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Comparative Study of Livelihoods and Food Security Status of Sugarcane Out growers and Non-Cane Growers, Magobbo Scheme, Zambia

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Abstract
In recent times there is a surge in the number of large-scale agricultural based investments. The most common form of large-scale land based investment in Zambia is the out grower scheme. This study is a comparative study of the livelihoods pathways and food security status of out growers in the Magobbo Out grower scheme, Zambia and non cane out growers surrounding the out grower scheme. The livelihoods of the cane growers are slightly better than that of the non-cane growers. The cane out- growers have access to better water facilities; electricity and more income earnings though they have more debts compared to the non-cane growers. On the other hand the non-cane growers were in a survivalist livelihood mode, they were struggling to make ends meet and they straddled subsistence farming and wild fruit selling. In terms of food security at 6.00 Household Dietary Diversity (HDD) index, the food security of cane growers' was higher standing at 74.3 percent than non-cane growers at 46.9 percent. The study draws from a mixed method approach. The qualitative method was used to explore the livelihoods of the two groups. Quantitative techniques such as t test were done to assess the food security and insecurity of the two groups. A total of 151 households (HH) (70 cane-growers and 81 HH of non-cane growers) participated in this study.
Keywords: Sugar cane Outgrower; Non- cane Outgrower; livelihoods; food security; Zambia

Introduction

The past decade has witnessed rampant land transfers, which some studies deem the phenomenon as a facade of 'land grab' by large-scale investments especially in sub-Saharan Africa (Deininger et al. 2011;Elizabeth et al, 2013;Vermeulen and Cotula 2009; Zoomers 2010; Borras et al. 2011). The land transfers have been in various ways, most common among them is the out grower model. There are varying positions on the impacts of out grower schemes. Some research note that out grower schemes do not empower locals rather they are an extension of the plantation model which makes the local people disguised as laborers (Matenga and Hichaambwa, 2017; Singh 2002). Some view that the out grower scheme has resulted in empowerment of local communities which participate in the schemes (World Bank, 2008).

Eaton et al., (2001) define an out-grower scheme as a form of a contractual farming system in which both private and public sector co-operate to facilitate improved access to inputs, markets and services for small-scale farmers under some legal agreements. Out-grower arrangements do not only support sugarcane production but also supported a wide range of crops that included: cotton, tobacco, coffee, paprika and fresh vegetables (Likulunga, 2007). Contract farming agreements (or out-grower arrangement) come in two forms: (1) Informal (or oral), through which verbal assurances are pronounced but poses more risk as it is less secure because of lack of evidence (2) Formal (or written), in which laws and regulations defines the terms and conditions for engagement and require mutual agreement between the two parties (Bijman, 2008).

Many forms of out-grower models have since been identified. Bijman (2008), Abwino and Rieks (2006), Eaton and Shepherd (2001), illustrated five as follows: (1) The centralized model; (2) The nucleus estate model; (3) The multipartite model; (4) The informal model; and (5) The intermediary model.

In Zambia Studies by Rocca (2014), Schüpbach (2014), Matenga and Hichaambwa (2017), Mudenda (2014) and Kalinda (2014) were conducted to assess the implementation of Magobbo Outgrower Scheme. However, these studies revealed contradicting conclusions on the socio-economic status of farmers. Rocca, Schüpbach, and Kalinda upheld the claim that Magobbo cane growers' income increased while Mudenda held the opposite. Matenga and Hichaambwa (2017) noted that the farmers incomes had increased, however this is not an out grower scheme but an extension of the plantation model. A further contradiction to this debate of out-grower systems' lucrativeness to farmers is seen when a media report emerged at the end of 2014 that a group of cane growers planned to stage a protest against Zambia Sugar PLC over the suspected deceitful allocation of profits (income) for farmers.

Overview of Magobbo Sugarcane out-grower scheme

Magobbo sugarcane out-grower scheme is one of the three schemes under Nakambala Estates in Mazabuka district, one of the 14 districts in Southern Province of Zambia. The scheme is situated in Magobbo village within Lubombo ward and has a population of approximately 900 (GRZ 2010). The village is located about 12Km from the Sugarcane factory, known as Zambia Sugar PLC[4]; and runs along the Kafue River plains. The predominant economic activities in this village are crop production particularly maize, being the staple food for the country, livestock production and fish capture (Kalinda, 2014)

In 2010, Magobbo village became one of the areas to benefit from the sugarcane expansion program of Zambia Sugar. The expansion program came as a result of changes in the European Union (EU) sugar trade regime which began in 2006 which led to a price reduction of about 36 percent of Sugar in 2009 (Palerm et al. 2010, Rocca, 2014). Subsequently, alternative instruments and programs such as free and duty quotas were put in place, which apparently encouraged the affected countries to produce more Sugar with incentives but not more than 25 percent per year (Richardson, 2009). Following these conditions on the global market, some affected countries embarked on an expansion program with the aim of increasing Sugar exports for purposes of continuing profit maximization. Unlike other countries, Zambia was given a slightly different instrument "inside track" (Rocca, 2014) which provided a favorable market opportunity for increasing supplies. Conversely, Zambia Sugar PLC, the dominant Sugar factory in Zambia, seized this opportunity and equally embarked on the expansion program.

Concepts of livelihood approaches

Chambers and Conway (1992), state as follows:

"A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living; a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long-term" (ibid).

The central element to this definition is that resource endowments people possess that contribute to their wellbeing are liable to "stress and shock", and therefore a household's ability to secure sustained livelihood is solely dependent on its resilient capabilities to absorb future calamities (Morse et al, 2009). This concept of livelihood has evolved so many times over time both in principle and theory.

But the concept of food security was later thought to be too narrow, and thus researchers began to broaden their perspectives back to livelihood point of view (Solesbury, 2003). To them, this concept not only recognized the importance of addressing issues of food and nutritional securities, and poverty, but it also incorporated an aspect of structural and institutional significances (Chambers and Conway, 1992). Therefore, since 1990, the perspective changed from 'material-bound' food production as a key component to social parameters that focused on enhancing people's capability as they safeguard their own lives (Bekele, 2008).

Livelihood outcomes

These are products that come out from the configuration of resources such as knowledge, skills, land, and technology to produce outputs of varying forms (Ronan, 2007). Scoones (1998) highlighted that the outcomes constitute a number of elements that include: enhanced income levels, improved well-being - ability to have access to non materials such as services, good health, and sense of inclusion. In other words, every household's goal is to have an improved welfare which ensures: (a) enough food to eat (b) stable flow of income (c) capable of sending children to school (d) have access to health services (d) effective management of natural resources (World Food Program, 2005). With these factors at hand, households have abilities to reduce vulnerability through improved asset possession, improved food security and finally using the assets in a sustainable way. In short, these are the objectives people live for. They acquire or obtain the resources in order to turn them into desired outcomes through the interventions of working strategies and systems.

Vulnerability context

Vulnerability contexts are external factors that fundamentally affect people's livelihoods and have little or no control over them (Frankenberger et al, 2002). They are risks that tilt people's welfare into other dimensions, usually unpleasant (Heitzmann, Karen et al. 2002). This is because choices to livelihood strategies are in turn shaped by the exposure to vulnerability context a household has. DFID (1999) classified vulnerability context into three main groups as follows:

Trends – though less benign affects livelihood through influences on economic parameters (rate of return) that directly or indirectly affect strategies (Soussan et al 2000).

[4] see Vera Rocca, 2014 for a detailed historical development of Zambia Sugar

Shocks have a direct effect on people's assets. These shocks include 'floods, storms, civil wars' etc., (DFID, 1999) which can lead to people abandon their forms of living to new areas as a form of coping strategy.

Seasonality is bordered on changes in prices, opportunities such as employment and trade, which exert hardship on the poor themselves.

Food security

Nearly one-third of the world is still battling with issues of hunger and starvations. The largest proportion of this phenomenon is in developing nations. However, concerted efforts are being witnessed by the affected countries in motivating policies and programs aimed at enhancing household food security because of the understood close link between poverty and household food security (George, 1999).

The concept of food security began to emerge in the mid-1970s following the sudden rise in food prices, which later created fears of possible world food system 'running out of control' (Maxwell. 1996). Therefore, in 1974 a World Food Conference (WFC) was organized (UN, 1974 quoted by Maxwell, 1996

Food security is conceptualized in three dimensions namely: Food availability, access, and utilization (Swindale, et al, 2006). Concurrently, USAID and other United Nations bodies included an additional component that cut across the three pillars namely: Stability5.

Food availability entailed that food stock is sufficient in quantities and available on a consistent basis. However, having food availability only did not seem to translate into having access to food that is safe, nutritious which in turn contributed to the health of individuals and household as well as overall wellbeing (Webb et al, 2006, Bimerew and Beyene, 2013).

Hence, the second pillar attempted to address the issues of food access. Food access is defined as simply the ability to have access to appropriate foods with nutritious value. 'Ability' in this context was understood as having sufficient resources ('entitlement' by Stamoulis and Zezza, 2003) such as money, gifts, aid, stocks, land etc, which necessitated one to have the capacity to acquire safe and nutritious food. It illustrated the demand side of the food system in which individuals expressed their willingness and ability to acquire quality food.

DFID (1999), argues that livelihood based approaches provide an effective and practical means of reducing food security through methods, capacities, and actions. To Young et al. (2001), the livelihood framework avoids narrowing the focus to just agriculture activities. Instead, it broadens the scope to incorporate a wide range of interventions that analyze the effects of non-agricultural strategies and other resources that ultimately enhance food security of people.

Data and methods

The study used both quantitative and qualitative approaches to analyze the data. Under quantitative, a structured questionnaire with both closed and open-ended questions was designed. The questionnaire facilitated in collecting information pertaining to household (HH) characteristics, main economic activities of households, production levels, general perceptions of the out-grower scheme and Household Dietary Diversity (HDD). Meanwhile, for qualitative approach interview guides were used to collect in-depth data.

Quantitative approach

The 'Listing exercise' resulted in listing 278 households both participants and non-participants. From this frame, a stratified sampling technique was performed to produce two strata - those in the scheme therein called the cane-growers and those that are not therein called the non-cane. The cane growers' list aided the process. It is worth mentioning that these farmers share similar geopolitical and social backgrounds.

To obtain a sample size for non-cane growers, from the established stratum, a simple random sampling technique was performed to attain 80 households. Since cane-growers were already 80, a complete coverage was envisaged. This brought the total to 160 households. As earlier noted classification of the farmers into these groups was done with minimal efforts as the resettlement program had already separated some farmers based on their involvement in Sugar production, and thus making categorization easier.

At the end of the survey, 70 HH of the planned 80 cane-growers and 81 HH out of the planned 80 non-cane growers were interviewed, thus bringing the total to 151. During the survey, it was discovered that the remaining 10 cane-growers' HH were non-indigenous farmers that had bought land from some of these indigenous farmers before the concept of the out-grower scheme was even anticipated. They reside in cities and operate remotely.

[5] See Rainer Gross, Hans Schoeneberger, Hans Pfeifer, Hans-Joachim A. Preuss (2000): The Four Dimensions of Food and Nutrition Security: Definitions and Concepts

Qualitative approach

Under the qualitative approach, in tandem with the survey, 4 key informant interviews were conducted with the Mazabuka District Agricultural officer, the district welfare officer under the Ministry of Community development, Zambia Sugar managing director, and Magobbo trust committee chairperson. In addition, two Focus Group Discussions (FGDs), one from each farmer category in which 6 farmers per group were in attendance, were conducted. Furthermore, a purposive sampling technique was also engaged in which 10 HH were interviewed. The selection process of HH to be interviewed was aided with the help of one knowledgeable local farmer who provided basic information about a chosen HH and the way about.

Furthermore, field observations were carried out which also helped to compile field pictures showing varying infrastructure and assets. Four farmers accompanied the process. This process was then preceded with reviewing of secondary data. The documents that were reviewed included National Agricultural Policy (NAP), National Agricultural Investment Plan (NAIP), Zambian Lands Policy, Agricultural Strategic Plan, Indaba for Agriculture Policy Research Institute (IAPRI) Policy briefs and Agricultural Regional Policy. In all, the field duration was from 14th August to 29th September.

Data analysis

Qualitative analysis began in the field. As the data was collected from the interviews and observations, notes and recordings were compiled and where possible farmers and key informants were asked to make sense of certain unclear information.

In essence, livelihood analysis uses wealthy ranking to analysis livelihood framework. But for this study, the two groups were used to represent two dichotomous variables where cane growers were treated as rich farmers and non-cane growers as poor farmers (Kalinda, 2014). The qualitative analysis and some descriptive analysis provided information pertaining to the livelihoods

Meanwhile, the quantitative analysis was used to determine the food security status of the two groups of farmers. To do this, the research followed a cross-sectional design. In order to estimate the conditions of food security of the farmers, a proxy indicator known as Household Dietary Diversity (HDD) was used. This approach goes beyond just measuring available calories by evaluating a household's ability to have access to a diverse nutritional adequacy. In 2011, FAO evaluated key approaches used in measuring food security between the period 1998-2011 which included the following: Dietary Intake Assessment (DIA) indeed more appropriate for measuring food access, Food Insecurity Experience-based Measurement Scales (FIEMS), Anthropometry, Household Expenditure Survey Method (HESM), FAO Method and Rapid Rural Appraisal (RRA) approach.[6] HDD, which became in principle the successor of DIA, stood superior because of its ability to measure "food consumption that reflects household access to a variety of foods" (Kennedy et al, 2011); which made it a better measure of food access (Swindale et al, 2006). In addition, it has the ability to show a snapshot socio-economic situation and can determine the household's capacity to procure a variety of foods (Kennedy, et al., 2011, Hatloy et al., 2000, Hoddinot and Yohannes, 2002, quoted by Saaka, 2013, Assenga and Kayuze, 2016). Therefore, it establishes an association between food security and dietary diversity.

The process began by asking the person responsible for preparing meals to list the foods consumed in the last 24 hours from the time of the interview. Then the foods were matched with their respective food groups according to table 3-1 below. The method was operationalized by establishing the Household Dietary Diversity Score (HDDS), which is determined by simply summing up the number of different food groups consumed. However, this method has no standardized internationally established cut-off point of determining whether a household is food secure or not (Ruel, 2002, 2003 quoted by Assenga and Kayuze, 2016). Instead, it is location specific and the type of food system in place. Therefore, to establish a threshold point, Assenga and Kayuze (2016) method was adopted in which a mean HDDS index – obtained by taking an average of total HDDS scores of both groups was used, and stood at 6.00. The study established two groups in each farmer category: a household was deemed food secure if the scores were above the mean HDDS and were deemed food insecure if scores were 6.00 and below the mean HDDS.

The table below shows the 12 food groups commonly used in the calculation of HDDS as adapted from Swindale, et al (2006) with little modification to suit with the local context.

[6] See Muhammad Khalid Bashir and Steven Schilizzi (2012): Measuring food security: Definitional sensitivity and implications; Australian Agricultural and Resource Economic Society, for more details.

Table 1: Food groups

a) Cereals	g) Fish and seafood
b) Root and tubers	h) Pulses/legumes/nuts
c) Vegetables	i) Milk and milk products
d) Fruits	j) Oil/fats K. Sugar/honey
e) Meat, poultry, offal	k) Sweets
f) Eggs	l) Spices, beverages

Source: Adapted from Swindale et al, 2006

SPSS version 23 and Microsoft excel were used to perform the analysis, and generated tables and graphs showing the comparisons between the two groups of concern

Under SPSS the study used Comparative Inferential Statistics and descriptive statistics to analyze the data. Unlike descriptive statistics that described the data through grafts, frequencies, cross tab etc., Inferential Statistics went further into examining the distances between the groups (cane and none-cane farmers) of particular interest. Independent two-Sample T- test was used to test whether the population means were significantly different from each other, using the means from randomly drawn samples.

In order to facilitate the use of Independent two-sample t – test, the following assumptions[7] were tested:

1. Continuous variable: the dependent variable should be measured in continuous or ordinal levels.

2. Independent variable: the independent variable should be categorical.

3. Independence: there should be no relationship between the observations in each group such that they should not influence each other.

4. Normal Distribution: the populations from which the samples have been drawn should be normally distributed for each group of the independent variable.

5. Homogeneity of Variance: The two populations must have equal variances, meaning the standard deviation of the population should be equal i.e. $\sigma X2 = \sigma Y2 = \sigma 2$, where $\sigma 2$ is unknown.

For this study, the independent variable (x) was participation in the out-grower scheme while the dependent variable (y) was food security (Food access).

This study hypothesized that food security status of cane-growers was the same with non-cane growers. To test this fact, two sets of hypotheses were constructed as follows: The null hypothesis stated that H_0: μ(Participants) = μ(Non-participants), which essentially meant that there was no significant difference between the food security of cane growers and non-cane growers. Meanwhile, the alternative hypothesis stated that H_1: μ(Participants) $\neq$ μ(Non-Participants), meaning there was a significant difference between the two groups.

In this study, the analysis was narrowed to two capitals namely Physical and Financial. These capitals were used to assess their use by the sugarcane growers and non-cane growers in achieving food security through the filters of policies, organizations and structures, and resilience to vulnerability factors. It should be noted that the study realizes the fact that people combine a range of capitals to achieve their desired outcome. As kollmair (2002) indicated, there is no single capital endowment that can yield sufficient outcome by itself. The two capitals were chosen for analysis purposes as they have a more direct influence on food security. The comparison is between the cane growers deemed rich and the non-cane growers deemed poor.

Livelihood analysis based on Physical and Financial capital

This section provides the analysis of livelihood based on the Physical and Financial capitals as components of livelihood framework.

[7] See https://statistics.laerd.com/statistical-guides/independent-t-test-statistical-guide.php

Physical capital

Physical capital was viewed from two perceptive. The first one was basic infrastructure composition and producer possessions needed to support livelihoods (DIFD, 1999). Basic infrastructure in this study comprised building structures and other assets, energy, and water sanitation. Secondly, livestock composed producer goods possessed by households required to support livelihood. It should be noted that the list is not exhaustive. These forms of assets were selected due to their direct influence towards food security and nutrition.

Building structures and other assets:

As the project was advancing in its implementation, a plan was developed to relocate the farmers that fell under the catchment area. The catchment area in this context is an area delineated for the production of Sugarcane. Before the coming of the project, most of the homesteads in this area were characterized with ancient ambiance; house structures covered with mud and grasses while yards mostly covered with twigs, usually running in battle with animals like Goats that liked nibbling the leaves. With the relocation money together with their increased income base from cane production, the cane growers had the opportunity to develop modern structures. Joy and satisfaction could be seeing in the eyes of farmers when they recalled the moments during the interview. Like one farmer said:

> *I could not believe myself to receive such an amount in my life…[ ]. It helped me build a house with burnt bricks and iron sheets, a plan that took me many years and was never realized in my old residence. But here I am. This scheme has made me build it. Look at it (jokingly teasing while pointing at the house).*

Even from the viewpoint of the researcher, it was observable that there was a massive change in the area. Moreover, having been born closer to the area, it was easier for the researcher to notice the tremendous transformation. Farmers upgraded their statuses, at least from the observational point of view, and infrastructure development was undoubtedly immense. Houses changed from thatched to iron roofs. In addition, other assets observed included: bicycles, fridges, planters, television sets, radios and vehicles in some households.

To the side of the non-cane growers, life was mere as usual. A significant number of them still lived under thatched roofs, with surroundings engulfed in ancient ambiance. Other assets observed included: simple tools like holes, picks, axes, and small radios. Furthermore, bicycles and ox carts were observed with some households though appeared old and dilapidated. The majority of such households belonged to widows and aged women who could not do anything else except hand-to-mouth agriculture production.. With the coming of the scheme, some farmers embraced the opportunity and motivated themselves to adjust accordingly. They were able to compete favorably with their counterparts both in tems of infrastructure and asset possession. Equally, items such as television sets, radios, hammer mills, and vehicles were observed. Most of these farmers were either agro-businessmen and women or local dealers. It was impressive to see how the few of them with more income sources were able to keep up with the cane growers.

Electricity:

Besides improvements in the housing structures, the farmers were enriched with the capacity to connect to electricity. Connection fees in Zambia are quite expensive, especially for farms. To connect a household, in places where a transformer or a single-phase line has been installed, the Electricity Company usually charges in the range of K 5000 to K 8000[8] (US$ 500 to US$ 800) for less than 50 meters distance per household. But in cases where the transformer is not installed, the cost could be as high as K 240,000 (US$ 24,000) for the same distance. Unlike the non-participants, power grid lines were already installed prior to the scheme in the cane residence. All that farmers had to do was to pay for individual connections. 60 percent of the farmers had connected to power, thus making it easy for them to carry out certain activities which they could not do when they did not have. For instance, one farmer mentioned:

> *"This electricity is a miracle. I am now able to store perishables like vegetables and meat products for an extended time without worrying of deterioration. I am able to quench my thirst with cool clean water than the warm contaminated water …[ ]"*

Nevertheless, not all cane farmers were closely located to the installed transformers. A few of them were located as far as 2km, this is a group that constituted the remaining 40 percent without electricity. To make that connection, on average, farmers were required to pay a total sum of about K 240,000[9] a similar dilemma for the non-participants. An inquiry to this fact was sort with the Trust on whether they had any plans to cushion farmers' connection cost. The Trust stated that negotiations with the ZS and ZESCO were already instigated. What remained was implementation. But one farmer said;

[8] 2015 ZESCO Quotation
[9] From the ZESCO quotation issued to the Trust

"[ ]……even if I am not connected to power, I am happy that my living standards have improved. I know the fact that I am located here, I have more chances of having power than my previous life"

When asked if they had any plans in the future, they equated the phenomenon to chasing an impossible dream. However, for those that dwelt near government institutions; a public clinic and a primary school, as well as a Catholic church, had the privilege to have power. In addition to this, the local dealers and agri-business personnel seized the opportunity and tapped electricity for both their businesses and homestead.

Water sanitation:

For the cane-growers, water availability was one of the creditable things they mentioned. They indicated that at least they were provided with pumped water from central locations, unlike the shallows wells they previously owned.

However, the farmers lamented of poor maintenance works being done on these boreholes. Pumps were breaking apart in some areas, and rust could evidently be seeing as water comes out, implying that the pipe linings were metallic and not polymer. When the committee was asked as to why this happened, they responded that they had no control over the installation of the pumps.

On the other hand, non-cane growers, the majority of them rely on shallow wells,. Cases of water contamination were reported to be a huge threat to their health because of partially covered wells and in some instants are located near latrines. Of course, boreholes are there but not as many as those under the cane farmers.

Livestock possession:

Livestock plays a critical role as an asset that farmers use to safeguard their livelihood. It is used mostly as an alternative means of income and food security especially in instances of crop failure and other income source disruptions. Livestock possession in this part of society is regarded as a measure of wealth status of a particular household or an individual.

In the study, the mean for each livestock category was determined and compared between the cane and non-cane-growers. However, it should be noted that of late, farmers lamented series of challenges in the livestock production, which included dried pasturelands due to droughts, diseases and limited land in the case of cane farmers. Therefore, the assumption above might not well be reflected in this situation.

Nonetheless a quick glance at table 1 revealed that the larger animals like cattle were dominant among the non-cane growers' holding on average 4 cattle per household compared to 2 cattle for the cane growers. This is because of the larger pieces of land the non-cane growers have in possession.

Table 1: Average livestock possession per household

	Cane-growers	Non-cane growers
Cattle	2	4
Goats	7	6
Sheep	1	1
Poultry	24	17
Pigs	2	1

Source: Household survey

Financial capital

This money comes in form of credit, savings, remittances, cash inflow, pensions etc. In this study, remittance, savings, credit, and debts were analyzed.

Remittance:

Cash transfers are a social protection mechanism; they reduce poor household vulnerability. During the study, varying patterns of remittances received between the two groups were observed. From figure 6-2, it can be seen that both groups recorded remittance as one of the contributors to their income sources. Meanwhile, between groups, cane growers recorded higher levels of remittance contribution standing at 57.1 percent compared to non-cane growers at 12.3 percent. The logic behind this assumption is that the older the head of the household, the more likely that he or she has older children working in cities and thus able to remit money back home. Of course, the research realizes the fact that there are several factors at play in this circumstance.

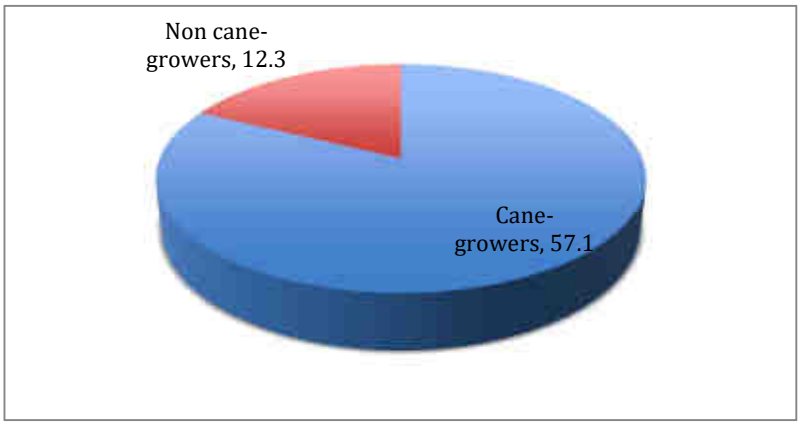

Figure 1: Remittances

Savings:

To cane growers, the monthly pay that is usually in the range of K5000 to K8000 (in good years) for the 6 hectares holders while K4000 to K 6000 for the 4 hectares, was kept in banks if they had no immediate use for it. However, the majority of them mentioned that the money was usually converted into assets such as housing materials, furniture or buying animals, as well as taking children to schools, meeting medical costs and purchasing of food.

Conversely, others especially the non-cane growers expressed shock at the question. Most of them rely on agriculture, particularly crop production and wage earning for their livelihood. Wage earning more or less contributed an equal percentage of the farmers' income held. The wages are usually obtained from working as casual workers in nearby commercial farms including in sugarcane fields. On average, income levels for the non-cane growers was reported to range from K700 (US$70) to as high as K7000 (US$700) per month from wages, remittances and sale of maize, vegetables, and small ruminants like pigs and goats, and poultry. The income flow, however, depended heavily on the farmers' capital endowment and level of engagement in alternative means. One non cane farmer said:

> *" my brother how can you still have money when what I get every season is peanuts? As soon as any money is available, it is consumed there and then either through purchasing of food or other things. Sometimes I struggle to meet education and health bills. I don't have the luxury of keeping savings. If that opportunity was there, I could have bought a car by now (jokingly saying)*

Credit and Debt:

All the respondents (cane and non-cane) acknowledged the presence of credit facilities in close proximity. But they mentioned that their presence meant nothing to them because funds were inaccessible due to high interest rates and lack of collateral. Instead, they opted for a locally arranged system commonly called 'Kaloba'. This works more or less like financial lending institutions. Unlike financial institutions, loans are obtained from close friends who entrust each other's money to be paid within some agreed period of time. Despite them attracting exorbitant interests, which would be as high as 100 percent, they opt for this choice because there is no collateral demanded and payments are usually flexible. Some local entrepreneurs and few lucrative farmers, who saw an opportunity following the increased borrowing rate of money especially cane farmers, initiated the program. It was intriguing to note that cane growers were even the ones on the top of the borrowing chart. This could be attributed to the fact that when income levels started to dwindle due to sudden unexplained reduction in their monthly pay from K 18,000 and K12,000 for 6 and 4 hectares respectively in 2011 to K 6000 and K 4000 in 2015, the farmers couldn't cope with the declines. The reduction was so enormous, thus farmers found themselves borrowing more money to meet their established standards of living. The scenario, thus, stirred up conflicts between the farmers and the Trust in 2015. Soon the glory days once experienced by farmers slowly began to disappear, they reflected. During the interviews, farmers mentioned that the amounts of food procured started to reduce in return, and thus 'Kaloba' became an immediate source of survival.

Off-farm activities

The main form of off-farm activities that the people of Magobbo mentioned was waged labor. Few of them found agriculture production stressful, and though they had land, opted to earn money elsewhere. The most common place of work is on commercial farms. Four major commercial farms surround the village

namely; Nanga farms, Lano, Clint, and Jacaranda. The distances to these farms from the villages range from 1Km to as far as 9Km. It is however interesting to note that the scheme is the closest of all to the people of Magobbo with distances less than 1Km and yet very few people are employed in it. Majority of the workforce comes from nearby villages, most Nanga.

When ZS was asked to respond to this matter, it said that people of Magobbo were lazy and thus the decision to get outsiders. The company was requested to respond to this inconsistency amid a huge number of local young people travelling long distances in search for jobs in nearby farms. Unfortunately, it expressed ignorance on this matter. But from the researcher's analysis, it was clear that the recruitment exercise deliberately excluded the People of Magobbo because Nanga farms – subcontracted to provide services, the fact that it was located in Nanga village, gave people of Nanga priority over the Magobbos'. The reason corresponded to the farmers' statement when they said most of the people employed in the scheme belonged to areas closer to either ZS or Nanga farms.

Nevertheless, working on these farms is not easy some farmers mentioned. They mentioned that the main tasks and responsibilities they are engaged in are crop management activities such as weeding, digging, irrigation and spraying that require muscle strain. When asked why they opted for this nature of job when they could have expended that energy on their abandoned pieces of land. The question received mixed feelings. To some, they expressed willingness of engaging in farming but lamented constraints such as costly inputs like fertilizer and pesticides, and lack of irrigation infrastructure to support all year round cultivation as well as capital and implements. While others thought working for commercial farms was more rewarding than farming after considering the climatic challenges.

Petty businesses

Petty business in this context is a small level business engaged by the community members that do not necessary require an established trading center with structures and is not bound to obligations such as trade taxes and corporate responsibilities. In simple terms, it is a small business that people especially rural poor engage in to sustain their livelihood in a situation where more lucrative ventures become unattainable due to lack of capital and other mediums. Roadside selling, opportunity chancing, and door-to-door services characterize this nature of business.

The common form of petty business practiced is charcoal and wood selling. Males usually dominate charcoal selling and delivery is mainly through door-to-door service. While females typically dominate in wood selling, and unlike males, their business demands specific location. The village has fewer forests or trees to support such a business, and therefore the people have to travel long distances to collect wood, usually in private lands that in most cases the practice is illegal and usually run risks of legal implications. The wood is usually carried to the selling points on heads in case of women and on bicycles for men. It is not an easy venture from observation. Besides jail sentencing, the people usually face risks of being attacked by wild animals.

However, it is a survival strategy farmers mentioned. Most of the farmers interviewed indicated that they found themselves with this nature of the business when the climatic challenges became immense. Like one farmer mentioned:

> *" My brother, I could not withstand watch my family go hungry every time I experience crop failures due to poor rains. Therefore, I had to start selling wood, tough as it is, I had no choice.[ ]. I had to….[ ]").*

The other form of petty business is collecting and selling wild fruits. Of course, this nature of the business is seasonal as it is dependent on the time wild fruits produce their fruits. The common fruits collected include 'Masuku and Mbubu'. Female-headed households usually practice this business. Besides wild fruits, these women also engage in selling roasted maize and groundnuts, equally seasonal in nature. During the selling season, the women set temporary location spots usually dependent on the demand for that commodity. Typically, they take advantage of public events such as agricultural shows, farmers' day and sports day as well as local events as demanded by the local leadership.

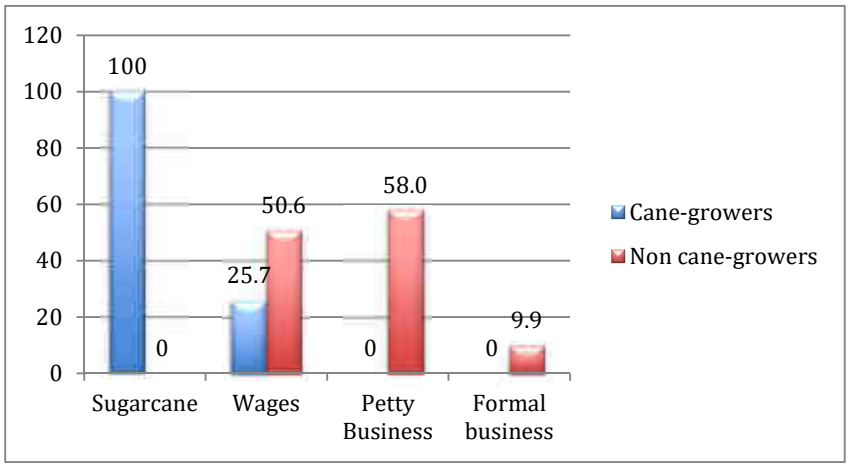

Figure 1: Livelihood Strategies

Vulnerabilities

Vulnerabilities are risks people tend to be exposed by virtue of being framed in the external environment. The people's livelihood systems tend to be exposed to factors such as 'shocks, trends and seasonality' (DFID, 1999) in which they have limited or no control over them. How their livelihood systems cope and adapt to these risk is of utmost importance to comprehend. In this study, two prominent factors were noted: Droughts and Price fluctuation.

Droughts:

In past few decades, the southern part of the country where Magobbo is situated has been experiencing erratic supply of rainfall. The supplies are usually between 500 to 700 mm of rainfall far less from 800 to 900mm that used to be experienced some 10 years ago (GRZ Met report, 2015). Drought spells in this area have become eminent such that agricultural production is now viewed as a risk activity. It is for this reason that many of the farmers have been forced to engage in alternative means of survival such as becoming cane growers, intensifying off-farm activities and petty businesses – discussed at length in the previous section.

When a comparison was made between the two categories of farmers, the cane growers exhibited high coping levels than the non-cane growers. Obviously, much of it was attributed to the fact that their resource base was much higher, enough to assume shocks than the non-cane growers. Even if the non-cane growers' portrayed multiple engagements in alternatives, their total capacity could not be compared to the cane growers.

During the study, it was observed that at the center of the village, there was a dam belonging to one of the commercial farmers in the area. This dam could provide fishing opportunities for the farmers in times like this. In addition, the dam could be a good source of water for irrigation to nearby gardening activities. However, as it is privately owned, the locals are not allowed to use the water from the dam regardless of purpose. This is due to fears of clogging the dam. The excuse, of course, sounded ridiculous especially when considering the fact that it is located right in the heart of the village conglomerated by non-cane growers; and perhaps this could have been an appropriate 'social corporate responsibility' for villagers. As a matter of fact, such a gesture could have worked for the better for as long as protection and management mechanisms were agreed upon and put in place to prevent fears.

Prices:

However, cane growers had their own unique challenge, price fluctuations. Even though prices of commodities such as maize, cowpeas, and soybeans, which also affected non-cane growers, faced peaks and troughs moments, the fluctuations associated with sugarcane were more threatening, adequate enough to expose a household to food and livelihood insecurity risks. Despite the positive shock from the sudden increments in their resource base for a moment, they now faced a downward force enough to pull the most lucrative farmer into the syndrome of dependency and create a search avenue for alternatives. This trend was mainly brought about the sudden dwindling monthly payments sadly generated conflicts and mistrust between the farmers and ZS via the umbrellas of the Trust. The farmers began to think that the problem could perpetuate and thus others began to think of terminating the contracts before more losses were incurred.

Food security as an outcome of livelihood strategies

This section presents the quantitative analysis on food security of cane and non-cane growers as an outcome of livelihood strategies. The first part illustrates the HDDS threshold while the second part shows the analysis of the food density of each food group between the two categories of the farmers. The third part presents the analysis of the independent sample t-test. The section concludes with the analysis of the associations between participation and demographic factors.

HDDS threshold

To facilitate the process, the concept known as HDD was used as a proxy measure of food security because of its ability to assess household accessibility to a diverse nutritional adequacy (Willy et al, 2016, Assenga and Kayuze, 2016). The process began by generating HDD scores in SPSS and Excel. The scores were then used to generate two set of information. The first set was to determine the food security threshold, which ultimately assisted in establishing food security status of the respective farmer groups. The threshold cutoff point, also known as the mean HDDS point was tagged at 6.00. It was determined by taking the mean score of the total HDDS indexes from both groups.

Table 2: HDDS threshold point

Category	**HH**	**Food Secure@ 6.00**		**Food Insecure@ 6.00**	
		N	(%)	N	(%)
Cane-growers	70	52	74.3	18	25.7
Non Cane-growers	81	38	46.9	43	53.1

Source: Household survey

From the table above, cane growers recorded 52 cases of food secure households representing 74.3 percent, while 18 households representing 25.7 percent were food insecure. Meanwhile, 38 percent of non-cane growers representing 46.9 percent were food secure while 43 HH represented by 53.1 percent were food insecure. This clearly showed that cane-growers were more food secure with 74.3 percent than the non-cane farmers with 46.9 percent at the HDDS mean thresholds.

Food density

The second set of information generated food group densities. The process was essential as it showed score distribution for each food group, which thereafter illustrated the most consumed food group by each farmer cluster at the prescribed time.

Table 3: Score density of each food group

	Cane-growers		**Non-cane growers**	
	N	**(%)**	**N**	**(%)**
Cereals	70	100	81	100
White tubers and roots	3	4.3	5	6.2
Vegetables	66	94.3	81	100
Fruits	2	2.9	2	2.5
Meat	20	28.6	12	14.8
Eggs	5	7.1	11	13.6
Fish and other sea foods	34	48.6	26	32.1
Legumes, nuts and seed	20	28.6	26	32.1
Milk and Milk products	11	15.7	13	16.0
Oils and fats	65	92.9	69	85.2
Sweets	56	80	35	43.2
Spices, condiments, and beverages	70	100	80	98.8

Source: Household survey

The table 3 shows that Cereals recorded the highest scores in both groups. This is attributed to 'Nshima'- maize based thick porridge of a sort, which is the country's stable food. Under the cane category, spices, condiments, and beverages ranked the first with 100 percent, besides cereals. Then vegetables seconded with 94.3 percent while oils and fats with 92.9 percent ranked third. Meanwhile, sweets with 80 percent –

mainly composed of Sugar, Cakes and candies ranked fourth. This was followed by Fish and other seafood with 48.6 percent, meat and legumes, nuts and seed with 28.6 percent, Milk and Milk products with 15.7 percent, Eggs with 7.1 percent, white tubers and roots with 4.3 percent and lastly Fruits with 2.9 percent.

Under the non-cane category, besides cereals, vegetables ranked first with 100 percent, followed by spices, condiments, and beverages with 98.8 percent ranking second while oils and fats with 85.2 percent ranked third. This was followed by sweets with 43.2 percent at fourth position, then by fish and other seafood and legumes, nuts and seed with 32.1 percent, milk and milk products followed with 16.0 percent, meat with 14.8 percent, eggs with 13.6 percent, white tubers and roots with 6.2 and lastly fruits with 2.5 percent.

From simple observation, it would be challenging to establish if the two groups are even different after all from each other in the cycles of food security when considering the fact that, though cane growers portraying dominance over the non-cane growers, both groups seemed to have similar food group ranking. To prove this fact, an Independent sample two t-test was employed using SPSS to assess the two groups statistical differences. The sub-subsection below presents the analysis of independent sample t-test.

Independent sample two t –test

An independent sample t-test is an inferential statistical test that determines whether there is a statistically significant difference between the means of two unrelated groups. Summation scores might portray some push for the unverified subjective conclusion, which in an actual sense would show a different direction. Therefore, an independent sample t-test is employed to prove that fact. To facilitate the analysis, HDDS were used as a dependent variable while participation in the out-grower scheme was used as a categorical variable (independent variable).

The process began by ensuring that the data conformed to five (5) critical assumptions of Independent t-test. (See *Methodology above for explanation of assumptions).* The first three assumptions were pretty easy to verify because their verification didn't warrant statistical proof. Only when it came to assumptions four and five did statistical verification done. Assumption testing was performed in a sequential style in order to ensure that the data passed each stage before proceeding to the next. This procedure was essential as it prevented making erroneous conclusions on the final results. The discussion below presents the testing procedures done on assumptions four and five, and ultimately the determination of conclusion.

Assumption four:

This assumption was employed to check for normality in the data. In other words, the population distribution of one group was compared with the other group. The aim was to assess the location of the median of one group in relation to the other. To carry out this process, Shapiro-Wilk and Kolmogorov-Smirnov tests were employed to assess normality. Table 3 was generated and produced both values of Shapiro-Wilk and Kolmogorov-Smirnov as shown below. To aid analysis, an alpha value was established which helped to determine whether the data had met the assumption requirement or not. The alpha was tagged at: if the **Sig.** of Kolmogorov-Smirnov or Shapiro-Wilk < 0.05, then the data was not going to be normally distributed. But if Sig. of Kolmogorov-Smirnov or Shapiro-Wilk > 0.05, then the data was to be deemed normal. From table 3 it can be seen that the Sig values were less than 0.05, meaning the data was not normally distributed. The implication to this was that if ignored, the final result in step five would not reflect the true conclusion.

Table 4: Test of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Type of farmer	Statistic	df	Sig.	Statistic	df	Sig.
Household Dietary Diversity Score	Non-cane	.167	81	.000	.926	81	.000
	Cane	.240	70	.000	.902	70	.000

a. Lilliefors Significance Correction

Source: Household survey

To solve this dilemma, Mann-Whitney test was employed to determine if the two groups were statistically different from each other amid violated assumption on normality. Mann-Whitney tests allowed for maneuver to make different conclusions about the data, in the case where the population medians of two groups differed between each other. Nonetheless, the median mismatch was already predetermined in the normality test. Therefore, the Mann-Whitney test allowed the research to use mean ranking instead of median to deduce conclusions. The discussion below shows how the Mann-Whitney test was conducted. The process involved performing three steps as follows:

The first stage involved determining of Hypotheses; Null (H_o) and Alternative (H_1) hypothesis which are illustrated below.

H_o: There is no difference between the ranks of the two treatments

H_1: There is a difference between the ranks of the two treatments

Then, the alpha value to assess whether to accept or reject the null hypothesis was tagged at 0.05. If $p < 0.05$, then H_o is rejected. In addition, the critical value of plus/minus of 1.96 was obtained from the z-table to concretize the decision. The conditions set for this one was that, if z value is less than – 1.96 or greater than 1.96, the null hypothesis was to be rejected and thereafter acceptance of the alternative.

The final stage involved computing and generation of the Rank and test statistics tables respectively.

The Rank table below shows the number of cases analyzed in relation to participation in Sugarcane production. 70 Cane growers and 81 Non-cane growers were reported amounting to 151 cases. The table also shows the mean rank values of the two groups (Noncane-growers and cane-growers) standing at 67.65 and 85.66 respectively. (Note: These mean rank values should not be confused with the HDDS mean scores). The 'Sum of ranks' is the aggregation of HDD scores of 5479.50 and 5996.50 for Cane and Non-cane growers respectively. The rank table evidently depicted that HDDS rank mean locations were actually different between the two groups.

Table 5: Rank table

	Type of farmer	N	Mean Rank	Sum of Ranks
Household Dietary Diversity Score	Non-cane	81	67.65	5479.50
	Cane	70	85.66	5996.50
	Total	151		

Source: Household survey

The test statistics table below tested for significant difference between the cane growers and the non-cane growers. In relation to the parameters set above, it was observed that z = -2.598 was less than -1.96 and correspondingly p-value = 0.009 was less than 0.05. The implication to this effect was the rejection of the null hypothesis and acceptance of the alternative. Therefore, this meant that the two groups were significantly different despite issues of normality and thus warranted progress to the next assumption.

Table 6: Test Statistics table

	Household Dietary Diversity Score
Mann-Whitney U	2158.500
Wilcoxon W	5479.500
Z	-2.598
Asymp. Sig. (2-tailed)	.009

a. Grouping Variable: Are you a cane grower?

Source: Household survey

Assumption five:

Having completed verifying the data in the previous stages, it was now time to analyze the independent sample t test. But before this could be determined, the data was tested for homogeneous. To do this, Leneve's test at 95 % Confidence Interval was used to assess the level of 'homogeneity of variance'. Two hypotheses, the null and alternative, were constructed. A detailed discussion is presented below.

The group statistics table below highlights basic information pertaining to group composition and general characteristics. The table shows that there were 70 cane growers and 81 non-cane growers in the analysis. In addition, it also shows the HDDS mean values in relation to each group i.e., 6.03 HDDS mean for cane growers and 5.44 for non-cane growers. From this table, it was observed that the average HDDS for the cane growers was higher than for those not involved in cane production.

Table 7: Group Statistics

	Type of farmer	N	Mean	Std. Deviation	Std. Error Mean
Household Dietary Diversity Score	Cane	70	6.03	1.021	.122
	Non cane	81	5.44	1.378	.153

Source: Household survey

Table 7 below shows the analysis of independent sample t-test. In it, two parts are recognized, the Levene's Test for Equality of Variances and t-test for Equality of Means. Levene's Test for Equality of Variances assesses the assumption of homogeneity of variance. Under this test, *F*-statistic and a significance value (*p*-value) are produced and provide the basis for analysis. Of importance in this analysis is the p-value. Levene's Test involved the construction of the two hypotheses as follows:

H_o: there is no statistically significant difference in the variances between the cane growers and non-cane growers.

H_1: there is statistically significant difference in the variances between the cane growers and non-cane growers.

The alpha value was tagged at 0.05. That meant, if the p value was greater than 0.05, meaning $p > 0.05$, then the groups were to be regarded as being homogenous, and conclusion would be made at this stage. But if not, then they would be regarded as non-homogenous and alternative methods would be employed. From the table, it can be seen that the $p = 0.00$ was less than 0.05. That meant the data violated the assumption of homogeneity. In this case, an adjustment to the degrees of freedom using the Welch-Satterthwaite method was employed. This simply meant that instead of focusing on the **"Equal variances assumed"** values (pooled mean) to draw a conclusion, the attention was on the column **"Equal variances not assumed"** and Sig. (2 tailed).

From table 7, it can be seen $p = 0.03$ was less than 0.05. The implication was that the null hypothesis had to be rejected and alternative hypothesis accepted which entailed that there was the statistically significant difference in the variances between the cane-growers and the non-cane growers. In simplicity, it meant the HDDS means for Cane and the Non-cane growers were different. To confirm this observation further, Confidence Intervals (Cls) were assessed. The rule behind was that if CIs values were not zeros, then the decision to reject the null hypothesis would be affirmed, but if the CIs values were zeros, then the study would have failed to reject the null hypothesis. Nonetheless, the Cls values contained no zeros (0.197; 0.971), and thus meant that the results were significant at 95%. The finding also correlated with the conclusion that was drawn in the Mann-Whitney test and thereby giving confidence in concluding that the means of the two groups were indeed different. In sum, after controlling the HDD scores data for heteroscedasticity and outliers, the data was found to be significantly different at 95 percent. The research found that on average, the cane growers (6.03 ± 1.02) had higher Household Dietary Diversity scoring than the non-cane growers (5.44 ± 1.38) at 95% CI, ($t_{145.73} = 2.983$, $p = .0.003$).

Table 8: Independent Sample T Test

			Household Dietary Diversity Scores	
			Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F		17.741	
	Sig.		0.000	
t-test for Equality of Means	t		2.920	2.983
	df		149	145.729
	Sig. (2-tailed)		0.04	0.03
	Mean Difference		0.584	0.584
	Std. Error Difference		0.200	0.196
	95% Confidence Interval of the Difference	Lower	0.189	0.197
		Upper	0.979	0.971

Source: Household survey

Analysis of Association

An extra mile was then taken to evaluate the data for the association between participation in the scheme and parameters that included: Age, Gender, Marital status, Education, HH size, Distance to nearest

Market, Participation in FISP and FG. The essence of this exercise was aimed at seeing if any of these parameters had significant association with the groups such that their association would be interpreted as having the possibility of influencing food security statuses. To facilitate the testing, the Chi-square for categorical variables and independent sample t-test for continuous variables were employed. Note: *the independent sample t-test at this stage was measuring association and not difference, as is the case in table 8 above.*

The two hypotheses were as follows:

H_o: There is no statistical significant association between participation and the parameters

H_1: There is statistical significant association between participation and the parameters

The alpha value was set at 0.05 in which the null hypothesis would be rejected should p-value become less than the alpha value and subsequently accepting the alternative hypothesis.

Table 9: Participation against demographic factors

	Demo factors	**Pearson Chi-square value**	**Asymptotic significance (2-sided)**
Chi-square test	Gender	0.003	0.954
	Marital status	4.62	0.205
	Education	2.98	0.395
	FRA	0.036	0.849
	FISP	19.356	0.000*
	FG	96.504	0.000*
		Levene's Test F value	Sig. value
T-test	Age	0.001	0.972
	Stay	0.093	0.761
	HH size	0.196	0.658
	Market (2 -tailed)	-1.157	0.249

Confidence level at 95%
Source: Household survey

Table 9 shows both the chi-square and t-test analysis. Under the chi-square analysis, the results showed that χ(Gender) = 0.003, p = 0.954; χ(Marital status) = 4.62, p = 0.205; χ(education) = 2.98, p = 0.395; and χ(FRA) = 0.036, p = 0.849; had p-values more than the alpha value at 0.05. Therefore, the study failed to reject the null hypothesis, which meant that there was no statistically significance association between participation in the scheme and the parameters. However, χ(FISP) = 19.356, p = 0.000 and χ(FG) = 96.504, p = 0.000 were both less than 0.05. Meaning, the null hypothesis was rejected and alternative accepted. In simple terms, there was an association between participation in the FISP, FG, and participation in the Scheme. Therefore, besides participating in the scheme, being members of FISP and FG might have some probability of influencing food security status of cane growers.

Equally, independent sample t-test was run to test for association. Holding the assumptions and hypothesis established above, the study also failed to reject the null hypothesis. Consequently, parameters Age (t_{149} = 0.001, p = 0.972), Duration of stay (t_{148} = 0.093, p = 0.761), HH size (t_{149} = 0.196, p = 0.658) and distance to the nearest market (t_{149}= 1.157, p = 0.249) had no association with participation in the scheme. Meaning, there were no significant association between participation and farmer category that would explain substantial influence on food security statuses.

Food security

The quantitative analysis revealed that the food security (food access) was exceptionally better for the cane growers than the non-cane growers. The finding could be viewed from four perceptive as highlighted below. Firstly, the HDDS analysis provided evidence that at 6.00 HDD index, the food security of cane growers' was higher standing at 74.3 percent than non-cane growers at 46.9 percent. Equally, from the perceptive of food insecurity, non-cane growers ranked first with records of 53.1 percent than cane growers at only 25.7 percent. Therefore, in implicit terms, cane growers exhibited high-level ability to have access to diverse foods compared to non-cane growers.

Secondly, when food density (*see table 3*) is considered, cane farmers still dominated, though showed similarities in food ranking, in such food groups as Sweets – mainly cakes, candies; meat; fish and oils, which illustrated cane-growers' endowed high buying power standpoint, and thus in economic terms income superiority. However, non-cane growers also portrayed some dominance in food groups such as Eggs and Vegetable. This is because, in the case of vegetables, locally available leaves such as rape, pumpkins, cassava and sweet potatoes leaves as well as wild leaves locally known as 'Bbuyu' and 'Kanunka' constituted the largest

proportion of vegetables. Much of the local vegetables were grown in farmers' backyards and could be argued that their dominance among non-cane growers was attributed to the fact that, because of financial limitations, non-cane growers found themselves maximizing production of these commodities due to their medium to the low cost of production involved. The same could be said with Eggs in which, due to financial constraints, the non-cane growers relied on consuming backyard-raised chickens eggs - usually domestic breeds. At this point, the analysis became contentious because it could be argued that increased income results in people increasing the consumption of unhealthy foods as shown with the cane growers. Well, the scope to determine which group of farmers had access to nutritious food is beyond this study.

Lastly, it was observed that many cane-growers recorded high participation in FISP and FG. Participation in FISP and FG meant that cane farmers had access to subsidized inputs and information pertaining to farm production, nutrition, storage, agro-finance etc., and other interventions such as field demonstrations for crops. This could perhaps explain why crop production per unit of cane growers was more compared to the non-cane growers. On average, each cane farmer household produced, for instance, maize – 569.56 Kg on 0.87ha (0.65ton/ha) compared to non-cane growers with 548.99kg on even much larger area of 1.29ha (0.43ton/ha) (see table A-1). But it should be noted that in terms of the total production, non-cane growers dominated because of their numbers. If recalled, not every cane grower was involved in the production. Instead food supply was through purchases from supermarkets, and unfortunately, it is this type of farmers that were a trapped in the income dependency syndrome. Either way, at the household level, cane growers had more food at their disposal either for consumption or sale.

However, both categories fell to meet the country's production standards in crops like sweet potatoes, soybeans. According to Ministry of Agriculture of Zambia (GRZ CFS report, 2015) small-scale farmers countrywide record on average 2 to 5 metric tones of maize per hectare. This could have been attributed to persistent dry spells cases in the area as indicated by some farmers during the interviews. Thus this gives a proper justification for farmers to be cane growers.

The findings were in conformity with the livelihood analysis as well as the findings from the studies of Rocca, Matenga, Schüpbach (2014) who reported that farmers in the scheme experienced life change turning point when compared to the non-participants.

Conclusion

The study revealed that those in the scheme were far better off than those outside, with an exception of few non-cane farmers who engaged in entrepreneurship and other income generating activities. Participating in the scheme was a better option in ensuring improved livelihood and food security especially in the contemporary times of Climate Change.

In addition, the program can be motivated to incorporate structures of maize production and other crops so that even the most vulnerable farmers can benefit from the concept. The out-grower concept can take advantage of the climatic challenges farmers face such as erratic rainfall and floods especially in productive regions of the country: Southern, Eastern, and Western.

Therefore, it is recommended that the FISP program should be extended to the non-cane growers as well, especially to widowed and/or most vulnerable households. Their exclusion from the program was mainly attributed to poor targeting and bias by the program design (GRZ CFS report, 2015). Participation in FGs is locally arranged and is dependent on farmers' willingness.

Lastly, one of the prominent challenges the cane growers mentioned was dwindling monthly pays. Perhaps one way farmers' income can be improved is by redirecting some services being provided by Nanga farms such as weeding and application of pesticides to farmers so that the money meant to pay the contracting firm is instead channelled to farmers.

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