives, farmer organisations and other similar forms of collective actions are among the efforts of the pro-poor market approach and, as such, have been recognized

as ways to reduce high transaction costs (Markelova et al. 2009; Valentinov 2007). They are supposed to provide services that should reduce transaction costs and several other market failures for small-scale producers to raise production levels and rural incomes (Thorp et al. 2005; Grashuis & Ye 2019). They also help improve farmers' production, marketing, and livelihoods, and sometimes, they could serve more than one purpose (Bernard et al. 2008; Francesconi & Heerink 2011; Bernard & Taffesse 2012). These collective actions are considered cost-effective tools for the execution of programs that aims at reducing poverty while at the same time providing external benefits to targeted groups in rural areas (Chirwa et al. 2005; Markelova & Mwangi 2010). With technology evolving and innovations increasing globally, farmer organisations and other similar forms of collective actions will be the only authorized business organisation capable of providing smallholder farmers with new opportunities in a sustainable way (Figueiredo & Franco 2018). Agricultural cooperatives could help farmers mitigate risks, especially market risks, while at the same time helping to stabilize production.

One way to bring input subsidies closer to farmers at relatively lower transaction costs is through cooperatives and similar forms of collective actions. Agricultural cooperatives serve as channels to contribute to farmers' social and economic development, and these have been the primary reasons for several governments and donors in supporting cooperatives (Johnson & Shaw 2014; Tefera et al. 2017). They can serve as instruments to implement government policies in rural areas.

Lately, inclusion has emerged as an important concept in international development (World Bank 2013; Khan et al. 2015). It is considered a vital tool to improve the involvement of disadvantaged groups in development (Cook 2006). The term inclusion is described as the "removal of institutional barriers and the improvement of incentives to increase the access of various individuals and groups to opportunities for development" (World Bank 2013). Results from several impact studies are not uniform despite several publications indicating the exclusion of small-scale farmers, less-privileged farmers or farmers who live in isolated areas). Results from several impact assessment studies are not uniform despite several publications indicating the exclusion of small-scale farmers, less-privileged farmers or farmers who live in isolated areas (Verhofstadt & Maertens 2015; Mojo et al. 2017; Abate 2018; Mutonyi 2019; Wassie et

al. 2019). According to Bijman & Wijers (2019), producer cooperatives are often not including the most impoverished farmers.

Recent studies on the receipt of subsidies in Malawi found out that the most vulnerable people in Malawian communities, for instance, a female-headed household and those with fewer assets, were not the significant beneficiaries of subsidy vouchers (Chibwana et al. 2012b)**.** Similarly, Burke et al. (2012) discovered that fertilizer subsidies in Zambia have been strategically aimed at larger and richer farmers but argued for more direct concentration towards the less-privileged farmers given their potential involvement in maize production. Contrary to these recent findings on excluding these categories of farmers, cooperatives and development programs should be inclusive of smallholder farmers. Puusa et al. (2013), Davis (2016) and Pouw & Gupta (2017) believe that producer cooperatives adopt a bottom-up, grass-root or democratic approach that is important to the development of the economic and social aspect of the weak and marginalized farmers.

According to the Indaba Agricultural Policy Research Institute (2015), the rural poverty rate in Zambia has remained unchanged and stagnant at about 80% for more than a decade. It has often assumed that the input subsidy programs in Malawi and Zambia have had little impact on rural poverty despite the programs in place for several years (Jayne et al. 2011; Mason et al. 2013b; Lunduka et al. 2013). The Government of the Republic of Zambia (GRZ) devotes a considerable amount of its resources to input subsidy, and according to Mason et al. (2013b), more than 90% of the GRZ's spending on input subsidies have been on Farmer Input Support Program (FISP). Little is known about the effect of FISP on small and large farmers' productivity. One of the aims of this research work is to understand the effect of FISP on the economic performance of cooperative members. FISP constitute one of the ways to raise farm incomes and increase the productivity of farmers.

FISP is the most extensive agricultural subsidy programs in Zambia. It is an established successor of the Fertilizer Support Program (FSP). FISP is targeted towards the "vulnerable but viable" farmers with a set of eligibility criteria to decide who should participate within the program (Ministry of Agriculture and Conservation 2008). Under the current implementation of FISP, a set of criteria exist to be participants in the program.

These criteria include cultivation of 0.5 to 5 hectares of land, membership in any Farmer Organisation, no debtors of previous credit programs, and not currently benefitting from the Food Security Pack Program (Ministry of Agriculture and Livestock 2014). The FISP program targets individuals at a disadvantage in accessing commercial inputs due to either high cost, transaction costs, or failures or absence of credit markets by lowering these costs for many disadvantaged groups. This targeting criterion qualifies the program as an inclusive development program. FISP recognizes and reaches its recipients through farmer organisations (Jayne & Rashid 2013)**.**

However, according to Mason et al. (2013)**,** FISP does not fully reach its target groups, but rather, the inputs are diverted to better-off farmers. By channelling these subsidies towards these categories of farmers, the effect on poverty reduction, production levels and prices of maize in the country has been marginal so far (J Ricker-Gilbert 2013; NM Mason 2013). This study tried to examine if similar traits within smallholder cooperatives in Zambia related to the inclusive distribution pattern and the cooperatives' internal management of input subsidies.

In Zambia, no literature has focused on the factors influencing the inclusiveness of members of agricultural cooperatives regarding participation in FISP allocation (Mofya-mukuka et al. 2013; Smale et al. 2014; Minah & Carletti 2018; ; Bijman & Wijers 2019; Minah & Malvido Pérez Carletti 2019). Although Burke et al. (2012) and Personal et al. (2018) considered the effect of input subsidy (fertilizer use) on maize productivity as well as retailer prices, none of these authors explicitly focused on the exclusiveness of some members in the cooperative as regards input subsidy allocation. Also, no literature in Zambia considered comparing the effect of input subsidy on the economic performance of small and large farmers in the cooperatives. This research aimed to analyse how access to input subsidy through the cooperative affects the economic performance of maize farmers in the western province of Zambia.

The other parts of this research are organized as follows. The second chapter provides a review of relevant literature, while the third chapter describes the aim of this study. Chapter four explains the data collection and methodological approach adopted for this study. Chapter five presents the study's findings, while the sixth chapter provides the discussion and proposes recommendations. Lastly, chapter seven gives a conclusion to the whole study.

2. Literature Review

2.1. Agricultural Cooperatives and Transaction Cost Economies

The transaction cost economics offers the conceptual basis for understanding the role of smallholder cooperative organisation (Williamson & Gorringe 1987). Famous Williamson first introduced this concept in 1975 (Williamson & Gorringe 1987); nevertheless, the concept of transaction cost was introduced by Coase in 1937 (Coase 1995). The transaction cost economics provides answers to the observable and unobservable costs of market exchange. According to Williamson (1987), transaction cost economics is defined as the costs associated with making any economic transaction when participating in a market. This cost involves costs such as searching costs, information costs, negotiation costs, bargaining costs, monitoring costs, decision costs, coordination costs, policy, and contracts. Every transaction cost item is influenced by four different factors: social, legal, political, and economic institutions (Sykuta & Chaddad 1999).

Williamson (1987) identified three critical variables to describe transactions. The first variable is the transaction frequency under which the transaction takes place. The second variable is asset specificity, which focuses on the value of investment lost when used for an alternative purpose (Menard 2006). The third variable is uncertainty, which explains both internal and external disturbances such as inputs, outputs, transformational processes, and shift in an institutional environment under which the transaction happens (Williamson 1991; Menard 2006).

Authors have argued that cooperatives assist its members to economize transaction cost and develops counterbalance market power (Bonus 1986; Staatz 1987). According to (Staatz 1987), the ability of the cooperative to achieve transaction cost is achieved by developing countervailing market power, protecting farmers from intrinsic risks in agricultural markets by providing farmers with revenue insurance; and providing quality control through forward and backward linkages. According to Hansmann (1988), due to weak market power and information asymmetry in contracts, farmers usually experience high transaction costs. According to Thomas & Vink (2020), incomplete information among value chain actors, despite the government providing access to input,

credit and output markets in the vegetable industry, leads to the slow development of the vegetable enterprise.

Studies confirmed that agricultural cooperatives serve as organisations that help compensate for the unfavourable positions such as low prices for outputs, high costs of input, high transaction costs, low negotiating power that trading partners find themselves in (Bonus 1986; Staatz 1987; Hansmann 1988). According to Fischer & Qaim (2012), the incentive for collective actions is to reduce transaction costs by utilising economies of scale.

2.2. Inclusion and Inclusion Outcomes

2.2.1. The concept of Inclusion and Inclusion Outcomes in Farmer Organisations

Inclusion is described as a complex phenomenon that remains relatively abstract and difficult to comprehend (de Haan 2011; Pouw & Gupta 2017). According to Bijman & Wijers (2019), the inclusiveness of producer cooperatives in developing countries continues to be a challenging issue. Inclusion is identified as means for improving the participation of individuals in a society that are disadvantaged due to factors such as age, sex, disability, race, ethnicity, origin, religion, economic or status, through improved opportunities, better access to resources, voice, and respect for rights (United Nations 2016). According to Fischer (2012), the concept of inclusion has two meanings. The first is to recognize inclusion as a static and required outcome, while the second is to understand it as a process that occurs between different actors in societies. Researchers have preferred the first meaning of this term as it can be measured against some predefined indicators by standardized qualitative methods. Such studies have focused on analysing the extent to which certain groups are represented in particular programs (Khan et al. 2015).

One major issue with applying such a concept is that the results presented do not provide meaningful insight into the causal mechanisms that contribute to the observed results. It is then vital to support the method by using a process-oriented approach to explain how inclusion's formal and informal rules operate (Hickey & Toit 2013).

According to Sen (2000) and World Bank (2013), it is not always clear who is more in a disadvantaged position than others in the society. This issue represents the rationale behind researchers being challenged to identify individuals at risk of exclusion from development opportunities due to high levels of deprivation in many developing societies. Gupta et al. (2015) established that it is not always enough to compare individuals against their relative incomes. However, instead, a more contextualized and relational method needs to be utilized because the inclusion and exclusion of individuals often depend on their social positions. According to Khan et al. (2015), the concept of inclusion may correct unequal power relationships. However, it may also require specific motivations by individuals who lack resources to participate and be involved on their own entirely.

It is imperative to highlight that inclusion processes and results are designed at multiple levels. Different levels of inclusion occur at micro, meso and macro stages. These stages relate to the individual, institutional and citizenship rights (Abbott et al. 2017), but these levels are all interlinked. Thus, these conceptual considerations are projected to clarify why focusing on inclusion as a concept remains a challenge, showing that researchers need to navigate through contesting applications, meanings, and levels to apply the concept. For this research paper, the definition of inclusion that makes a good fit is the 'removal of institutional obstacles and the enhancement of incentives to increase the access of diverse individuals and groups to development opportunities' (World Bank 2013). This definition addresses inclusion as a process rather than outcomes alone. It also suggests that some forms of proactive actions to remove barriers or increase incentives can lead to inclusion. Lastly, it states that the goal behind the inclusion process generally coincides with the intention of targeted-subsidy programs.

Literature has grown around the topic of inclusion in farmer organisations in Africa. Most of the empirical studies conceptualize inclusion in the aspect of access to market or value chain and, lastly, in the context of public policies to a lesser extent (Markelova & Mwangi 2010; Lutz & Tadesse 2017). One major problem with this topic has been that existing literature lack pre-formulated inclusion targets and thus can hardly justify why farmer organisations should be inclusive of whom, to what degree and on what grounds. Therefore, their significant contributions to knowledge lie in outlining membership propensities and access to benefits.

Empirical studies have identified that better-off farmers are more likely to be involved in farmer organisations as farm size, wealth, credit access, increases the likelihood of participation (Bernard & Spielman 2009; Francesconi & Heerink 2011; Fischer & Qaim 2012; Verhofstadt & Maertens 2015). Evidence also suggests that the gender gap also creates a barrier in participation in farmer organisation in which female-headed households are less likely to become members of farmer organisations (Mojo et al. 2017; Wossen et al. 2017). However, very few studies have focused on investigating this relationship whether external development programs can induce the inclusion of poorer farming households.

According to Verhofstadt & Maertens (2014), organisations in Rwanda with subsidized inputs have higher income effects as it generates increased expected benefits than those without subsidized inputs. These benefits then attract a heterogenous group of farmers to the group. Although Arcand & Wagner (2016) found that membership has become more inclusive in line with program regulations, they also discovered that the rates of dropouts were higher amongst long-established members, with the women dropping out proportionately more. The result conforms with the findings of Gugerty & Kremer (2008) that participation in public programs attracts younger, and wealthier farmers into farmer groups, who then assume leadership positions.

2.2.2. Factors Influencing Inclusiveness in Development Programs

Producer cooperatives may have some good reasons not to include all members in certain activities, and this is often true for organisations that prioritise competitiveness over-inclusiveness. When an organisation adopts a competitive strategy, issues relating to increased production volume and quality and increasing investment for innovation, product development and marketing should involve all organisation members (Bijman & Iliopoulos 2014). Empirical results on inclusion highlight the need to better understand the underlying procedures that shape barriers and incentives to inclusiveness from an organisational perspective. According to Bijman & Wijers (2019), producer cooperatives are always not including the most impoverished farmers.

According to Nxumalo & Oladele (2013) on factors that influence farmers' participation in agricultural programs, their findings showed that the age of a farmer has a significant positive influence on farmers' participation in agricultural programs. Nnandi

& Akwiwi (2008) and Farid et al. (2009) also observed the relationship between the age of farmers and participation in agricultural programs. They discovered a positive relationship between age and participation in the agricultural project. On the other hand, the age of farmers may not have a significant relationship with participation in agricultural programs as Oladejo et al. (2011) and Etwire et al. (2013) believed that age and participation in agricultural programs have no significant relationship with each other.

The sex of a farmer is an important variable to consider, especially with the distribution of input subsidy within the cooperative. According to Nxumalo & Oladele (2013), the gender of a farmer has a significant negative effect on farmers' participation in agricultural programs, signifying that male farmers are more likely to be participants in the agricultural project. Etwire et al. (2013) and Nnandi & Akwiwi (2008) were of a contrary opinion as their findings did not show any significant relationship between the sex of a farmer and participation in the agricultural project.

According to Farid et al. (2009), the size of the farm a household cultivates has a negative relationship with participation in agricultural projects. Nxumalo & Oladele (2013) were of a different opinion. Their findings showed no significant relationship between the size of farmland a farmer cultivates and participation in the agricultural project. The finding of Etwire et al. (2013) also suggests no relationship between the size of the farm a farmer has and participation in agricultural programs.

According to Mason & Ricker-Gilbert (2013); Mason et al. (2013b); Nicole M. Mason et al. (2013), households with larger landholding areas get significantly more subsidized inputs. Results showed that an increase in the landholding size of a farmer increased household receipt of subsidized input. Mofya-mukuka et al. (2013) believed that input subsidy beneficiaries cultivating larger areas receive significantly more subsidized fertilizer than beneficiaries cultivating smaller areas.

Contact with agricultural extension officials is expected to have a positive impact on participation in agricultural programs. Most projects partner with agricultural extension service to recognize farmers to participate in their projects; hence the probability of a farmer being notified and prepared to participate in a project or program increases with contact with an extension agent. Etwire et al. (2013), in their analysis on determinants of farmers participation in agricultural projects in Ghana, believed that access to extension service has a significant positive influence on participation in

agricultural projects. Ragasa & Mazunda (2018), on the impact of agricultural extension services on subsidized input in Malawi, discovered that farmers who received input subsidy also received extension services and vice versa.

The experience of members in the cooperative may influence how members participate in cooperative activities. Österberg & Nilsson (2009) suggest that members with more experience in the cooperative can participate in the cooperative's governance and how things are run within the cooperative than younger farmers. These authors found a significant positive influence of members experience in the cooperative and democratic control in the cooperative. According to Muthyalu (2013), young members have more awareness about the benefit of cooperatives, and they may have more opportunities to current information and opportunities than older farmers within the cooperative.

Nicole M. Mason et al. (2013) also showed that an increase in the wealth of farmers has a positive relationship with households' receipt of subsidized fertilizer. According to Mason & Ricker-Gilbert (2013), input subsidy continues to go excessively to households with more land, livestock or farm equipment. On average, wealthier households acquire significantly more subsidized inputs (Ricker-Gilbert et al. 2011; Chibwana et al. 2012b; Pan & Christiaensen 2012). Jayne et al. (2011) also believed that fertilizer subsidy is often disproportionately targeted towards farmers with more significant assets and incomes. They concluded that farmers with about 10 – 20 hectares of land receive seven times more subsidized fertilizer, on average than farmers with 2 hectares of land or less.

Members active participation in the cooperative connotes member's actual participation in the cooperative. Participation is measured through participating in group meetings and committee of the cooperative. According to Verhees et al. (2015), the active participation and involvement of members in cooperative affairs such as holding significant positions offer benefits for individual members, such as opportunities for members to participate in the design of new services and products. The willingness of members to be active allows them to be involved in decision-making processes in the cooperative. It allows them to participate in cooperative activities and make things happen (Verhees et al. 2015).

Reciprocity of relationship among members of a cooperative should influence access to input subsidy within the cooperative. According to Ruben & Heras (2012),

reciprocity of relationship and mutual trust among members does influence the performance of agricultural cooperatives. According to Rudd (2000) and Pretty & Ward (2001)**,** social capital such as reciprocity enhances the productivity of collective actions and vice versa. Both social capital and productivity can play a significant role in sustainable development. At the individual level, reciprocity of relationship and trust among members can reduce transaction costs in situations of information asymmetry (Rudd 2000)**.**

Members acceptance within the cooperative is a combination of motivation, activation and interest based on a solid relationship between the cooperative and its members. Acceptance and involvement within the cooperative are preconditions to spend time on the governance of the cooperative and participate actively (Van Dijk & Klep 2008; Birchall & Simmons 2003). According to Verhees et al. (2015), members involvement within the cooperative brings benefits for individual members as it allows them to get information and thus identify opportunities.

Cooperative members would get access to subsidy when they perceive that they have a voice or opinion in the cooperative and their opinions are respected. Although no study has considered voice as a factor influencing access to input subsidy within the cooperative, Cechin et al. (2013) believed members who experience a more democratic voice are more involved in collective actions within the cooperative such as involvement in agricultural projects in the cooperative.

López et al. (2017), on agricultural input subsidies and productivity among farmed, used probit model to evaluate factors influencing respondents' participation in input subsidy programs. Results showed that remittances (measured as a dummy variable) significantly affected receiving input subsidy (positively) among Paraguayan farmers. In another study carried out by Muthyalu (2013), the authors observed that shareholding of members within the cooperative has a significant positive effect on participation in agricultural input and output programs by members of cooperatives.

The findings of Nicole M. Mason et al. (2013) on fertilizer subsidies and voting pattern in Zambia showed that kinship ties with leaders have no statistically significant influence on access to subsidized inputs. This signifies that the level of relationship a farmer has with leaders does not significantly influence participation in development programs such as input subsidy programs.

Empirical evidence from the study of Uzzi (1996) on the sources and consequences of embeddedness for the economic performance of organisations showed that open communication between the board and the cooperative members offers benefits for the individual members because communication safeguards against opportunism and market uncertainties. Open communication helps to speed up members' response to market challenges or problems in the supply chain. Open communication from the member's standpoint is the willingness of the member to use the voice mechanism rather than the exit mechanism to display discontent (Fulton 1999).

Empirical evidence has suggested that small-scale farmers and large-scale producers benefit differently from their membership in farmer organisations. According to Fischer & Qaim (2012), the benefit for smaller farmers is relatively higher than large-scale farmers. Mojo et al. (2015) concluded that large-scale farmers benefit more in absolute terms, as they produce more and benefit from economies of scale when dealing with farmer organisations.

2.3. Zambia's and its Agricultural Subsidy Programme

Zambia is in the southern area of Africa, and it is a country that is well gifted with natural resources and favourable weather conditions. In 2011, agriculture in Zambia generated 10% of foreign exchange earnings (Zambia Agriculture 2017). In 2010, the agricultural sector in Zambia confirmed itself as the country's first employer, providing works to more than 3,042,000 people, which is equivalent to 66.5% of the country's labour force (Zambia Agriculture 2017). Also, the agricultural sector in Zambia comprises crops, livestock, and fisheries. The most cultivated staple crop (65% of cropped land) in the country is maize.

In contrast, other major crops in the country include cotton, soybeans, tobacco, groundnuts, paprika, sorghum, wheat, rice, sunflower seeds, coffee, and sugar, fruits as vegetables and flowers (Zambia Agriculture 2017). In terms of land area cultivated by each farmer, there are three major categories of farmers in Zambia. The first are small-scale farmers, who are the vast majority among the farmers in the region. They cultivate less than five (5) hectares, use few external inputs, consume most of the yields from the farm, and occasionally enter the market to sell surpluses from the farm (Global Yield Gap

Atlas 2020). These categories of farmers are responsible for cultivating most of the staple crops in the country, including maize, sorghum, rice, millet, and cassava (New Agriculturist 2012)**.** The second category of farmers is the medium-scale farmers who cultivate between five (5) to twenty (20) hectares of land. They make use of improved seeds as well as other inputs such as fertilizers. These categories of farmers, unlike the small-scale farmers, sell most of their produce to the market. The large-scale commercial farmers, the last categories of farmers, cultivate over twenty (20) hectares of land annually. They utilize high levels of purchased inputs and technology for farm activities. They produce almost solely for direct market sale or feed their grain to livestock reared on the farm. These farmers constitute just 4% of farm households in Zambia but cultivate 22% of all cropped land (Global Yield Gap Atlas 2020).

Authors have argued that the country's overdependence on its mineral resources has hindered the development of the agricultural sectors (Üllenberg et al. 2017). The overdependence on mineral resources has put additional pressure on agriculture to supply the needs of the urban population in terms of enough food at reasonable prices, leaving the country in a long-standing state of large-scale agricultural or credit subsidy programs. These programs are essential to encourage increased agricultural production, better the livelihood of rural dwellers and ensure food security. According to (Mason et al. 2013; Mason & Tembo 2015), since maize is regarded as the main staple and commercial crop, governments in the country, have highly politicized subsidies to ensure electoral votes.

An average Zambian small-scale farmer produces typically enough to sustain their family and a small quantity for sale. With about 1.5 million small-scale farmers in Zambia (9% of the total population), these farmers are responsible for most maize production (Ministry of Agriculture and Livestock 2014). Since independence in 1964, political administration ever since has supported pro-cooperative policies (Food and Agriculture Organisation 2014). Cooperatives in the country have been established to provide specific ways through which socioeconomic progress and the fight against poverty may occur (Ministry of Agriculture and Livestock 2016). To achieve that goal, the Department of Cooperatives of the Ministry of Agriculture considered using cooperatives to raise productivity and production in the agricultural sector. In the Zambian context, the improvement of agricultural productivity and production starts with the utilization of

Green Revolution inputs: hybrid seeds, inorganic fertilizer, and input. They make use of cooperatives to distribute these inputs.

2.4. Farmer Input Support Program (FISP)

2.4.1. Overview of FISP

Policy makers in Zambia incentivize more intensive agricultural production through the FISP. This program follows the Green Revolution model by distributing hybrid maize seed and fertilizers to encourage increased yields and production (Mason et al. 2013b). FISP is the 2009/2010 established successor of the Fertilizer Subsidy Program (FSP), which began in 2002/2003 in Zambia. According to the Ministry of Agriculture and Conservation (MACO) in Zambia, the goals of FSP and FISP are still the same. They include the improvement of household and national food security; the improvement of incomes for smallholders; to grant smallholders access to inputs; regeneration of smallholders' resource base; and enabling the private sector to supply farm inputs (Ministry of Agriculture and Conservation 2008). The distribution of hybrid maize seeds and fertilizers by FSP began in the 2002/2003 growing season (Mason et al. 2013a). The FISP in Zambia mainly targets the "vulnerable but viable" farmers, which attracts some forms of eligibility criteria that should be included to participate in the program (Ministry of Agriculture and Livestock 2014).

According to the Ministry of Agriculture (2015), agricultural cooperatives are the main channels through which inputs are distributed, and FISP is entirely executed through cooperatives. According to the Ministry of Agriculture and Livestock (2015), farmers who wish to participate in FISP must first register as cooperative member and have a bank account. Membership in a cooperative is done by purchasing one cooperative membership share and the subsequent renewal of the membership through annual renewal fees. Once the farmer is registered in a cooperative, s/he must meet the following criteria (Ministry of Agriculture and Livestock 2015):

- be a registered small-scale farmer and be actively involved in farming within the camp coverage area. The Camp Agricultural Committee (usually consisting of representatives from different cooperative

societies) is responsible for identifying FISP beneficiary and their selection

- cultivate between 0.5 – 5 hectares of land
- can pay the prescribed farmer contribution towards the total cost of an input pack
- not be a recipient of the Food Security Pack Program (FSPP). The FSPP is a different subsidy program that targets very poor and socially disadvantaged smallholders. This program accounts for less than 5% of the spendings of the government compared to FISP.
- not be a defaulter from any other agricultural credit program.

According to Luke Harman (2015), since the 2015/2016 agricultural season, the farmer contribution for a standard maize pack is K400.00. During the 2015/16 season, one FISP pack was worth K2,100 ZMK. This standard maize pack consists of 400kg of fertilizer and 2 x 10kg of maize, and another crop type pack.

Nevertheless, cooperative membership alone does not guarantee that a farmer will receive subsidized inputs. As a cooperative member, the farmer will have to apply through the Camp Agricultural Committee (CAC). Then the CAC will review the list of applicant farmers, choose which farmers to admit into the program, and then the list of approved farmers is generated at the district level (Smale et al. 2015). Once approved for participating in FISP, the farmer must pay a fee to the program

With all this in place, the targeted respondents of the programme are supposed to be those who are ordinarily disadvantaged in accessing commercial input due to the high cost of incurring them, transaction costs and absence of credit markets. This qualifies the program as an inclusive development program (Jayne & Rashid 2013).

2.4.2. Criticisms of Farmer Input Support Program

While the program has successfully linked small-scale farmers with enhanced inputs and credit, the program has been strongly criticized. A body of independent evaluations exist which underlines the different failures of the FISP in terms of reaching its main intended outputs of improving household security.

One of the concerns is that the FISP has been considered a rationed program which means that the subsidies provided are insufficient to reach all eligible and intended recipients (Mason et al. 2013a). According to Mason et al. (2013), about 30% of smallholder households in Zambia benefit from this program, whereas 79% of them are those who meet all the eligibility criteria. These authors have also identified that targeting is not done correctly. It often does not correctly identify disadvantaged households, which results in input diversion towards better-off farmers, who cultivate larger fields and are unlikely to be poor (Mason et al. 2013).

With more subsidies being channelled in the wrong direction, especially towards the better-off farmers, authors found that the effect of the program on the prices of maize, production levels in the country and on poverty reduction has been marginal (J Ricker-Gilbert 2013; NM Mason 2013; Mason & Tembo 2015). This wrong targeting resulted in poverty rates in Zambia being stagnant at around 78% (IAPRI 2016), while national inequality has even increased over the years (Human Development Report 2016)**.**

According to Burke et al. (2012)**,** the hybrid maize seed and fertilizer combination made available through the "traditional" form of FISP was poorly suited to soils in the country. Evidence also suggests that the late delivery of inputs has been a significant concern that directly impacts yield and subsequently on farmers' income (Kuteya 2014). As a result of the combination of late input delivery and poorly suited input package, Mason et al. (2013a) conclude that the program has only had minimal impact in reducing the rural poverty rate in Zambia.

Another major criticism is concerning the design of the program itself. The program appears unable to achieve its stated aims as a farmer cannot exit poverty by cultivating 0.5ha of maize, with Jayne et al. (2013) suggesting that increment in the value of maize output is in most years considerably lesser than its cost. This means that while the program is considered as one for increasing household food security and reducing poverty, in the true sense, it is regarded by many as a social transfer. There is also widespread recognition of it being a highly politicized program with significant scope for patronage from the country's national to local level (Nicole M. Mason et al. 2013).

Another primary concern is that while the original plan of the FISP was for recipients to graduate after three years following an incremental decrease in the level of subsidy, in practice, this can never be achieved, but rather, the subsidy levels were

maintained and even increased (Luke Harman 2015). According to Luke Harman (2015), even if recipients of FISP were able to graduate, one significant reason why they do not is that the existing targeting design and implementation, mixed with local power politics, does not permit for or encourage it. The author also believed that it was usual for those with the means and local power to influence local structures (for example, Camp Agricultural Committees who influence those who benefit from the program). As a result, individuals will continue benefitting year in, year out and those intended to benefit from it often rarely benefit.

Another issue identified by authors is the allocation of subsidies that households receive. According to (Sitko 2010)**,** many farmers and households receive less than the FISP official pack size, consisting of 400kg of fertilizer and 2 x 10kg bags of hybrid maize seed and another pack of any other crop type. According to the author, packs are often broken up so that more households can benefit from the program. While some households receive multiple packs by signing up multiple households and non-household members for the program, some receive far less than what is considered a substantial amount (Sitko 2010).

According to the historical context stated by Mason et al. (2013b), input subsidy programs are often insufficient to serve all eligible applicants. Therefore, there is always some discretion over who receives the subsidized inputs among farmers. According to these authors, although all programs require that farmers apply for the subsidized inputs, some eligibility criteria still exist within the cooperatives regarding those who get subsidized inputs.

2.4.3. Effect of Input Subsidy on Farmers Productivity

According to Dlamini et al. (2019), in their analysis on the impact of agricultural input subsidy on the productivity of small-scale maize farmers, the PSM model matched participants with non-participants of input subsidy based on observable covariates. The result of productivity (measured in output per hectare) between participants and non-participants of input subsidy showed that before matching was done, the average productivity of smallholder farmers that participated in the program was more than non-participants by 0.01tons/ha. Authors matched and controlled for factors and discovered that the difference between the average productivity of smallholder farmers that

participated in the program and non-participants increased to 0.13tons/ha. These authors concluded that participating in the agricultural input subsidy program positively affects the productivity of smallholder maize farmers.

Wossen et al. (2017), on productivity and welfare effects of Nigeria's e-voucher-based input subsidy program, used maize yield as a proxy for productivity. Results showed that the average maize yield for Growth Enhancement Support (GES) scheme participants were significantly higher than for non-participants at a 1% significance level. While using income for maize production as a proxy for productivity, results showed that income received from maize sales is higher for GES participants. Although these differences in yield and income cannot simply be attributed to participation in GES by mere looking at mean differences between GES participants and non-participants, they are only indicative of the correlation. They cannot be used to make casual inferences regarding the program's impacts on maize yields and income without controlling for other confounding factors. However, using PSM and Inverse Probability Weighted Regression Adjustment (IPWRA) for estimating productivity, the authors found a positive and statistically significant effect of participation in GES on all productivity outcome indicators. Results showed that participation in the GES program increased maize yield and maize incomes.

According to Ricker-Gilbert & Jayne (2011), the estimate of subsidized fertilizer on maize yield suggests that 100kg of subsidized fertilizer increases immediate maize yield by 165kg and 100kg per year over three years results in an extra 316kg of maize in the 4^{th} year. Chibwana et al. (2012a) also opined that maize and tobacco area estimates increase with input subsidy.

In a survey conducted by Dorward & Chirwa (2013) on the impact of the Malawi Farm Input Subsidy Program on smallholders livelihood, results showed a consistent estimated increase in maize production across all beneficiaries of input subsidy with a higher increase among the impoverished recipients. The authors further concluded that poorer households usually gain more proportionately, but not necessarily in absolute term, from the same input subsidy package.

López et al. (2017) researched agricultural input subsidies and productivity among Paraguayan farmers. Using a quasi-experimental approach (PSM), estimates of the impact of receiving an input donation on production per hectare as a measure of the effect on

agricultural productivity showed that agricultural input donations do not impact agricultural productivity or input utilization. The result derived from different matching methods showed no evidence of agricultural input donation on productivity and expenditures per hectare and gross margin of program beneficiaries in 2012.

Burke et al. (2012) carried out a survey on food production and poverty reduction in Zambia. Their analysis suggests that maize yield response to fertilizer use may be higher on small farms than larger farms. This finding is against the assumption that bigger and wealthier farms are more capable of using subsidized inputs to raise total maize productivity in Zambia substantially. Their survey showed that farms that are less than one hectare produce 3.73kg of maize per kg of fertilizer used, which was 0.27kg/kg more than farms larger than ten hectares. These authors concluded that an additional tonne of fertilizer distributed to small farms of one hectare or less would contribute as much maize to national output as it would if fertilizers were distributed to farmers with more farm size.

Mason et al. (2013b) also examined the impact of fertilizer subsidy on smallholder crop production. Results showed an increase in the quantity of fertilizer subsidy acquired by small farmers increased its maize area planted, yields, and output. They discovered an increase of maize output of 1.88kg maize per kg of fertilizer subsidy used in a similar range compared to 1.65kg output of maize per kg of fertilizer subsidy used in Malawi (Ricker-Gilbert & Jayne 2011).

2.5. Aims of the Thesis

Membership in producer organisation alone does not guarantee inclusiveness in development programs such as the Farmer Input Support Program in Zambia. While several small-scale farmers in agricultural cooperatives are eligible to participate in the FISP, literature has highlighted the exclusion of some categories of these farmers in these development programs.

The FISP should meet the "poor and vulnerable" need to increase incomes for smallholder farmers, which is one of the program's goals. Still, the allocation of these subsidies through agricultural cooperatives has raised serious questions about those

benefiting from the program. Therefore, it is necessary to increase the scope of knowledge about the effect of the FISP among smallholders in Zambia.

The ultimate objective of the study was to analyse how access to input subsidy through cooperatives affect the economic performance of small and large maize farmers in the Western province of Zambia.

The specific objectives were to:

1. describe how cooperatives internally manage input subsidies
2. analyse determinants that influence member-farmers to gain access to input subsidy through the cooperatives with regards to their characteristics, their active participation in the group and the subjective feelings about their acceptance and integration in the cooperative group
3. estimate the effect of input subsidy on the economic performance of large farmers among beneficiaries and non-beneficiaries of input subsidy with regards to land size
4. estimate the effect of input subsidy on the economic performance of small farmers among beneficiaries and non-beneficiaries of input subsidy with regards to land size

2.6. Hypothesis

Based on inspiration from Chirwa et al. (2010); Nxumalo & Oladele (2013); Mason & Ricker-Gilbert (2013); and Bijman & Wijers (2019), we tested the following hypotheses:

- H_{1a}: Higher engagement with farming (farm size and cooperative experience as proxy) have a positive influence on access to input subsidy
- H_{1b}: Higher commitment to the cooperative (investment in cooperative and active participation as proxy) have a positive influence on access to input subsidy

Also, based on inspiration from Dlamini et al. (2019); López et al. (2017); Wossen et al. (2017); Mason et al. (2013b); Burke et al. (2012)**;** Ricker-Gilbert & Jayne (2011), the following hypotheses were tested:

- H_2: Smallholder farmers achieve higher economic benefit compared to large farmers in the cooperative as regards access to input subsidy

3. Methods

This study used a quasi-experimental design. For the complete experimental design, respondents are chosen randomly, and it is usually possible to manipulate and control the respondent. For this study, assigning members to groups randomly (treatment and control) was impossible because respondents are already self-selected to the groups. This type of experiment is used to estimate the causal impact of a program or intervention (e.g., input subsidy) on the target population without random assignment. Quasi-experiments usually have desirable characteristics because the study conditions may represent real-world situations compared with randomized experiments (Luellen et al. 2005). This study used a two-group comparative form of research design to determine the cause and effect of input subsidies on member farmers. The study compared the treatment group (beneficiaries) and control group (non-beneficiaries) based on their total landholding area. To deal with the randomization of data (i.e., the risk of selection bias), the Propensity Scores Matching (PSM) technique was used to match the treatment with the control group.

3.1. Area of Study

This study was carried out in the Western province of Zambia, Mongu, and Limulunga district precisely. The Western province is the largest administrative region in Zambia. It has a total land area of 126,386km^2. The Provincial headquarter of the Western Province of Zambia is Mongu. The provincial headquarter is located about 600 km from Lusaka – the capital city of Zambia. The Province shares borders with Namibia to the south and Angola to the west. Additionally, the province has internal borders to the east by Central Province, north by North-Western Province and southeast by Southern Province. Altogether, there are 16 districts in the Province with 881,524 inhabitants according to the population census carried out in 2010 (Western Province Information 2017).

Mongu and Limulunga districts are among the poorest districts in Zambia. The inhabitants live on agriculture and livestock and also produce coal illegally. Many cooperatives have been established by external support (government and development NGOs) in these districts for agricultural purposes (plants and livestock), multipurpose,

youth, local development, and credit and saving cooperatives. There are about 1501 registered cooperatives in the region, with agricultural and multipurpose cooperatives specializing in legumes, cereals, cashew, small livestock, and vegetables. Through its local, provincial authorities, the Zambian government uses these cooperatives as a measure to reach out to small-scale farmers in the region (Paos 2019)

Figure 1. Map of the study area

3.2. Target Group and Data Collection

The sample size for the research was 187 members in agricultural cooperatives who are beneficiaries (111 members) and non-beneficiaries (76 members) of the FISP in maize cooperative societies. Member-farmers were selected from maize cooperatives in the five (5) cooperatives concentrated in Zambia's southern and western province. Furthermore, interviews were set up with managers, some cooperative members, and other key informants in the cooperatives to get qualitative information on the system of operation adopted in the cooperatives.

Additionally, qualitative data was also collected from Caritas field officers, representatives of cooperatives, the department of cooperatives in Moongu and other key informants, managers, and leaders in the cooperative for more robust analysis.

Non-probability sampling technique, particularly the purposive sampling technique, also known as judgment, selective or subjective sampling, and snowball sampling technique, was employed for this study. The Caritas Czech Republic at Mongu district supported data collection from respondents in these targeted cooperatives by organising meetings in different cooperative centres. Member-farmers involved in the sampling were recipients or non-recipients of FISP packs within the last two years.

Data was gathered using Nest Forms. Data was collected on social and demographic aspects of the respondents, which could influence access to FISP within the cooperative such as age, gender, marital status, land, and farm sizes, amongst others. This information was used as factors that could influence access to input subsidy within the cooperative. Furthermore, data on economic aspects of member's production, such as production quantities, cost of production and prices, were collected from both recipients and non-recipients of input subsidy within the cooperatives.

For robust qualitative discussion, interviews were set up with managers and other key informants in the region to get detailed information on the system of operation adopted in the cooperatives. Interviews conducted were to identify different means of operation among the cooperatives that influence the inclusiveness of its members in development programs.

3.3. Data Analysis

The first objective of this research work was analysed qualitatively using descriptive analysis of the open-ended interviews carried out on the field. This was done to examine the distribution and delivery of FISP packs to farmers and determine how farmers' cooperatives internally allocate input subsidies to their members.

The second objective of the research work was to analyse the determinants that influence the participation of members in FISP packs allocation within the cooperative. The Probit regression model was adopted to examine the factors that influence the participation of members in FISP allocation, i.e., being a beneficiary of input subsidies in the cooperative.

Based on previous studies of Chirwa et al. (2010); Nxumalo & Oladele (2013); Mason & Ricker-Gilbert (2013); Minah & Malvido Pérez Carletti (2018) and Bijman &

Wijers (2019), the following variables were considered as the dependent and independent variables:

Table 1. Dependent and independent variables used in Probit regression

Dependent Variable	**Description**	**Measurement**
Access to input subsidy	Member farmers getting subsidies from cooperative	Access – 1; non-access – 0
Independent Variables	**Description**	**Measurement**
	Farmer & Household Characteristics	
Age	Age of farmers	Years (continuous variable)
Gender	Sex of farmers	Female – 0; Male – 1
Land size	Total land holding area by farmer	In Hectares (continuous variable)
Farm size	Area of land used for maize cultivation	In Hectares (continuous variable)
Cooperative experience	Number of years of being a cooperative member	Years (continuous variable)
	Commitment to the Cooperative	
Share investment	Amount of money paid for shares in the cooperative by members	In ZKw (continuous variable)
Active participation	The activeness of member farmers in cooperatives and measured as the percentage of attendance in association meetings within a year (average of 80% attendance).	Active – 1; Non-active – 0
Cooperative as a marketing channel	Use of cooperative as a marketing channel for marketing any amount of farm produce	Cooperative – 1; Others – 0
Communication level with leaders	Perceived level of communication with leaders in the cooperative	5-point Likert Scale
Position in cooperative	Significant office held by farmer members in the cooperative	Leader – 1; Member – 0
	External Networks	
Extension access	Frequency of meetings with extension workers for advice or consultancy within a year	5-point Likert Scale
	Social Relations within the Cooperative	
Reciprocity of relationship	Members perception about the feeling of likeness in the cooperative	5-point Likert Scale
Acceptance	Members perception about the feeling of involvement within the cooperative	5-point Likert Scale
Voice	Members perception about the feeling of respect of opinion within the cooperative	5-point Likert Scale

Table 2 below summarizes descriptive characteristics of both groups of respondents included in the Probit regression models. Simple analysis using T-test for continuous data and Mann-Whitney U test for Likert scales and binary variables, was

done. Results showed a significant difference (at 1%) between the age of farmers, farm size, land size, share investment, active participation, cooperative experience, cooperative as a marketing channel, extension access, reciprocity of relationship and acceptance between the beneficiaries and non-beneficiaries of input subsidy in the cooperative. Also, the position of members in the cooperative was statistically significant at 5% between beneficiaries and non-beneficiaries of input subsidy. As one of the social relations variables, voice also showed a significant difference (at 10%) between the beneficiaries and non-beneficiaries of input subsidy.

Table 2. Variables included for Probit regression

Dependent Variables	**Beneficiaries**	**Non-beneficiaries**	
	Frequency (%)	**Frequency (%)**	
Access to input subsidy	111 (59.35)	76 (40.64)	
Independent Variables	**Beneficiaries Mean (SD)**	**Non-beneficiaries Mean (SD)**	**Mean diff.**
Age	50.68 (14.40)	44.89 (15.36)	5.79***
Gender	0.37 (0.49)	0.34 (0.48)	0.03
Farm size	2.30 (1.71)	1.32 (0.76)	0.99***
Land size	6.50 (5.40)	4.04 (3.08)	2.46***
Share Investment	383.77 (279.32)	221.05 (212.49)	162.71***
Active participation	0.74 (0.44)	0.41 (0.49)	0.33***
Cooperative Experience	8.62 (6.34)	4.33 (3.18)	4.29***
Cooperative as marketing channel	0.59 (0.50)	0.33 (0.47)	0.26***
Communication level with leaders	4.09 (0.84)	3.95 (0.91)	0.14
Position	0.43 (0.50)	0.28 (0.45)	0.16**
Extension access	3.03 (1.22)	2.47 (1.38)	0.55***
Voice	4.50 (0.75)	4.18 (1.02)	0.31*
Reciprocity of relationship	4.74 (0.46)	4.12 (1.04)	0.62***
Acceptance	4.70 (0.55)	4.34 (0.87)	0.36***
Voice	4.50 (0.75)	4.18 (1.02)	0.31*

Note: ***, ** and * represents significance level at 1%, 5%, and 10% respectively

For analysing the third and fourth objectives, two broad categories were created for beneficiaries and non-beneficiaries in our study. Table 3 below shows the categories created for beneficiaries and non-beneficiaries based on their total landholding area.

Table 3. Categorization of beneficiaries and non-beneficiaries as regards total landholding area

Land size	Total number of non-beneficiaries (% out of 187)	Total number of beneficiaries (% out of 187)	Amount of seed subsidy received by beneficiaries	Amount of fertilizer subsidy received by beneficiaries
0.5 – 5ha	58 (31.02%)	69 (36.90%)	967kg	23,310kg
5.1 – 30ha	18 (9.63%)	42 (22.50%)	975kg	23,210kg

The descriptive statistics shown in Table 3 above indicate that farmers with a total landholding area between 0.5 and 5ha of land who meet the eligibility criteria to participate in the input subsidy program receive less allocation of seed subsidy than farmers with more landholding area. Regarding the allocation of fertilizer subsidy, data revealed that farmers with total landholding areas greater than 5ha receive more fertilizer subsidy than farmers with less land area. This shows that 22.50% of farmers having 5.1 - 30ha get almost an equal amount of fertilizer subsidy as 36.90% of farmers having 0.5 - 5ha of land.

Figure 2 below shows the normal distribution curve of input subsidy based on the total landholding area of farmers in the cooperative.

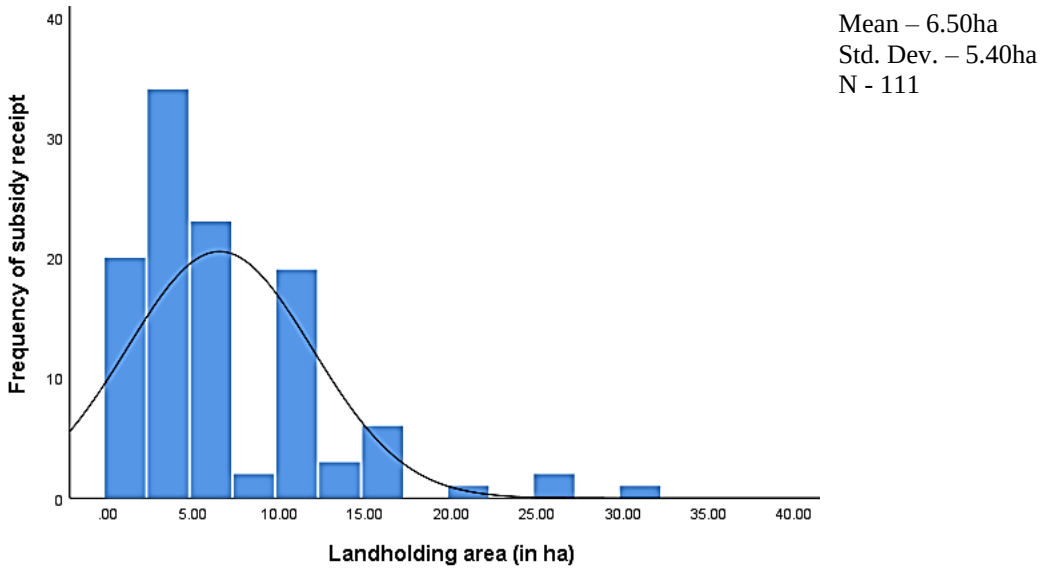

Figure 2. Normal distribution graph of input subsidy allocation among farmers

Figure 2 indicates that farmers with a total landholding area above 5ha are beneficiaries in the cooperative FISP packs' distribution. Based on this finding, the third and fourth objectives are analysed.

Based on the above observation, to achieve the third and fourth objectives of estimating large and small farmers' economic performance regarding access to input subsidy, the PSM technique was adopted. These objectives were estimated quantitatively and utilized a T-test to see significant differences between members' economic performance. To control for confounding in our estimation, the study used PSM to match beneficiaries with non-beneficiaries. It estimated the average treatment effect on the treated (ATT) on the cooperative subsidy's beneficiaries.

The PSM involves creating matched sets of treated and untreated subjects that share a similar value of propensity score (Rosenbaum & Rubin 1983). PSM enables one to estimate the ATT. The most frequent application of PSM is one-to-one matching, where pairs of treated and untreated subjects are created such that matched subjects have similar values of the propensity score. Once a matched sample is formed, the treatment may be estimated by comparing outcomes between treated and untreated subjects in the matched sample. For continuous outcome variables, like yield, the effect of the treatment can be estimated as the difference between the mean outcome for treated subjects and the mean outcome for untreated subjects in the matched sample (Rosenbaum & Rubin 1983). Once the effect of the treatment is estimated in the matched samples, the variance of the estimated effect and its statistical significance can also be estimated. Since the treated and untreated subjects within the same matched set have similar propensity scores, controlling for confounding factors will create a balancing score that will put the treated and untreated subjects of similar characteristics on a playing field to make causal inferences regarding the impact of input subsidy. Lastly, for a continuous outcome, paired T-test could be used for assessing the statistical significance of the effect of the treatment. This approach was used by authors such as Dlamini et al. (2019), Wossen et al. (2017) and López et al. (2017).

For this study, the PSM was utilized to measure and observe the potential outcomes for a given farmer: the outcome of non-beneficiaries in the presence of subsidized inputs (observed outcome) and the outcome of beneficiaries in the absence of subsidized inputs (counterfactual). Since PSM uses a two-stage approach matching

estimation, for the first stage, propensity scores or covariates P(x) were generated from a Probit regression model, which shows the farmer's probability to participate in the input subsidy program. The variables selected for matching listed in Table 1 were used as exogenous variables (treatment dependent). On the other hand, the dummy variable – access to input subsidy – was used as an endogenous variable (treatment dependent). A control group that matched beneficiaries to non-beneficiaries was formed.

Empirically, ATT is represented as:

$$ATT = E[\rho(X)|D = 1][E(Y1|D = 1, \rho(X)] - [E(Y0|D = O, \rho(X)] \quad (1)$$

Where $E[\rho(X)|D = 1]$ is the likely probability of the distribution of the estimated propensity scores, Y_1 and Y_0, which is the productivity variables (yield; fertilizer productivity) that the farmers who participated in the input subsidy program and non-participants, respectively. D is the participation taking the values 1 for beneficiaries and 0 for non-beneficiaries.

Since Y_1, as well as the Y_0, are the outcomes, the difference between the two outcomes refers to the Average Treatment Effect on the Treated (ATT).

After propensity scores have been formed, the criteria for selecting untreated subjects whose propensity score is "close" to that of the treated were the nearest neighbour, radius calliper and kernel bwidth matching. These are matching within a specified calliper distance (Rosenbaum & Rubin 1985). The nearest neighbour matching selects for matching to a given treated subject an untreated subject for which the propensity score is closest to the treated subject. If several untreated subjects have propensity scores that are just as close to that of the treated subject, one of these untreated subjects was chosen randomly. It is crucial to state that no restrictions were put upon the maximum acceptable difference between the propensity score of the two matched subjects.

For the radius calliper and kernel bwidth matching, some prespecified threshold (the calliper distance) was set so that for a given treated subject, all the untreated subjects whose propensity score lay within a specified distance of the treated subject were identified. From the restricted set of untreated subjects, the untreated subject whose propensity score was closest to that of the treated subject was selected for matching to this treated subject. For the radius calliper matching, 0.05 distance was used, while for

kernel bwidth matching, 0.06 was used. Treated subjects in the data with no untreated subjects with propensity score within the specified calliper distance of propensity score of the treated were excluded from the resultant matched sample.

PSM cannot control for unobservable bias. As a result, Rosenbaum r bounds was used to check the sensitivity of the PSM estimates to unobservable bias as carried out by DiPrete & Gangl (2004).

Stata, SPSS, and Microsoft Excel software were used for analysis.

3.3.1. Outcome Variables for PSM comparison

The impact indicators can express the effect of the treatment (access to input subsidy). Approaches exist on how to assess the impacts of treatment on the performance of an individual or an organisation. This can be achieved by quantitatively measuring farmers' output or using different scales to ask for the performance level. For this study, productivity is measured in terms of yield (in kg/ha), and fertilizer productivity (in kg/kg) variables are defined as outcome indicators that can capture the direct impacts of input subsidy among farmers.

Wossen et al. (2017) used maize yield as a proxy for productivity effects of the e-voucher-based-input subsidy program in Nigeria. Maize yield was measured in kg/ha for this study. Dlamini et al. (2019) on the impact of input subsidy on the productivity of small-scale maize farmers also used maize yield as a proxy for productivity, and this was measured in tonnes/ha.

For the second productivity-related indicator, to estimate the actual impact of input subsidy on maize production, data gathered, and interviews conducted with farmers showed that improved maize seed packages received by farmers are negligible to the quantity needed for planting. The quantity of fertilizer subsidy received was substantial compared to the maize seed subsidy. Hence the rationale for the partial productivity measures of output per unit of a single variable. Furthermore, the use of fertilizer productivity has been used by several authors such as Mason et al. (2013b), Burke et al. (2012) and Ricker-Gilbert & Jayne (2011) to analyse output (kg) per fertilizer used (kg).

3.3.2. Economic Performance Indicators among Beneficiaries and Non-Beneficiaries for Large Farmers

Table 4 below shows the economic performance indicators used for the PSM for the third objective.

Table 4. Economic performance indicators for beneficiaries and non-beneficiaries among large farmers

Variable	Measurement	Access (n = 42) Mean (SD)	Non-access (n = 18) Mean (SD)	Mean diff. (Mann-Whitney U test)
Yield	In kg/ha	862.29 (488.31)	602.78 (242.97)	259.51**
Fertilizer productivity	In kg/kg	7.85 (9.01)	3.62 (6.19)	4.23*

Note: ** and * represents significance level at 5% and 10% respectively; 1 US$ = 22.10ZKw.

Table 4 shows that beneficiaries of input subsidy among large farmers (farmers with a land size of 5ha to 30ha) have yield and fertilizer productivity greater than non-beneficiaries of input subsidy with Mann-Whitney U test suggesting a significant difference at acceptable levels for both outcome variables. This suggests that farmers with access to input subsidy among large farmers reach higher economic performance compared to farmers without access to input subsidy.

3.3.3. Economic Performance Indicators for Small Farmers among Beneficiaries and Non-Beneficiaries

Table 5 below shows the economic performance indicators used for the PSM for the fourth objective.

Table 5. Economic performance indicators for beneficiaries and non-beneficiaries among smallholder farmers

Variable	Measurement	Access (n = 69) Mean (SD)	Non-access (n = 58) Mean (SD)	Mean diff. (Mann-Whitney U-test)
Yield	In kg/ha	996.62 (489.11)	820.17 (743.12)	176.45***
Fertilizer productivity	In kg/kg	6.38 (6.93)	2.35 (2.27)	4.03***

Note: *** represents significance level at 1%; 1 US$ = 22.10ZKw.

Table 5 shows that beneficiaries of input subsidy among smallholder farmers (farmers with a land size of 0.5ha to 5ha) have yield and fertilizer productivity greater than non-beneficiaries of input subsidy with Mann-Whitney U test suggesting a 1% significant difference for both outcome variables used. This suggests that farmers with access to input subsidy among small farmers reach higher economic performance compared to farmers without access to input subsidy.

3.4. Limitations of the study

There were some limitations to this research. Firstly, COVID-19 restrictions during the data collection period required a creative rethinking of the way data was collected as the government tightened rules that influenced movement and citizen's behaviour. The study acknowledges that this restriction influenced the number of people gathered in one place, influencing interviews and data collection with members. Also, the number of trained personnel who could travel to the study area for data collection purposes was affected.

The study also recognizes that the data collected on the economic performance of the cooperative members are not 100% accurate. The study acknowledges that there were data challenges as respondents gave information without the use of farm records. Respondents gave information off the top of their head, such as quantity harvested, cost of production, amongst others. This influences the reliability of the data collected, leading to under or overestimation of the economic performance indicators.

The study also acknowledges that the reliability of the responses during data collection could be a limitation since translators were relied upon. Data was collected through the help of translators, which could influence the accuracy of the data. Some data were also collected by trained administrators (without direct supervision), which could influence the accuracy and reliability of the data.

The study acknowledges that productivity could have been measured by yield and, most importantly, by the income realized from maize production. However, it was observed that while some farmers sell their produce locally, others transport and sell to the capital city, Lusaka, for much better prices. Even at this, farmers could not estimate

the amount that was realized from sales. Continuing with this method would have influenced the reliability of the data.

Measures were taken to increase the reliability and accuracy of the data that was gathered. The use of pilot testing with translators and administrators was done before field testing. This was in a bid to ensure that administrators understood the questions before they were administered to farmers. Besides this, personal interviews were carried out with important personnel to verify the accuracy of the data collected.

Results

3.5. Cooperatives Internal Management of Input Subsidies

Figure 3 below shows the descriptive statistics in the percentage of variables that influence inclusiveness of members in FISP within the cooperative as identified during the interviews conducted with by Caritas field officers, representatives of cooperatives, the department of cooperatives in Mongu and other key informants, managers, and leaders in the cooperative.

According to the interviews carried out, cooperatives consider the commitment level of members based on the position of members in the cooperative, experience within the cooperative, contribution within the cooperative, which is not limited to the membership fees or the number of shares owned in the cooperative, activeness of the member, wealthiness (land and farm sizes as proxy), and the social influence of the farmer within the cooperative

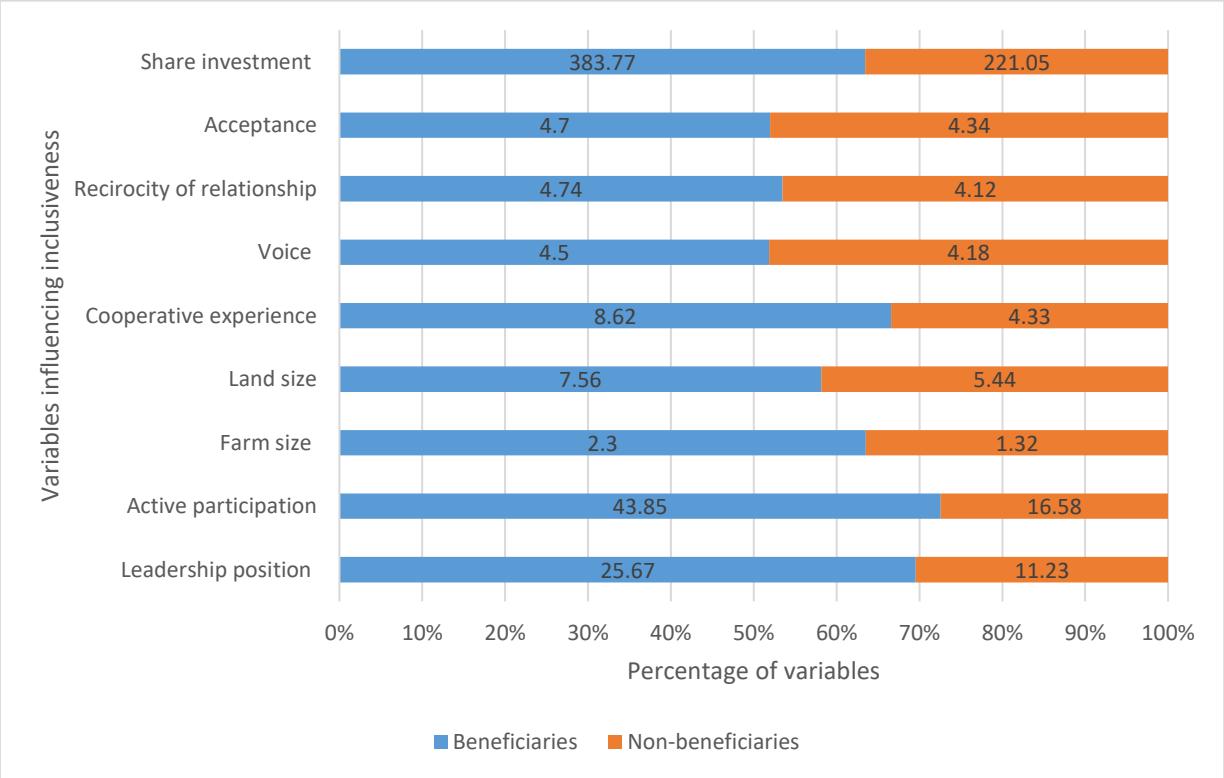

Figure 3. Descriptive statistics of variables influencing inclusiveness of members

The result suggests that beneficiaries of input subsidies within the cooperatives have a more significant share of investment within the cooperative, have more years of experience in the cooperative, participate more in cooperative meetings, and are wealthier (landholding area and farm size) than non-beneficiaries. Result also revealed that beneficiaries of input subsidy felt more accepted, had more voice and also felt a reciprocated form of relationship towards them.

Figure 4 below shows the process through which the FISP package reaches the farmer through the cooperative.

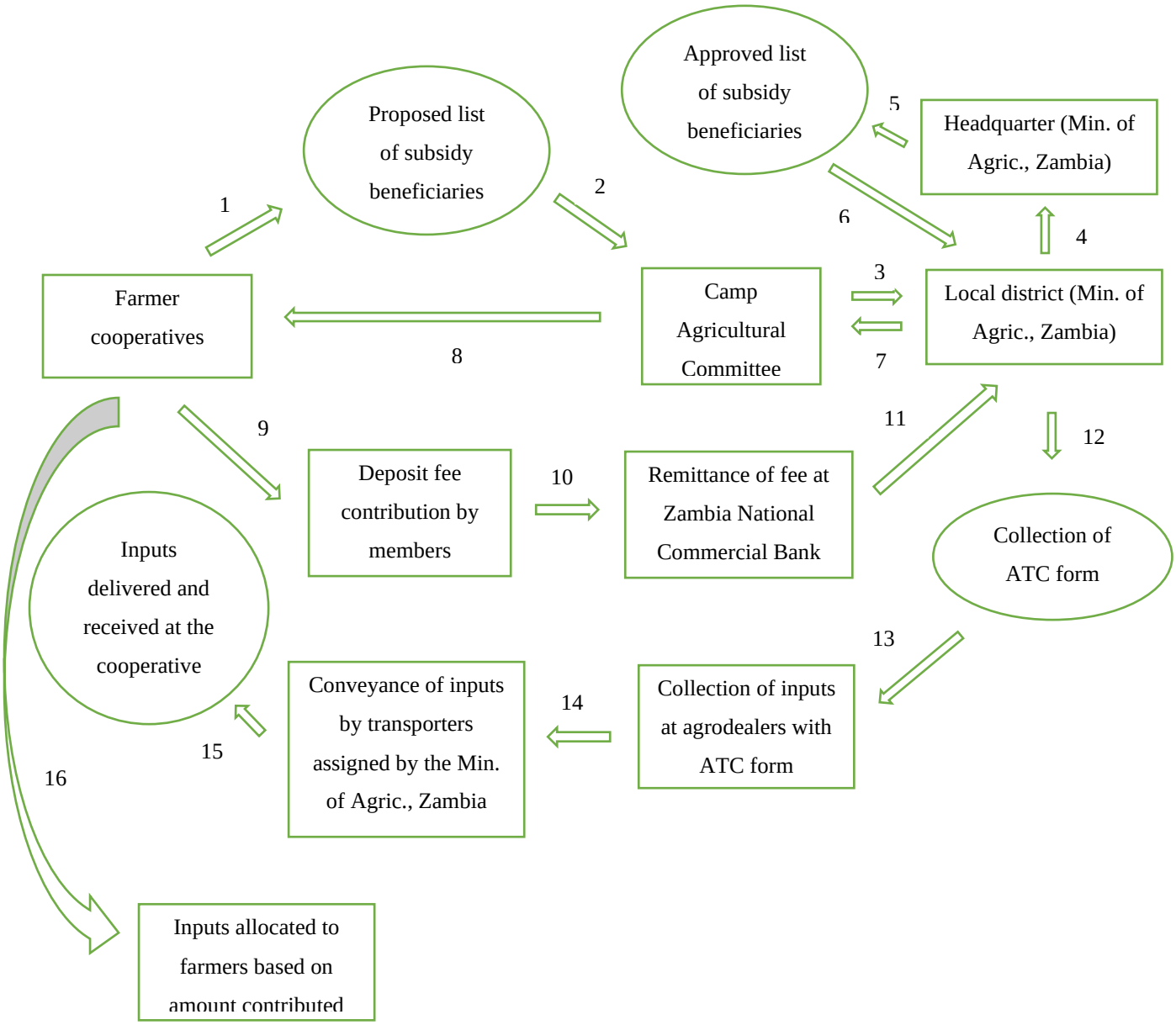

Figure 4. Flow chart showing input delivery to farmers; numbers indicate the pattern of flow

The procedure for distributing subsidy packages to farmers is that each agricultural cooperative submits the names of its members who should benefit based on the number of packs that should be assigned to the cooperatives. This is done after each Camp Agricultural Committee (CAC) agrees on the number of packs allocated to each cooperative regardless of the cooperative size. The allotment is based on the number of packs allocated to provinces and districts; a decision made at the Headquarter of the Ministry of Agriculture and Livestock (MAL), Zambia. The CAC consolidates the list and submits it to the local district. The local district likewise combines this list and sends to the headquarter where the list is approved, sent back to the district and then to the camp for confirmation and lastly to the cooperative for double-checking.

After each cooperative receives the list of approved names, the farmers deposit the fee (400ZKw) for the subsidy packs assigned to them using the Authority to Deposit (ATD) form collected at the district agricultural office. Remittance is made at the Zambia National Commercial Bank using the ATD form. Following the remittances at the bank, the farmer gets a deposit slip that is taken to the district office. An Authority to Collect (ATC) form – a written statement for collecting input at the specific agro-dealers – is written for the farmer. The ATC forms are brought to an agro-dealer that deals with the Ministry of Agriculture, Zambia. These agro-dealers have been commissioned to have these inputs in the shop for farmers. Using the ATC form, these inputs will be given and delivered to farmers by transporters, with whom the Ministry of Agriculture in Zambia has engaged. When goods have been delivered safely to the farmers, they sign a "Goods Delivered" note to specify the number of packs that the transporter has delivered. The transporter then delivers this note, together with the ATC form, to the district agricultural office for remuneration.

3.6. Factors Influencing Access to Input Subsidy among Farmer Members in the Cooperative

Table 6 below indicates the factors influencing access to input subsidy by farmer members in the cooperative. This was done using the Probit regression model. The estimated result shows that the model fits the data reasonably from the maximum likelihood estimates of the Probit Regression. The log-likelihood was -80.00 with a chi-square value of 92.66, which was significant at 1% ($p \leq 0.01$). The Pseudo R^2 of 0.37

indicates that the model predicts the outcome reasonably. Five (5) of the fifteen (15) variables were found significant at the acceptable levels.

Table 6. Factors influencing access to input subsidy among cooperative member-farmers using the Probit regression model

Access to Input Subsidy	**Coef.**	**St.Err.**	**z**
Age	0.260	0.181	1.43
Gender	-0.282	0.259	-1.09
Land size	0.007	0.042	0.17
Farm size**	**0.311**	**0.153**	**2.03**
Position in the cooperative	0.008	0.280	0.03
Share investment*	**0.001**	**0.001**	**1.68**
Cooperative as marketing channel	0.305	0.249	1.22
Cooperative experience**	**0.068**	**0.032**	**2.08**
Communication with leaders	-0.251	0.154	-1.62
Extension access	0.143	0.098	1.46
Active participation**	**0.587**	**0.272**	**2.16**
Reciprocity of relationship***	**0.756**	**0.187**	**4.04**
Acceptance	0.104	0.190	0.55
Voice	0.033	0.151	0.22
Constant***	-5.397	1.186	-4.55

Mean dependent var	0.59	SD dependent var	0.49
Pseudo R2	0.37	Number of observations	187.00
LR chi2(12)	92.66	Prob > chi2	0.00
Akaike crit. (AIC)	189.99	Bayesian crit. (BIC)	238.46
Log-likelihood	-80.00		

Note: ***, ** and * represents significance level at 1%, 5% and 10% respectively

In terms of farm characteristics, the result of the Probit regression analysis showed that farm size had a significant positive influence on access to input subsidy. This means that an increase in the farmers' size will increase access to FISP subsidy through the cooperative. This variable was significant at 5%. Result also showed that members share of investment, the number of years of being a cooperative member (cooperative experience), and active participation all have a significant positive relationship with the

farmers' access to FISP through the cooperative. These variables were significant at 10%, 5% and 5%, respectively.

Lastly, in terms of the social characteristics, only reciprocity of relationship had a significant positive influence on access to FISP through the cooperative. This variable was significant 1%.

3.7. Propensity Scores Matching (PSM) Technique Estimation

For the PSM estimation, the outcome variables (yield and fertilizer productivity of farmers) were used as the impact variables. Simultaneously, the factors influencing access to input subsidy included in the Probit regression model were utilized as variables for matching.

3.7.1. Matching quality

Figure 5 and 6 below show the result of the propensity scores graph before and after matching was done for small and large farmers. The propensity scores that were estimated were validated by checking their matching quality, which involves checking the common support region so that only beneficiaries and non-beneficiaries of similar characteristics are compared to one other when estimating the Average Treatment Effects on the Treated (ATT).

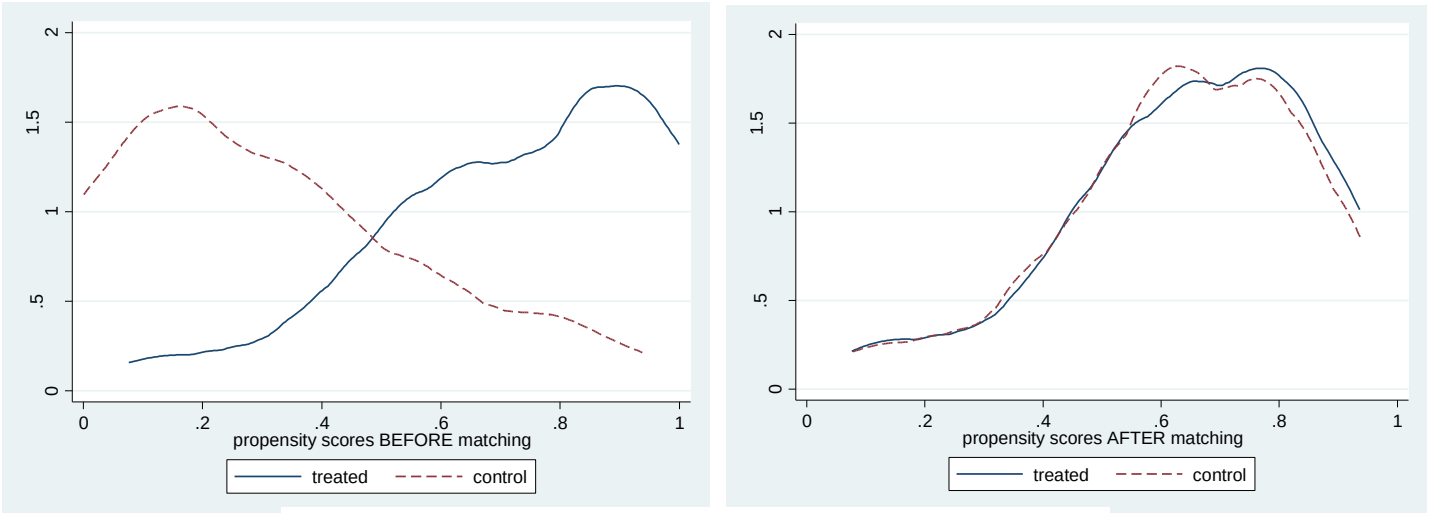

Figure 5. Propensity scores graph for small farmers

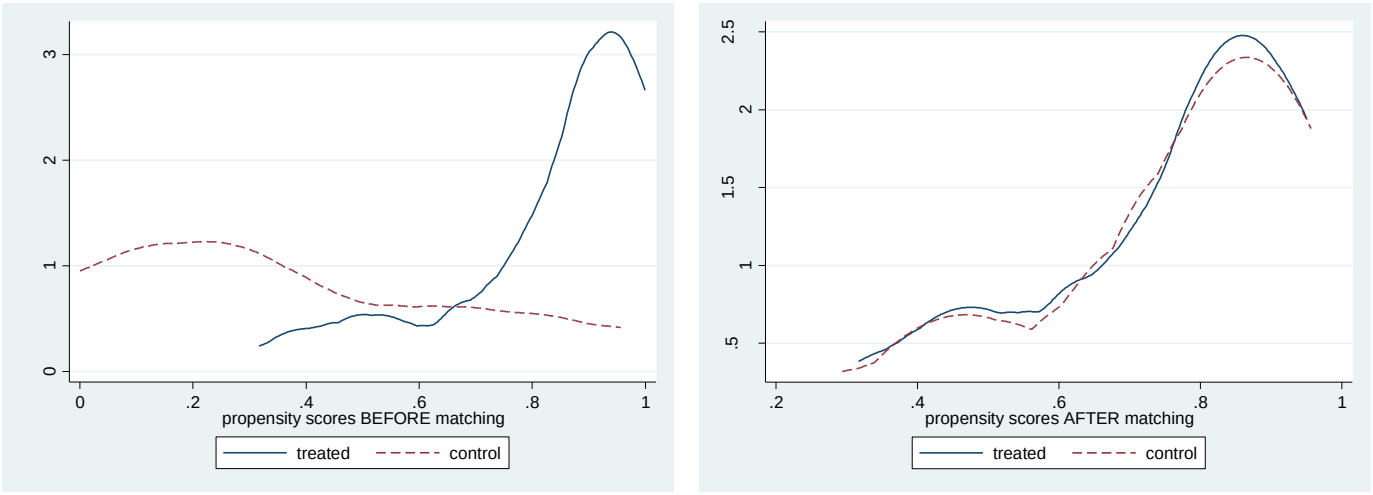

Figure 6. Propensity scores graph for large farmers

The density of the treated (beneficiaries) and control (non-beneficiaries) density scores are shown in Figure 5 and 6 for small and large farmers, respectively. The substantial overlap in the distribution of propensity scores shows that common support conditions were fulfilled. The condition of overlapping guarantees that treatment observations have comparison observations "nearby" in the propensity scores distribution (Heckman et al. 2016). This means that for propensity methods to be effective, it depends on having many non-beneficiaries to find a substantial region of common support. This is in line with the findings of López et al. (2017) and Dlamini et al. (2019) that also agreed with the assumption of common support

3.7.2. PSM Estimates of Economic Performance for Beneficiaries and Non-beneficiaries among Large Farmers

Table 7 shows the matched and unmatched estimates of the PSM estimates for large farmers in the cooperatives.

Table 7. Propensity scores matching estimates for large farmers

Variable	Matching Algorithms	Treated	Controls	Difference	Bootstrapped S. E.	z
Yield	Unmatched	862.29	602.78	259.51	121.45	2.14**
	Nearest Neighbor	889.52	579.46	310.06	150.33	2.06**
	Radius	819.78	633.54	186.23	199.35	0.93
	Kernel	819.78	627.24	192.54	201.28	0.96
Productivity	Unmatched	7.85	3.62	4.23	2.33	1.81*
	Nearest Neighbor	8.36	2.14	6.22	2.79	2.23**
	Radius	8.13	3.27	4.86	4.62	1.05
	Kernel	8.13	3.19	4.94	4.56	1.08

Note: ** and * represents 5% and 10% significance levels respectively; 1 USD=21.74 ZKw

The result indicates that only the unmatched algorithms and the nearest neighbour matching algorithm estimates showed a significant positive effect (at a 5% significant level) of access to FISP by cooperative member farmers on yield. For fertilizer productivity, the result also showed that only the unmatched algorithms and the nearest neighbour matching algorithm estimates had a significant positive effect (at 10% and 5% significance level, respectively) of access to FISP on fertilizer. This implies that farmers who had access to input subsidy were significantly different from farmers without access to input subsidy for the unmatched and nearest neighbour algorithm estimates for both productivity measures used. This shows that after vigorous matching to match farmers with similar characteristics was done, only one of the matching criteria (nearest neighbour) was significantly different between the two groups of farmers. Other matching criteria (radius and kernel) showed no difference between beneficiaries and non-beneficiaries of the input subsidy.

3.7.3. PSM Estimates of Economic Performance for Beneficiaries and Non-beneficiaries among Smallholder Farmers

Table 8 shows the matched and unmatched estimates of the PSM estimates for small farmers in the cooperatives.

Table 8. Propensity scores matching estimates of economic performance for smallholder farmers

Variable	Matching Algorithms	Treated	Controls	Difference	Bootstrapped S. E.	z
Yield (kg/ha)	Unmatched	996.62	820.17	176.45	110.10	1.60*
	Nearest Neighbor	952.61	741.83	210.78	210.78	1.21
	Radius	1000.58	856.53	114.06	191.11	0.75
	Kernel	996.91	837.03	159.88	138.59	1.15
Fertilizer productivity	Unmatched	6.38	2.35	4.03	0.99	4.06***
	Nearest Neighbor	6.40	1.93	4.47	1.37	3.27***
	Radius	6.42	2.82	3.60	1.63	2.20**
	Kernel	6.24	2.92	3.33	1.33	2.51**

Note: ***, ** and * represents 1%, 5% and 10% significance levels respectively; 1 USD=21.74 ZKw

The result indicates that only the unmatched algorithm estimates showed a significant positive effect (at a 5% significant level) of access to FISP by cooperative member farmers on yield. This means that after controlling for confounding factors, the three different matching methods used in PSM (nearest neighbour, radius, and kernel) showed no statistically significant difference between beneficiaries and non-beneficiaries of input subsidy among farmers.

For fertilizer productivity among small farmers, both the unmatched algorithms and all the other three matching algorithm estimates had a significant positive effect of access to FISP. This means that after controlling for confounding for productivity measured per fertilizer usage, farmers who had access to input subsidy in the cooperatives were significantly different from farmers without access to input subsidy for all matching algorithms.

3.7.4. Sensitivity Analysis

Tables 9 and 10 show the result of the sensitivity analysis carried out on the productivity measures used in the PSM analysis. Sensitivity analysis carried out on the ATT estimates to check for unobservable bias using Rosenbaum r bounds at 95% shows that the PSM is not sensitive to hidden bias. As such, the estimates are reliable.

The result of the sensitivity analysis presented in Table 9 for yield shows that from gamma (Γ) 1 to 1.8, the PSM estimates were not affected by hidden bias.

Table 9. Sensitivity analysis for yield

Gamma	gig +	sig –	t – hat +	t – hat –	CI+	CI –
1	0.000028	0.000028	218.75	218.75	114.583	312.5
1.2	0.000593	6.0e-07	179.167	254.167	70.8333	354.167
1.4	0.004726	1.2e-08	137.5	287.5	37.5	395.833
1.6	0.020316	2.2e-10	108.333	312.5	0.000031	433.333
1.8	0.058027	3.8e-12	83.333	341.667	-23.8095	462.5
2	0.12493	6.6e-14	62.5	366.667	-45.8333	493.056
2.2	0.219834	1.1e-15	41.6667	387.5	-68.75	512.5

The result of the sensitivity analysis presented in Table 10 for fertilizer productivity shows that from gamma (Γ) 1 to 2.2, the PSM estimates were not affected by hidden bias.

Table 10. Sensitivity analysis for fertilizer productivity

Gamma	gig +	sig –	t – hat +	t – hat –	CI+	CI –
1	6.7e-07	6.7e-07	3.54167	3.54167	2.125	5
1.2	0.000022	9.5e-09	3	4.09091	1.66667	5.625
1.4	0.000248	1.3e-10	2.5	4.58333	1.25	6.25
1.6	0.001459	1.7e-12	2.125	5	0.833333	6.75
1.8	0.005536	2.2e-14	1.875	5.375	0.375	7.25
2	0.015465	3.3e-16	1.54167	5.70833	-2.7e-07	7.6875
2.2	0.034594	0	1.33333	6.04167	-2.7e-07	8.125

4. Discussion

This study examines how access to input subsidy improves the economic performance of farmers who are recipients of the FISP in the Western Province of Zambia. Furthermore, the study investigates how cooperatives manage FISP packages internally and the factors that influence participation within the cooperative. Lastly, the study tries to compare the economic performance level of large and small farmers within the cooperative to see if beneficiaries of input subsidy performed better compared to non-beneficiaries and most important of all, to see if small farmers gain more from access to input subsidy as compared to large farmers in the cooperative.

Although the Southern and Eastern provinces are regarded as the two primary breadbaskets of Zambia, cultivation of crops is predominant in the western province and relies on agricultural inputs, especially from the government and donors. One of the essential advantages of cooperatives in the Western province of Zambia is for FISP participation. The FISP seems to incentivise small-scale farmers into cooperative participation through input subsidies.

Interviews carried out on the field with Caritas field officers, representatives of cooperatives, cooperatives in Mongu and other key informants, managers, and leaders in the cooperative provided detailed information about how inputs subsidies are managed within the cooperatives. It was observed that for farmers to gain access to FISP, the farmer must first be registered as a cooperative member. This membership is done by paying for the cooperative membership share and the subsequent renewal of the membership through annual renewal fees. This finding is consistent with the Ministry of Agriculture and Livestock 2015), which stressed the importance of cooperative membership and the subsequent renewal of the membership through annual renewal fees. However, it was observed from data gathered on the field that cooperative membership alone does not guarantee a farmer access to FISP as some members who meet the criteria for obtaining input subsidy through the cooperative do not benefit from the FISP package. This finding is consistent with the findings of Smale et al. (2015).

Although the FISP is supposed to include the names of farmers from cooperatives who have not benefitted from the program for three consecutive seasons, this is not the main argument for inclusion or exclusion in the subsidy program within the cooperative.

Report from the interviews conducted showed that the list of names gathered in the cooperative and sent through the Camp Agricultural Committee (CAC) is often either fake names, names of member-farmers with no interest in the FISP package who have not been involved in the program before that time or actual names of farmers that are eligible to participate in the program. In any of these three cases, the names of farmers gathered within the cooperatives are just mere channels through which the subsidies reach the cooperatives. This finding is consistent with (Mason et al. 2013b). They believed that while the program is considered one for increasing household food security and reducing poverty, in the true sense, it is regarded by many as a social transfer. In an interview conducted with a key informant in the area, it was stated that…

> *"cooperatives often get allocated inputs that are more or less than the number of members in the cooperative. When getting more allocation occurs, cooperatives come up with fake names as members of the cooperative. However, if the opposite is the case where cooperatives receive less allocation than the number of members, the issue of distribution occurs".*

Another critical issue identified during the interview carried out in the region relates to the distribution pattern adopted by the cooperative in the allocation of the FISP pack to its members. Since the names of farmers included in the approved list are just mere channels through which FISP packages reach the cooperatives, each cooperative must decide on allocating FISP packages to its members. According to another key informant that was interviewed…

> *"cooperatives consider the commitment level of members based on their position in the cooperative, the number of years as a cooperative member of that cooperative, contribution within the cooperative (this contribution is not limited to the membership fees or the number of shares owned in the cooperative), activeness of the member, wealthiness, and the social influence of the farmer within the cooperative".*

According to an interview with an agricultural cooperative officer in the province, when asked about the reason behind FISP contributions by members when members have paid cooperative shares and membership fees, it was stated that…

"Fee for the FISP package is authorized by the government, separate from the membership fees or shares in the cooperative. Members are expected to pay this fee to get the FISP pack after approval of names at the headquarter. Also, members make some contributions to fund or support cooperative activities (e.g., during special events). These contributions count for inclusion when FISP packages are being distributed within the cooperative since the fee for annual membership renewal and shares are often insignificant to cover for the cost of these activities or have been exhausted early in the year".

Based on the above information, at the cooperative level, the distribution of the FISP pack centres on the farmer's contribution and what the farmer intends to get based on his/her request. This leads to the differences in the number of bags of maize collected by a farmer as against the standard FISP pack of 1 x 10kg of improved maize seed, 1 x 10kg of another pack of any other crop type and 400kg of fertilizer. This agrees with (Sitko 2010) that many farmers and households receive less than the FISP official pack size. According to the author, packs are often broken up so that more households can benefit from the program. While some households receive multiple packs by signing up multiple households or non-household members for the program, some receive far less than what is considered a substantial amount.

Since the cooperative body is the decider on who gets included and who gets excluded during the distribution of FISP packs within the cooperative, it was essential to carry out the second objective. The criteria for selecting member-farmers involved in FISP contribution and distribution are not transparent, which is the rationale behind the second objective. Based on the result of the Probit model used to analyse factors influencing access to input subsidy within the cooperative, five (5) variables out of thirteen (13) were found to have a statistically significant influence on access to input subsidy in the cooperative. The model showed that the age of the farmer does not influence access to input subsidy within the cooperative, which is consistent with the findings of Etwire et al. (2013) and Oladejo et al. (2011), who discovered that age of farmers and participation in agricultural programs have no significant relationship with each other. This is against the findings of Farid et al. (2009) and who believed that the

age of farmers influences their participation in agricultural programs due to lack of information.

The gender of the farmer was also found to have no significant impact on access to input subsidy within the cooperative. The findings of Etwire et al. (2013) and Nnandi & Akwiwi (2008) also align with this result. It was concluded in their study that the sex of a farmer does not have a significant relationship with participation in agricultural projects. This suggests that both male and female farmers in the cooperative can equally participate in FISP without gender restriction. This goes against the result of Nxumalo & Oladele (2013). They believed that the gender of a farmer has a significant negative effect on farmers participation in agricultural programs. The result of the descriptive statistics does show an overrepresentation of female farmers within our sample. This was influenced by the selection of respondents during sampling and should not be interpreted that cooperatives in the region are female-dominant.

The survey showed that beneficiaries of input subsidies had more landholding area and farm size than non-beneficiaries, with the T-test showing a significant difference between these two categories of farmers. The regression of factors influencing access to input subsidy showed that only farm size significantly influenced access to input subsidy within the cooperative. This is against the findings of Mason & Ricker-Gilbert (2013); Mason et al. (2013b); Nicole M. Mason et al. (2013), and Mofya-mukuka et al. (2013), who suggested that households with larger landholding areas get significantly more subsidized inputs. It was expected that since the FISP is dependent on the area of land owned by the farmer, land size should have an influence on access to input subsidy within the cooperative. However, the result showed that this variable does not influence member-farmers access to input subsidy within the cooperative. On the other hand, farm size (which could also be used as a proxy for wealth of farmers) had a significant positive influence (at a 5% significant level) on access to input subsidy within the cooperative. This finding is against the findings of Nxumalo & Oladele (2013) and Etwire et al. (2013), who opined that there is no relationship between the size of the farm and participation in agricultural programs. This, however, agrees with the findings of Jayne et al. (2011); Ricker-Gilbert et al. (2011); Chibwana et al. (2012b) and Pan & Christiaensen (2012) who believed that wealthier households acquire significantly more subsidized inputs and that fertilizer subsidy is often disproportionately targeted towards farmers with greater

assets and incomes. This suggests that farmers' farmland used in maize cultivation increases access to input subsidy within the cooperative.

As noted during the interviews carried out during this research, leadership position and active participation, cooperative experience, and share investment are expected to influence access to input subsidy within the cooperative. The descriptive statistics showed that beneficiaries of input subsidy occupied more leadership positions and participated more in cooperative meetings. Also, beneficiaries of input subsidy had more years of cooperative experience and share investment in the cooperative. One thing of note here is that the number of shares owned by members in the cooperative should be equal for all farmers irrespective of their socio-economic characteristics. However, the results of the descriptive statistics showed that some members do contribute more to the cooperative than others.

The T-test result for cooperative experience and share investment also shows a significant difference between beneficiaries and non-beneficiaries. However, the Probit model results showed that active participation, cooperative experience, and share investment all had a significant positive influence on access to input subsidies at 5%, 5%, and 10% significant level, respectively. This suggests that member-farmers who show more commitment to the cooperative in meetings, long-term commitment to the cooperative, and investing in the cooperative have a better chance of having access to input subsidy.

This finding on the positive influence of cooperative experience on access to input subsidy somewhat agrees with the discoveries of Österberg & Nilsson (2009). They believed that members with more experience in the cooperative can participate in the cooperative governance and how things are run within the cooperative than younger farmers. Furthermore, active participation having a significant positive influence on access to input subsidy agrees with Verhees et al. (2015). They believed that active participation and involvement of members in cooperative affairs offers benefits for individual members, such as opportunities for members to participate in the design of new services and products. The findings of López et al. (2017) and Muthyalu (2013) also agrees with our finding of a significant positive influence of share investment on access to input subsidy as these authors also observed that shareholding of members within the

cooperative has a significant positive effect on participation in agricultural input and output programs.

Other results of the Probit model also showed that communication with leaders in the cooperative, cooperative as marketing channel and extension access all did not influence access to input subsidy. Extension access having no impact on access to input subsidy is against Ragasa & Mazunda (2018) findings and Etwire et al. (2013). They believed that access to extension service has a significant positive influence on participation in agricultural projects. This might be because of the influence of the COVID-19 pandemic regarding restrictions placed on interaction, communication, and movement of individuals in countries.

Regarding social relations within the cooperative, the result of the Probit model showed that one out of the three variables (reciprocity of relationship, acceptance, and voice) had a significant positive influence on access to input subsidy. Descriptive statistics showed that all three variables were significantly higher for beneficiaries than non-beneficiaries. However, Probit regression carried out on the factors influencing access to input subsidy within the cooperative showed that only reciprocity of relationship had a significant positive influence on access to input subsidy within the cooperative. Reciprocity of relationship having a significant positive influence on access to input subsidy somewhat agrees with Rudd (2000) and Pretty & Ward (2001)**.** They opined that social capital such as reciprocity enhances the productivity of collective actions and vice versa. At the individual level, reciprocity of relationship and trust among members can reduce transaction costs in situations of information asymmetry.

Previous research by Mason et al. (2013a) and Burke et al. (2012) finds that FISP positively affects increasing yield throughout Zambia. Our findings agree with this as descriptive statistic showed that in all cases of productivity measures used (for yield and fertilizer productivity), beneficiaries of input subsidy among small and large farmers had significantly higher productivity at acceptable levels to non-beneficiaries of input subsidy. For large farmers with a landholding area greater than 5ha, yield measures show that beneficiaries of input subsidy had yield of 862.29kg/ha. In contrast, non-beneficiaries had yield of 602.78kg/ha, with a further test showing a 5% statistical difference between the two categories of farmers. For small farmers with a landholding area of 5ha and less, productivity measured as yield shows that beneficiaries of input subsidy had yield of

996.62kg/ha. In contrast, non-beneficiaries had 820.17kg/ha, with a further test showing a 10% statistical difference between the two categories of farmers.

The difference in the productivity level between large (862.29kg/ha) and small farmers (996.62kg/ha) among the beneficiaries of input subsidy shows that small farmers gain more proportionally from the same input subsidy package. This is following the findings of Dorward & Chirwa (2013); Burke et al. (2012); Ricker-Gilbert & Jayne (2011) and Mason et al. (2013b). They believed that the impact of the input subsidy program on smallholders results in an estimated increase in maize production across all households who are recipients of input subsidy. A higher increase in maize production was observed among poorer households who usually gain more proportionately, but not necessarily in absolute terms from the same input subsidy package.

The differences in productivity measured as yield between small and large farmers are not sufficient to conclude that participation in the input subsidy program increases productivity among smallholders than large farmers in the cooperative by merely looking at the mean differences between these two farmers' mean. They only indicate correlations and cannot be used to make inferences regarding the impact of FISP on productivity without controlling for other factors.

Using PSM to control for other factors, results of the three matching algorithms used (nearest neighbour, radius, and kernel bwidth) indicates that although beneficiaries of input subsidy among small and large farmers had yield higher than non-beneficiaries, the result of t-test showed that there was no statistical difference between the yield of beneficiaries and non-beneficiaries of input subsidy among small and large farmers except for nearest neighbour matching for large farmers. It should also be noted that after matching was done for the three algorithms (nearest neighbour, radius, and kernel bwidth), smallholder still had yield higher than large farmers in the cooperatives.

Regarding fertilizer productivity, unmatched algorithms showed that productivity per fertilizer usage between beneficiaries and non-beneficiaries among large and small farmers was statistically significant at 10% and 1%, respectively. For the other three matching algorithms (nearest neighbour, radius, and kernel), PSM results for large farmers showed that only nearest neighbour matching was statistically significant (at 5% significance level) while other matching algorithms were insignificant. The result of PSM for nearest neighbour, radius, and kernel matching algorithms among smallholder farmers

showed that all the three matching algorithms were statistically significant for fertilizer productivity between beneficiaries and non-beneficiaries of input subsidy. Results showed that the treated respondents among the large farmers had higher productivity per fertilizer usage for all three matching algorithms than the treated respondents among small farmers. It shows that large farmers in the cooperative were more productive with the usage of FISP fertilizer during production. This finding is in line with the findings of Burke et al. (2012)**,** Ricker-Gilbert & Jayne (2011) and Mason et al. (2013b) who opined that subsidized fertilizer on maize yield increases immediate maize yield. These authors were also of the opinion that maize yield response to fertilizer use may be higher on small farms than larger farms. Dlamini et al. (2019)**,** Wossen et al. (2017), Chibwana et al. (2012a), and Dorward & Chirwa (2013) were also of the opinion that participating in agricultural input subsidy programs has a positive and significant effect on the productivity of smallholder maize farmers.

5. Conclusions

Small-scale farmers in Zambia and entire sub-Saharan Africa face several challenges to remain food secure. Previous studies identified high transaction costs as one of the most significant limitations faced by small-scale farmers in rural areas, primarily due to poor infrastructure and road networks throughout Africa. To reduce transaction costs, policymakers can take advantage of cooperatives by promoting collective actions to reduce market transaction cost, increase bargaining strength, and facilitate knowledge dissemination amongst small-scale farmers. By linking cooperatives with a large-scale subsidy program that seeks to enhance access to modern inputs, policymakers defeat the objective of cooperatives.

The main aim of this study was to analyse how access to input subsidy through cooperatives affects the economic performance of small and large maize farmers. Access to input subsidies was categorised as beneficiaries – for members who were the recipient of FISP within the last two years – and non-beneficiaries – for members who were non-recipient of FISP within the last two years. One hundred eighty-seven cooperative maize farmers in the Western province of Zambia were purposively selected through snowball sampling from Limulunga and Mongu districts. Structured questionnaires using Nest Form application were used to gather data from maize farmers who are agricultural cooperatives to obtain data on the farmer and household characteristics, commitment to the cooperative, external networks, and social relation within the cooperative.

The hypothesis $H_{1a,}$ which states that higher engagement with farming positively influences access to input subsidy, holds for this study. Results showed that farm size and cooperative experience significantly influence access to input subsidy within the cooperative. Further results showed that higher commitment to the cooperative in terms of active participation and investment in the cooperative has a significant positive influence on access to input subsidy. Therefore, the alternate hypothesis $H_{1b,}$ which states that higher commitment to the cooperative positively influences access to input subsidy, holds for this study.

Both small and large farmers benefit from participating in input subsidy programs, showing a significant difference between the productivity of beneficiaries and non-beneficiaries of input subsidy in the cooperative. Results also showed that the benefit for

participation in the input subsidy program is proportionally higher in terms of productivity in yield for small-scale farmers than large farmers. Therefore, we accept the alternate hypothesis $H_{2,}$ which states that smallholder farmers achieve higher economic benefit than large farmers in the cooperative regarding access to input subsidy.

Based on our results, the following recommendations are made:

- reviewing the FISP eligibility criteria can improve the program's effectiveness as the literature suggests that FISP is regarded by many as a social transfer platform.
- ensure that FISP is implemented successfully and in line with the government policy and objectives by ensuring that malpractices among cooperative representatives, camp officials, and agricultural officers, in general, are dealt with during the program's implementation.
- continued presence of the state government in input production and distribution to monitor the transfer of input to farmers.
- Incorporating a communication channel that allows targeted farmers to share their concerns about distribution and receipt of packs while district and provincial administrators assist in monitoring the implementation of FISP closely and are actively involved to ensure that challenges are addressed in good time without delay.
- to foster the better commitment of members to the cooperative and ensure that cooperatives serve both small and large farmers equally, the structure of cooperatives should be improved or the cost of cooperatives removed.
- since FISP program benefit small-scale farmers more in terms of output (kg) per area of land (ha), policymakers should come up with clear, open and transparent selection criteria that will be used for distribution input subsidy to farmers who are firmly in need of it
- farmers with larger farm areas should be encouraged to supplement their farming requirement with those from the open market to increase productivity

References

Abate GT. 2018. Drivers of agricultural cooperative formation and farmers' membership and patronage decisions in Ethiopia. Journal of Co-operative Organisation and Management **6**:53–63. Elsevier.

Abbott P, Wallace C, Sapsford R. 2017. Socially Inclusive Development: The Foundations for Decent Societies in East and Southern Africa. Applied Research in Quality of Life **12**:813–839. Applied Research in Quality of Life.

Arcand JL, Wagner N. 2016. Does Community-Driven Development Improve Inclusiveness in Peasant Organisations? - Evidence from Senegal. World Development **78**:105–124.

Barrett CB. 2008. Smallholder market participation: Concepts and evidence from eastern and southern Africa. Food Policy **33**:299–317.

Bernard T, Spielman DJ. 2009. Reaching the rural poor through rural producer organisations? A study of agricultural marketing cooperatives in Ethiopia. Food Policy **34**:60–69.

Bernard T, Taffesse AS. 2012. Returns to scope? Smallholders' commercialisation through multipurpose cooperatives in Ethiopia. Journal of African Economies **21**:440–464.

Bernard T, Taffesse AS, Gabre-Madhin E. 2008. Impact of cooperatives on smallholders' commercialization behaviour: Evidence from Ethiopia. Agricultural Economics **39**:147–161.

Bijman J, Iliopoulos C. 2014. Farmers' cooperatives in the EU: Policies, strategies, and organisation. Annals of Public and Cooperative Economics **85**:497–508.

Bijman J, Wijers G. 2019. Exploring the inclusiveness of producer cooperatives. Current Opinion in Environmental Sustainability 41:74–79.

Birchall J., Simmons, R., 2003. The participation of members in the governance of mutual businesses. University of Stirling. Final research report Economic & Social Research Council (ESRC award no R000223846).

Bonus, H. 1986. The Cooperative Association as a Business Enterprise: A Study in the

Economics of Transactions. Journal of Institutional and Theoretical Economics (JITE) / Zeitschrift Für Die Gesamte Staatswissenschaft, 142(2), 310-339.

Burke WJ, Jayne TS, Sitko NJ, Points K. 2012. Can the FISP More Effectively Achieve Food Production and Poverty Reduction Goals? 51.

Cechin A, Bijman J, Pascucci S, Omta O. 2013. Decomposing the Member Relationship in Agricultural Cooperatives: Implications for Commitment. Agribusiness 29:39–61.

CELIM 2020. Low Impact Agriculture: Fighting Climate Change in Zambia. Available on https://www.celim.it/en/progetto/low-impact-agriculture/ (accessed July 5, 2020).

Chibwana C, Fisher M, Jumbe C, Masters WA, Shively G. 2012a. Measuring the Impacts of Malawi's Farm Input Subsidy Program. SSRN Electronic Journal:1–38.

Chibwana C, Fisher M, Shively G. 2012b. Cropland Allocation Effects of Agricultural Input Subsidies in Malawi. World Development **40**:124–133. Elsevier Ltd.

Chirwa E, Dorward A, Kachule R, Kumwenda I, Kydd J, Poole N, Poulton C, Stockbridge M. 2005. Walking tightropes: supporting farmer organisations for market access. Natural Resource Perspectives:1–6.

Chirwa EW, Matita M, Dorward A. 2010. Factors influencing access to agricultural input subsidy coupons in Malawi:1–7.

Coase RH. 1995. The Nature of the Firm. Essential Readings in Economics **IV**:37–54.

Cook S. 2006. Structural change, growth and poverty reduction in Asia: Pathways to inclusive development. Development Policy Review **24**:s51-80.

CSPR 2011. An Assessment of the Implementation and Viability of the Farmer Input Support Programme in Zambia: With Case Studies of Mazabuka and Monze Districts. Zambia: Civil Society for Poverty Reduction.

Davis P. 2016. Retrieving the Co-operative Value-Based Leadership Model of Terry Thomas. Journal of Business Ethics **135**:557–568. Springer Netherlands.

De Haan A. 2011. Social Exclusion and the road not taken:1–26. Available from http://www.chronicpoverty.org/uploads/publication_files/WP218 de Haan.pdf.

DiPrete TA, Gangl M. 2004. Assessing bias in the estimation of causal effects: Rosenbaum bounds on matching estimators and instrumental variables estimation with imperfect instruments. Sociological Methodology **34**:271–310.

Dlamini SG, Ogunniyi LT, Vilane FM, Fanifosi GE. 2019. Impact of agricultural input subsidy on productivity of small-scale maize farmers in the Hhohho Region of Eswatini. International Journal of Development and Sustainability **8**:785–794.

Dorward A, Chirwa E. 2013. Impacts of the Farm Input Subsidy Programme in Malawi : Informal Rural Economy Modelling.

ETC. 2009. Who will feed us? Questions for the food and climate crisis. Communiqué. Issue 102:34.

Etwire PM, Dogbe W, Wiredu AN, Martey E, Etwire E, Owusu RK, Wahaga1 E. 2013. Factors Influencing Farmer's Participation in Agricultural Projects: The case of the Agricultural Value Chain Mentorship Project in the Northern Region of Ghana. Journal of Economics and Sustainable Development **4**:36–43.

Farid KS, Mozumdar L, Goswami UK. 2009. Nature and Extent of Rural Women'S Participation in Agricultural and Non-Agricultural Activities. Agric. Sci. Digest **29**:254–259.

Figueiredo V, Franco M. 2018. Wine cooperatives as a form of social entrepreneurship: Empirical evidence about their impact on society. Land Use Policy **79**:812–821. Elsevier.

Fischer AM. 2012. Reconceiving Social Exclusion. SSRN Electronic Journal.

Fischer E, Qaim M. 2012. Linking Smallholders to Markets: Determinants and Impacts of Farmer Collective Action in Kenya. World Development **40**:1255–1268. Elsevier Ltd.

Francesconi GN, Heerink N. 2011. Ethiopian agricultural cooperatives in an era of global commodity exchange: Does organisational form matter? Journal of African Economies **20**:153–177.

Fulton M. 1999. Cooperatives and member commitment. Lta **4**:418–437.

Global Yield Gap Atlas 2020. Description of Cropping Systems and Climate and Soils in Zambia. https://www.yieldgap.org/zambia

Grashuis J, Ye SU. 2019. A Review of the Empirical Literature on Farmer Cooperatives: Performance, Ownership and Governance, Finance, and Member Attitude. Annals of Public and Cooperative Economics **90**:77–102.

Gugerty MK, Kremer M. 2008. in Community Associations. Political Science **52**:585–602.

Gupta J, Pouw NRM, Ros-Tonen MAF. 2015. Towards an Elaborated Theory of Inclusive Development. European Journal of Development Research **27**:541–559. Nature Publishing Group.

Hansmann H. 1988. Ownership of the Firm. Journal of Law, Economics, & Organisation **4**:267–304.

Heckman JJ, Ichimura H, Smith J, Todd P. 2016. Characterizing Selection Bias Using Experimental Data. The Econometric Society **66**:1017–1098.

Hickey S, Toit A. 2013. Adverse Incorporation, Social Exclusion, and Chronic Poverty 1:134–159.

Holger Bonus. 1986. The Cooperative Association as a Business Enterprise: A Study in the Economics of Transactions. Journal of Institutional and Theoretical Economics (JITE) **142**:310–339.

Human Development Report. 2016. Human Development for Everyone. Page United Nations Development Programme. Available from http://hdr.undp.org/sites/default/files/2016_human_development_report.pdf.

IAPRI. 2015. Rural Agricultural Livelihoods Survey: 2015 Survey Report:119.

IAPRI. 2016. Rural Agricultural Livelihoods Survey 2015. Lusaka: Indaba Agricultural Policy Research Institute.

J Ricker-Gilbert NMFDST. 2013. What are the Effects of Input Subsidy Programs on Maize Prices? Evidence from Malawi and Zambia. Agricultural Economics **44**:671–686.

Jayne TS, Mason N, Burke W, Shipekesa A, Chapoto A, Kabaghe C. 2011. Mountains of Maize, Persistent Poverty **48**:1–5. Available from

Jayne TS, Mather D, Mason N, Ricker-Gilbert J. 2013. How do fertilizer subsidy

programs affect total fertilizer use in sub-Saharan Africa? Crowding out, diversion, and benefit/cost assessments. Agricultural Economics (United Kingdom) **44**:687–703.

Jayne TS, Mather D, Mghenyi E. 2010. Principal Challenges Confronting Smallholder Agriculture in Sub-Saharan Africa. World Development **38**:1384–1398.

Jayne TS, Rashid S. 2013. Input subsidy programs in sub-Saharan Africa: A synthesis of recent evidence. Agricultural Economics (United Kingdom) **44**:547–562.

Johnson H, Shaw L. 2014. Rethinking Rural Co-operative in Development: Introduction to the Policy Arena. Journal of International Development **26**:668–682.

Khan S, Combaz E, McAslan Fraser E. 2015. Social exclusion: topic guide. Definitions and different understandings of social exclusion by GSDRC:61.

Kuteya A. 2014. Analysis of the 2014 Zambia ' s Agricultural Sector Budget.

López C, Salazar L, De Salvo CP. 2017. Agricultural input subsidies and productivity: The case of Paraguayan farmers:1–26.

Luellen JK, Shadish WR, Clark MH. 2005. Propensity scores: An introduction and experimental test. Evaluation Review **29**:530–558.

Luke Harman. 2015. Strengthening coherence between agriculture and social protection. Food and Agriculture Organisation of the United Nations.

Lunduka R, Ricker-Gilbert J, Fisher M. 2013. What are the farm-level impacts of Malawi's farm input subsidy program? A critical review. Agricultural Economics (United Kingdom) **44**:563–579.

Lutz C, Tadesse G. 2017. African farmers' market organisations and global value chains: competitiveness versus inclusiveness. Review of Social Economy 75:318–338.

Wolfenson, K.D.M. 2013. Coping with the food and agriculture challenge: smallholders' agenda. Food and Agriculture Organisation of the United Nations, Rome.

Markelova H, Meinzen-Dick R, Hellin J, Dohrn S. 2009. Collective action for smallholder market access. Food Policy **34**:1–7. Elsevier Ltd.

Markelova H, Mwangi E. 2010. Collective action for smallholder market access: Evidence and implications for Africa. Review of Policy Research **27**:621–640.

Mason N, Tembo S. 2015a. Do Input Subsidy Programs Raise Incomes and Reduce Poverty among Smallholder Farm Households? Indaba Agricultural Policy Research Institute.

Mason NM, Jayne TS, Mofya-Mukuka R. 2013a. Zambia's input subsidy programs. Agricultural Economics (United Kingdom) **44**:613–628.

Mason NM, Jayne TS, Mofya-Mukuka R. 2013b. A Review of Zambia ' s Agricultural Input Subsidy Programs : Targeting , Impacts , and the Way Forward by Nicole M . Mason , T . S . Jayne , and Rhoda Mofya-Mukuka Working Paper 77 August 2013 Indaba Agricultural Policy Research Institute (IAPRI):43.

Mason NM, Ricker-Gilbert J. 2013. Disrupting Demand for Commercial Seed: Input Subsidies in Malawi and Zambia. World Development **45**:75–91.

Mason NM, Smale M. 2013. Impacts of subsidized hybrid seed on indicators of economic well-being among smallholder maize growers in Zambia. Agricultural Economics (United Kingdom) **44**:659–670.

Mason NM, Tembo S. 2015b. Do input subsidies reduce poverty among smallholder farm households? Evidence from Zambia. Agriculture in an Interconnected World, Milan, Italy, 29th May.

Menard C. 2006. Hybrid Organisation of Production and Distribution. Revista de Análisis Económico **21**:25–41.

Minah M, Malvido Pérez Carletti A. 2018. Pathways to Inclusion: Evidence from Zambia's Subsidy Program and Farmer Organisations. Humboldt Uniersitat Zu Berlin:172–195.

Minah M, Malvido Pérez Carletti A. 2019. Mechanisms of Inclusion: Evidence from Zambia's Farmer Organisations. European Journal of Development Research **31**:1318–1340. Palgrave Macmillan Ltd.

Ministry of Agriculture and Conservation Organisation 2008. Fertilizer Support Programme Internal Evaluation. Report. Lusaka, Zambia: Ministry of Agriculture and Conservation.

Ministry of Agriculture and Conservation Organisation 2009. Farmer Input Support Programme Implementation Manual, 2009/2010 Agricultural Season. MACO,

Lusaka, Zambia.

Ministry of Agriculture and Livestock. 2013. National Agricultural Policy (Revised). Lusaka, Zambia,Ministry of Agriculture and Livestock. (available at http://www.agriculture.gov.zm/index.php)

Ministry of Agriculture and Livestock 2014. Farmer Input Support Programme: Implementation Manual, 2014/2015 Agricultural Season. Lusaka: Ministry of Agriculture and Livestock

Mofya-mukuka R, Kabwe S, Kuteya A, Mason NM. 2013. How Can the Zambian Government Improve the Targeting of the FISP?1–7.

Mojo D, Fischer C, Degefa T. 2015. Social and environmental impacts of agricultural cooperatives: Evidence from Ethiopia. International Journal of Sustainable Development and World Ecology **22**:388–400.

Mojo D, Fischer C, Degefa T. 2017. The determinants and economic impacts of membership in coffee farmer cooperatives: recent evidence from rural Ethiopia. Journal of Rural Studies **50**:84–94.

Muthyalu M. 2013. The Factors that Influence the Participation of Cooperative Members in the Agricultural Input and Output Marketing – A Case Study of Adwa District, Ethiopia. Journal of Business Management & Social Sciences Research **2**:121–130.

Mutonyi S. 2019. The effect of collective action on smallholder income and asset holdings in Kenya. World Development Perspectives **14**:100099.

Nicole M. Mason, Jayne TS, Nicolas van de Walle. 2013. Fertilizer Subsidies and Voting Patterns: Political Economy Dimensions of Input Subsidy Programs. Agricultural & Applied Economics Association's.

Nnandi FN, Akwiwi C. 2008. Determinants of Youth's Participation in Rural Agriculture in Imo State, Nigeria. Journal of applied sciences **8**:328–333.

Nxumalo KKS, Oladele OI. 2013. Factors Affecting Farmers' Participation in Agricultural Programme in Zululand District, Kwazulu Natal Province, South Africa. Journal of Social Sciences **34**:83–88.

O.E. W. 1991. Comparative economic organisation of discrete structural alternatives. Administrative Science Quarterly **36: 269-96**:219–254.

Oladejo JA, Seyi O, Oladejo JA, Olawuyi SO, Anjorin TD. 2011. Analysis of Women Participation in Agricultural Production in Egbedore Local Government Area of Osun State, Nigeria. International Journal of Agricultural Economics & Rural Development **4**:1–11.

Österberg P, Nilsson J. 2009. Members' perception of their participation in the governance of cooperatives: The key to trust and commitment in agricultural cooperatives. Agribusiness **25**:181–197.

Paos M. 2019. Western Province Annual Report on Cooperatives.

Pan L, Christiaensen L. 2012. Who is Vouching for the Input Voucher? Decentralized Targeting and Elite Capture in Tanzania. World Development.

Personal M, Archive R, Zinnbauer M, Mockshell J, Zeller M. 2018. M P RA Effects if Fertilizer Subsidies in Zambia: A Literature Review

Pouw N, Gupta J. 2017. Inclusive development: a multi-disciplinary approach. Current Opinion in Environmental Sustainability **24**:104–108. Elsevier B.V.

Pretty J, Ward H. 2001. Social capital and the environment. World Development **29**:209–227.

Puusa A, Mönkkönen K, Varis A. 2013. Mission lost? Dilemmatic dual nature of co-operatives. Journal of Co-operative Organisation and Management **1**:6–14.

Ragasa C, Mazunda J. 2018. The impact of agricultural extension services in the context of a heavily subsidized input system: The case of Malawi. World Development **105**:25–47. Elsevier Ltd.

Ragin, C. (2000) Fuzzy-set Social Science. Chicago: University of Chicago Press. Available on https://books.google.cz/books?hl=en&lr=&id=nZC2dLUHOAC&oi=fnd&pg=PA1&dq=Ragin,+C.+(2000)+Fuzzyset+Social+Science.&ots=9OsN1XBB6z&sig=aqtA7BZaI_EsX9j4mJ7LX_oCe_I&redir_esc=y#v=onepage&q=Ragin%2C%20C.%20(2000)%20Fuzzy-set%20Social%20Science.&f=false

Ricker-Gilbert J. 2014. Wage and employment effects of Malawi's fertilizer subsidy program. Agricultural Economics (United Kingdom) **45**:337–353.

Ricker-Gilbert J, Jayne T. 2011. What are the Enduring Effects of Fertilizer Subsidy

Programs on Recipient Farm Households? Evidence from Malawi. Staff Paper Series.

Ricker-Gilbert J, Jayne T, Shively G. 2013. Addressing the "wicked problem" of input subsidy programs in africa. Applied Economic Perspectives and Policy **35**:322–340.

Ricker-Gilbert J, Jayne TS, Chirwa E. 2011. Subsidies and crowding out: A double-hurdle model of fertilizer demand in Malawi. American Journal of Agricultural Economics **93**:26–42.

Rosenbaum PR, Rubin DB. 1983. The central role of the propensity score in observational studies for causal effects. Biometrika **70**:41–55.

Rosenbaum PR, Rubin DB. 1985. Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. American Statistician **39**:33–38.

Ruben R, Heras J. 2012. Social capital, governance and performance of ethiopian coffee cooperatives. Annals of Public and Cooperative Economics **83**:463–484.

Rudd MA. 2000. Live long and prosper: Collective action, social capital and social vision. Ecological Economics **34**:131–144.

Sen A. 2000. Social Exclusion: Concept, Application and Scrutiny. Page Office of Environment and Social Development, Asian Development Bank, Social Development Papers.

Sitko, N.J. 2010. The Fractured Politics of Food Security: Maize, Power, and Hunger on a Zambian Frontier. Ph.D. dissertation. University of Colorado at Boulder.

Smale M, Birol E, Asare-Marfo D. 2014. Smallholder Demand for Maize Hybrids in Zambia: How Far do Seed Subsidies Reach? Journal of Agricultural Economics **65**:349–367.

Smale M, Simpungwe E, Birol E, Kassie GT, De Groote H, Mutale R. 2015. The Changing Structure of the Maize Seed Industry in Zambia: Prospects for Orange Maize. Agribusiness **31**:132–146.

Staatz J. 1987. Farmers' incentives to tare collective action via cooperatives: A transaction cost approach. Cooperative theory: New approaches **18**:87–107.

Sykuta ME, Chaddad FR. 1999. Putting theories of the firm in their place: a supplemental digest of the new institutional economics''. Journal of cooperatives **14**:68–76.

Tefera DA, Bijman J, Slingerland MA. 2017. Agricultural Co-Operatives in Ethiopia: Evolution, Functions and Impact. Journal of International Development **29**:431–453.

The World Bank. 2013. Inclusion Matters: The Foundation for Shared Prosperity. Page Inclusion Matters: The Foundation for Shared Prosperity.

Thomas B, Vink N. 2020. The development of vegetable enterprises in the presence of transaction costs among farmers in Omusati Region of Namibia: An assessment. Journal of Agriculture and Food Research **2**:100028. Elsevier Ltd.

Thorp R, Stewart F, Heyer A. 2005. When and how far is group formation a route out of chronic poverty? World Development **33**:907–920.

Üllenberg A, Minah M, Rauch T, Richter D. 2017. Zambia: Towards Inclusive and Sustainable Rural Transformation. Centre for Rural Development.

Uzzi B. 1996. The sources and consequences of embeddedness for the economic performance of organisations: The network effect. American Sociological Review **61**:674–698.

Valentinov V. 2007. Why are cooperatives important in agriculture? An organisational economics perspective. Journal of Institutional Economics **3**:55–69.

Van Dijk, G., Klep L., 2008. Democracy and the Big Economy. Utrecht: National Council for Cooperatives NCR

Verhees FJHM, Sergaki P, Van Dijk G. 2015. Building up active membership in cooperative. New Medit N:42–52.

Verhofstadt E, Maertens M. 2014. Smallholder cooperatives and agricultural performance in Rwanda: Do organisational differences matter? Agricultural Economics (United Kingdom) **45**:39–52.

Verhofstadt E, Maertens M. 2015. Can agricultural cooperatives reduce poverty? Heterogeneous impact of cooperative membership on farmers' welfare in Rwanda. Applied Economic Perspectives and Policy **37**:86–106.

Wassie SB, Kusakari H, Masahiro S. 2019. Inclusiveness and effectiveness of agricultural

cooperatives: recent evidence from Ethiopia. International Journal of Social Economics **46**:614–630.

Williamson OE. 1987. Transacting Cost Economics: The comparative contracting principle. Journal of Economic Behavior and Organisation **8**:617–625.

Williamson OE, Gorringe P. 1987. A Review Article : The Economic Institutions of Capitalism : Firms , Markets and Relational Contracting by Peter Gorringe t:125–143.

Wossen T, Abdoulaye T, Alene A, Feleke S, Ricker-Gilbert J, Manyong V, Awotide BA. 2017. Productivity and Welfare Effects of Nigeria's e-Voucher-Based Input Subsidy Program. World Development **97**:251–265. The Authors.

WPI. 2017. Western Province of Zambia information. Available from https://www.wes.gov.zm/ (accessed December 22, 2019).

Zambia Agriculture 2017. Zambia Agriculture Statistics. Available on https://www.zambiainvest.com/agriculture#:~:text=The%20Zambian%20agriculture%20sector%20comprises,fruits%2C%20other%20vegetables%20and%20flowers (accessed July 5, 2020).

Appendices

Appendix 1: Questionnaire for data collection

Members Questionnaire

This questionnaire has been designed to execute a research purposely for academic work. The principal objective is to analyze the economic performance of input subsidies among cooperative members in Zambia. All information provided will solely and exclusively used for academic purpose and all respondents will remain anonymous to the public domain. Information provided would be used to make sound empirical analysis and suggest policy recommendations that would help improve the distribution of subsidized inputs as well as the socio-economic well-being and standard of living of cooperative members in the region. The entire interview will take 30 minutes of your time and you are kindly requested to provide honest and genuine answers within your possible best.

Interview date……../……/20..…….

Section One: General Information

1. GPS coordinates

……

2. Name of province

……

3. Name of ward/community

……

4. Name of the cooperative

……

Section Two: Socio-economic Characteristics

5. Gender [ ] Male [ ] Female

6. Age of respondent (years)

……

8. Years of education of respondent…….

10. What is your total land holding area (in hectares)? ……

11. How many of the total land holding area do you use (cultivate) for maize production [in hectares]? ……..……

16. What is your main product? [ ] Maize [ ] Others (specify)
…….
19. Please indicate the number of years for which you have been a member of this cooperative ……..…… (years)
20. What position do you occupy in the cooperative?
……
21. What is the distance of your residence to the cooperative headquarter? (in km)
……

Section Three: Factors Influencing Access to Input Subsidy

22. How would you describe your level of communication with the cooperative leaders? [ ] Never [ ] Rarely [ ] Sometimes [ ] Often [ ] Always
23. Are you related to any of the cooperative leaders? [ ] No [ ] Yes
24. In the last year, how many times did you meet extension workers for advice or consultancy?
[ ] None [ ] One time [ ] Two times [ ] Three times [ ] Five times or more
25. Did you buy seeds or fertilizer from a commercial source within the last two years? [ ] No[ ] Yes
26. Please rate your level of attendance of cooperative meetings out of 100.
……
27. What quantity of your produce do you sell through the cooperative?
[ ] None [ ] 1 - 25% [ ] 26 -50% [ ] 51 – 75% [ ] Above 75%
26. Please specify how much you pay as share in the cooperative? …….ZKw
28. How affordable is the remittance fee for input subsidy to you? [ ] Not affordable [ ] Slightly affordable [ ] Moderately affordable [ ] Very affordable [ ] Extremely affordable

Section Four : Input Costs and Revenue

29. Labor

a. Please indicate the total quantity of hired labor that you utilized in your last farming period (per year)
…..……..
b. Please indicate the total number of days that you utilized hired labor
……...
c. Please indicate the total quantity of family labor that you utilized in your last farming period (per year)
…..……
d. Please indicate the total number of days that you utilized family labor
……..
e. What was the cost per unit (in ZKw) of labor in your last farming period?
….....

f. How much do you spend in total on labor per year (bush clearing, ploughing, planting, weeding, harvesting etc.) in ZKw?

……..

g. Did you use cattle (animal traction) on your farm during the last farming period? [ ] Yes [ ] No

h. If YES, indicate the number of days?

…….

i. If YES, indicate the amount per day?

……

30. Seeds

j. Please indicate the quantity of seeds (in kg) that you utilized in your last period of farming…….……..……

k. What was the cost per unit (in ZKw) of seeds in your last period of farming?

.....……..

31. Fertilizer

l. Please indicate the quantity of fertilizer (in kg) that you utilized on maize production in your last period of farming

……

m. What was the cost per unit (in ZKw) of this fertilizer?

…….....

32. Pesticide

n. Please indicate the quantity of pesticide (in liters) that you utilized on maize production in your last period of farming

……

o. What was the cost per unit (in ZKw) of this pesticide?

…….....

33. Herbicide

p. Please indicate the quantity of herbicide (in liters) that you utilized on maize production in your last period of farming

……

q. What was the cost per unit (in ZKw) of this herbicide?

…….....

34. Beneficiaries of Input Subsidy

r. Please indicate the quantity (in kg) of maize seed subsidy received last year

……

s. Please indicate the quantity (in kg) of fertilizer subsidy received last year

……

35. Revenue

a. What quantity (in bags) of maize were you able to harvest in your last period of farming? .....……

b. What quantity (in bags) of maize were you able to sell in your last season of farming? .....

c. What was the price of maize per bag in your last season of farming?
.....

Section Four

Subjective Feelings of Members

Please indicate how much you agree with the following statements

36. My fellow cooperative members are completely honest with me

[ ] Strongly Disagree [ ] Partly Agree [ ] Neither agree nor disagree [ ] Partly Agree [ ] Strongly Agree

38. My fellow cooperative members like me

[ ] Strongly Disagree [ ] Partly Agree [ ] Neither agree nor disagree [ ] Partly Agree [ ] Strongly Agree

39. My fellow cooperative members include me in what they are doing

[ ] Strongly Disagree [ ] Partly Agree [ ] Neither agree nor disagree [ ] Partly Agree [ ] Strongly Agree

40. My voice counts in cooperative matters

[ ] Strongly Disagree [ ] Partly Agree [ ] Neither agree nor disagree [ ] Partly Agree [ ] Strongly Agree

40. My fellow cooperative members are completely open with me

[ ] Strongly Disagree [ ] Partly Agree [ ] Neither agree nor disagree [ ] Partly Agree [ ] Strongly Agree

Thank you.

Annexes

Testing for Multicollinearity of Variables included in the Probit Model for Access to Input Subsidy

Test for multicollinearity between the variables to be included in the regression model for access to input subsidy was performed to check for the correlation that exist between the independent variables.

Result of the Pearson correlation matrix in the Table 11 below shows that there is no issue of multicollinearity between the variables included in the Probit regression model since none of the variables had correlation coefficient of 0.8 or higher.

Table 11. Matrix of correlation (access to input subsidy)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) Age	.00													
(2) Land size	.18	.00												
(3) Gender	0.05	.14	.00											
(4) Farm size	.10	.78	.16	.00										
(5) Position in the cooperative	.16	.17	.17	.19	.00									
(6) Share investment	.08	.27	.17	.31	.07	.00								
(7) Cooperative as marketing channel	.06	.09	.20	.06	.02	.22	.00							
(8) Cooperative experience	.30	.32	.08	.32	.18	.50	.30	.00						
(9) Communication with leaders	.13	.12	0.04	.09	0.03	.04	.06	.19	.00					
(10) Extension access	.12	0.07	.14	.01	.15	0.01	.21	.11	.10	.00				
(11) Active participation	.06	.11	.06	.16	.32	.18	.30	.24	.22	.24	.00			
(12) Reciprocity of relationship	.01	.02	.06	.11	0.04	.13	.11	.17	.18	.13	.11	.00		
(13) Acceptance	.15	.14	.07	.20	.18	.07	.18	.19	.37	.16	.34	.24	.00	
(14) Voice	0.01	0.01	0.04	.08	0.03	0.07	.08	.01	.20	.15	.18	.36	.32	.00