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AGRICULTURAL AID TO SMALLHOLDER FARMERS AND FOOD SECURITY IN CAMEROON

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Abstract

This study is aimed at analyzing the effects of agricultural aid to smallholder farmers on food security in Cameroon, the case of Santa Subdivision. Data was collected using questionnaires administered to 202 smallholder farmers from simple random sampling and purposive sampling techniques. Analysis was done using descriptive statistics, logistic model and covariance matrix. The results on the socioeconomic characteristics of smallholder farmers revealed that the majority of smallholder farmers' aid beneficiaries were mostly educated married men. Results from the logistic regression showed that, agricultural aid is strongly correlating with food security, while the covariance matrix revealed that the major constraints faced by smallholder farmers are: access to farms, farm to market infrastructure, storage facilities, access to credit and application of agricultural inputs. Policy aiming at improving farmers' access to agricultural inputs, infrastructure, capacity building, participatory management and access to credits will accelerate agricultural production in Cameroon.

Key Words: Agricultural Aid, Smallholder Farmers, food security, Cameroon

INTRODUCTION

Agricultural development is critical to achieving the goal of reducing poverty and hunger. With an estimated 850 million people worldwide who are undernourished and a growing global population, it is expected that the demand for food will continue to increase (FAO, 2013). Agriculture is facing new and severe challenges resulting to rising food prices that have pushed over 40 million people into poverty in 2010 (World Bank, 2011), more effective interventions are therefore essential in agriculture. The growing global population, expected to hit 9 billion by 2050, has heightened the demand for food and placed pressure on the already fragile resources. Feeding such a population will require 70 percent increase in food production (FAO, 2009). Agriculture faces a range of modern and serious challenges, particularly in developing countries exposed to price shocks, climate change, and continued deficiencies in infrastructure in rural areas that requires development. In fact, agriculture is around four times more effective at raising incomes among the poor than other sectors (Reuben, 2014). In addition, improved agriculture has a direct impact on hunger and malnutrition, especially in decreasing the occurrences of famine, child stunting and maternal infirmity. To overcome malnutrition, the government of Cameroon has set up two centers for fingering production and a center for the production of fish feed to boost aquaculture production in the country and curb the importation of frozen fish (Hervé et al., 2014). Furthermore, the Government recently constructed many roads which link Cameroon to other countries of the sub region, thereby making it easy for food to be exported to neighboring countries. Several laws have been adopted to improve the legal framework for land tenure, the management of "national" land and conditions for obtaining land titles and land registration. These laws also revisited the legal framework for seed businesses in terms of varietal improvement, guaranteeing seed quality and preservation of national plant genetic resources. The Fertilizer Law governs the fertilizer sub-sector and provides guidance on production, import, export, packaging, distribution and use of fertilizer. Similarly, other laws regulate animal health and inspection, the management of forests, wildlife, water resources and fisheries. The Government of Cameroon also set up a network of parliamentarians united in the fight against malnutrition. The Government subscribed to the "Scaling-Up Nutrition" initiative and set up a private sector network in 2013 to support specific interventions within this initiative. It set up an Inter-

Ministerial Committee on the fight against malnutrition and in 2014 she adopted a roadmap for the reduction of chronic malnutrition (Reuben, 2014).

Despite these efforts, agriculture is widely seen as underperforming (World Bank, 2007), whereas 80 percent of the rural population directly or indirectly depend on agriculture as their main source of income and employment (International Finance Corporation (IFC), 2011). These smallholders also play a key role in increasing food supplies, more so than large farms in the cities. Despite their socioeconomic importance, smallholders tend to have little or no access to formal credit which limits their capacity to invest in the technologies and inputs they need to increase their yields and incomes and reduce hunger and poverty. Even with the improvements that have been done in recent year's large percentage of people who depend on farming for a living are in poverty. Income gaps between farm and non-farm households are wide and a too-high percentage of both rural and urban populations suffer from malnutrition and food insecurity. According to Ngongi (2010), smallholder farmers produce most of Africa's food and often, they will do this with minimal resources and little support, without good seeds, fertile soils, finances and good policies. Without these basic necessities, African agriculture has fallen far behind that of every other continent and yields have remained at one-quarter the global average. Cameroon probably has not escaped this trend, for though it has vast stretches of arable land, fertile soils, and good rainfall. But what the country gets back from these natural assets is not good enough to feed its growing population. According to Seville et al (2011), decades of underinvestment mean that small-scale producers in low and middle income countries like Cameroon often operate in areas with inadequate infrastructure (roads, electricity, irrigation and wholesale markets). They have inadequate skills and services (training, credit, inputs) and are highly dependent on favorable weather conditions. The producer holds a very important part in ensuring food security and it is essential to support the producer in his production, storage and marketing. So many projects have been and are being put in place in the rural areas of Cameroon to ensure the development of agriculture and food security. As years go by, new projects are coming up, yet the state of agriculture in the rural areas is deteriorating and causing food insecurity. More so, although agriculture is the main stay of this area, the area still faces many difficulties as far as crop production is concerned. Most of the crops produced in this area are perishable and their prices always fluctuate, making the income of the farmers unstable. The poor farm to market road network, high cost of transportation and absence of good storage facilities, still act as a constraint for the rural masses from assessing urban areas with their harvested crops (FAO, 2008). To resolve this issue, this study aim to answer the following questions: what are the socio-economic characteristics of smallholder farmers in Cameroon? What is the actual effect of agricultural aid on food security? What is the nature of the aid offered to smallholder farmers and its importance to smallholder farmers? What are the Constraints faced by smallholder farmers in their production process? And what socioeconomic policy can be derived on the basis of our findings?

Agricultural aid and challenges of smallholder farmers: Within the context of this study, smallholder farm is any piece of land or small plantation used for the cultivation of crops, vegetables or the breeding of animals, while agricultural aid refers to any help, assistance, succor or relief given to a farmer with the aim of increasing agricultural productivity, this may either be in cash or in kind. With the right conditions, smallholders can be at the forefront of a transformation in world agriculture. With their immense collective experience and intimate knowledge of local conditions, smallholders hold many of the practical solutions that can help place agriculture on a more sustainable and equitable footing (IFAD and UNEP, 2013). To do this, they need help to overcome market failures and other disincentives for sustainable land use, including insecure land tenure, high transaction costs and weak institutional support. A major challenge will be to address the discrepancies of scale between decisions made at the farm level and impacts at larger ecosystem scales (IFAD and UNEP, 2013). Cargil (2014) in a study on the important role of governments in achieving food security brought out the part played by governments in ensuring agricultural development. According to the study, public sector support for research and development, enhancements in agricultural infrastructure and support of open trade all contribute to increased food security. This can be better done by; enabling open markets, supporting smallholder farmers, investing in agriculture, harmonizing food safety standards, reforming biofuels mandates, reducing environmental impact, and facilitating emergency food aid. From this point of view, governments, civil society, academia and the private sector must all work together toward solutions to help smallholder farmers fulfill their expanding role in feeding the hungry and fighting malnutrition by providing training and practical support, establishing revenue certainty, managing risk and clarifying poverty rights. Smallholder farmers need training in agricultural best practices and access to inputs, credit, storage and technology to increase their productivity in a sustainable way, which raises their own living standards and produces surpluses to help nourish others.

Smallholder farmers often are forced to sell at harvest when they are cash flow destitute and have limited access to real credit. Selling at depressed prices creates a cycle of discouraging further production in future years. Smallholder farmers in developing countries need reliable markets to sell

their crops each season and an adequate price to compensate for their efforts and provide incentive to continue production. These smallholder farmers need aid from donors, civil society organizations and governments by establishing and maintaining good agricultural policies that include revenue assurance programs, such as guaranteed prices that may require supplemental payments in difficult years, working with the private sector to support producer associations or price pooling cooperatives, which give farmers improved access to markets and greater leverage in pricing their products, providing revenue safety nets and encouraging the private sector to provide price assurances through their contracts with farmers. To facilitate smallholders' activity, Bader et al (2013) pointed out several agricultural aids intervention strategies that enhance the role of smallholder farmers in food security and nutrition. These strategies involve the: promotion of homestead food production, promotion of micronutrient-rich crop varieties, promotion of biodiversity and sustainable agricultural practices, improvement of post-harvest handling, empowerment of women smallholder farmers, "do no harm" principles and provision of nutrition education. According to Bader et al (2013) for all these interventions to have real impacts on smallholder farmers' nutrition, they need to be participatory.

LITERATURE REVIEW

About 80 percent of the world's estimated 500 million small farms provide over 80 percent of the food consumed in a large part of the developing world, contributing significantly to poverty reduction and food security (IFAD and UNEP, 2013). Increasing fragmentation of landholdings, coupled with reduced investment support and marginalization of small farms in economic and development policy, leaves many smallholders vulnerable. As cited in IFAD and UNEP (2013), Reardon et al noted that smallholders produce food and non-food products on a small scale with limited external inputs, cultivating field and tree crops as well as livestock, fish and other aquatic organisms. Many poor families earn their incomes in multiple ways, and productivity on farms should be viewed as the overall context of total family income. In addition, Murphy as cited in IFAD and UNEP (2013) noted that smallholder farmers are characterized by marginalization, in terms of accessibility, resources, information, technology, capital and assets, but there is great variation in the degree to which each of these applies. More so, Nobeji et al (2015) in analyzing issues on smallholder farmers' used strategies for identifying needy famers and addressing the low input use among smallholder farmers for improved crop productivity in Tanzania and other rural agricultural based economies. They found that the probability of using agricultural inputs increase with education level, quantity of crops produced, livestock, and farm income, while it decrease with total number of livestock and nonfarm income owned by a household.

In studying smallholder agriculture in East Africa vis-a-vis trends, constraints and opportunities faced by smallholder farmers, Adeleke et al (2010) revealed that smallholder farmers face long-standing constraints in agriculture such as; land tenure, access rights and land management, financing agriculture and access to credit, access to input and output markets, infrastructure, agricultural extension and innovation, policy related and institutional constraints, and climate change and related food security challenges as well as food and financial crises. The equally observed that at the national level, weak institutions, restricted access to markets and credit, inadequate infrastructure, and constrained productivity growth of smallholder farming are major obstacles to the growth of smallholder firms. As measures to improve productivity of smallholder farmers they recommended: ease of access to land, training to enhance skills, encourage technology adoption and innovation, the removal of obstacles to trade and at the regional and global levels, international trade barriers had to be addressed (Adeleke et al., 2010). Generally, farmers face a series of unprecedented, intersecting challenges, often originating at global levels; increasing competition for land and water, increased influence of and changing markets, rising fuel and fertilizer prices and climate change. According to IFAD and UNEP (2013), this changing context poses difficult challenges for smallholders, who are more directly dependent on ecosystem services and have less capacity to adapt to changing contexts, compared with larger, more resource-endowed farmers. In the same perspective, transforming smallholder farms, Shenggen et al (2013) reported that, smallholders often have limited access to markets for both inputs and outputs and this has a significant effect on their production activities. Further, the geographic dispersion and limited access to infrastructure in many rural areas drive-up transaction costs lower smallholders' profit margins and lead many smallholders to pursue more subsistence oriented production practices. In the same way, smallholders' limited access to productivity-enhancing technologies is grounded in an environment where national research systems do not sufficiently prioritize smallholder-friendly technologies and extension systems fail to help smallholders gain access to and adopt such technologies (Shenggen et al, 2013).

Dwelling on the ideas of Adams and Ohene-Yankyera (2014) and Bader et al (2013), we noticed that smallholders' productivity is affected by lack of access to education, which could help build the skills needed to manage on and off-farm production systems more efficiently and raise smallholder adoption of innovative and high-return technologies. This means smallholders have become increasingly vulnerable to

a spectrum of emerging climatic, health, price, and financial risks and challenges as well. These emerging challenges lead many smallholder farmers to pursue livelihood strategies that involve lower-risk and lower-yielding agricultural activities. The report ended with some proposed policy options to strengthen smallholder farmers with agricultural potential which include; promote context-specific farm size policies, establish social safety needs, improve risk mitigation and adaptation strategies, link agriculture, nutrition and health, promote pro-smallholder value chains, and ensure smallholder friendly financing and investment (Adams and Ohene-Yankyera, 2014; Bader et al, 2013).

METHODOLOGICAL ANALYSIS

Presentation of Study Area: Santa Subdivision is found in the North West Region of Cameroon, whose predominant activity is agriculture with more than 85 percent of the population engaged in food crop cultivation and other agricultural activities. Principally, Santa is one of the seven administrative units of the Mezam Division in the North West Region of Cameroon, with a total population of about 99,852 people according to the last census projections of 2008. The area covers a surface area of about 533 square kilometers. The population density is about 108 inhabitants per km^2 and it consists of 13 villages. This population is unevenly distributed with the highest densities found around Santa center. Santa subdivision is one of the agricultural hearts of the Mezam Division of the North West Region of Cameroon. It lies within latitudes 5^0 4` and $5^0$ 53' to the North of the equator and between longitudes $9^0$ 45` and 10^0 18` to the East of the Greenwich meridian (Santa council, 1996). Climatically, the area shows great ecological variations and consequently climate variations which greatly influenced settlement patterns and agricultural activities. The type of climate found here is the Guinean climate. The climate is marked by two distinct seasons; the dry and rainy seasons. The rainy season usually begins around March to mid-October. The rainfall ranges between 2000 to 3000mm per annum. The dry season is usually from mid-October to February. The nights are generally very cold while the days are hot. The annual average temperature recorded at the Santa Agricultural Post is about 19˚C. Strong winds and heavy cloud cover characterize the area. The heavy cloud descending from hills leads to poor visibility during their occurrences. Its average temperature is the lowest and widest variation in Mezam Division. The abundant rainfall and cold climate make the area favourable for gardening and thus creating a market for the people and a source of livelihood.

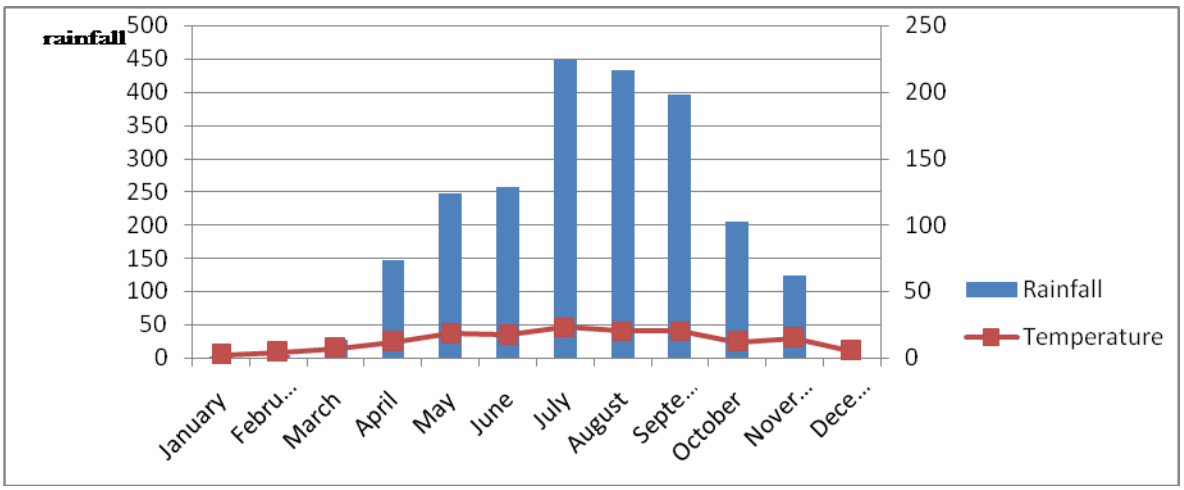

Figure 1: Ombro thermal diagram of rainfall and temperature
Source: Computed by authors from Bamenda Meteorological Station Statistics

Santa subdivision shows a wide variety in its relief, with altitudes ranging from 1300m above sea level in Baligham and Awing to about 2600m above sea level at the boundary with Wabane Sub Division. Mt. Lefo (2300m) in Awing is the second highest mountain in the region after Mt Oku. Characteristic features include many hills with gentle to steep slopes. Most of the high altitude parts of the area lie on the highland mountain chain of the North West and West Regions of Cameroon. Santa sub division is characterized by a good number of rivers, streams and springs, most of which are temporary. The steams here flow in the north south direction where they converge to form the Matazem stream. These streams reduce in size during the dry season and are greatly increased during the rainy season. Water from some of these streams is used for irrigating Irish potatoes farmlands and other crops especially during the dry season. The streams are also used as demarcation of boundaries for some of the chiefdoms found in the area. Furthermore, beautiful waterfalls are found on some of the mountain slopes especially during the rainy season. A major crater lake, Lake Awing is one of the beautiful attractions of this area.

The highland range, which extends from the Bamboutos through Santa and Bambuluwe has been blessed with volcanic activity. The area has rich volcanic soils favourable for agriculture or crop farming. There are three main types of soils in this study area; the Penevoluted ferralictic soils found mostly in the low-lying areas especially in Baligham, Santa town and Njong. The Orthic soils are found in Highlands of Akum, Baba, Mbu and Awing while within Mbei and Pinyin area are dominated by the Aliatic and Penevoluted ferralictic red soils. The fertility of the soils varies in lowlands and highlands. On the high lands, the soil is not very fertile since it has been washed down to the valleys while the soils in lowlands are more fertile due to nutrients washed from the hills and deposited there. The ferralitic soils are used for making of sun-dried bricks. Crops like Irish potatoes, cabbage, carrots and spices are grown in the rich valley soils. However, eucalyptus trees are planted in some of the areas, which have heavily leached soils.

Situated in the Sudan Savanna Zone, the area is endowed with different types of vegetation; a sub mountainous forest (which has been greatly degraded), a mountainous forest, and a domesticated sub mountainous landscape. The landscape is mainly grass with fringes of forest along the gentle slopes and narrow valleys. Fulani's occupy the grassland areas of the mountain slopes for grazing. Extensive grass cover can be found on the Azope and Mafoumusong hills in carpet-like shape, which gives a touch of beauty to the landscape. However, the vegetation types have greatly degenerated over the years. This has been as a result of constant bush fires set by hunters and grazers and sometimes accidentally by farmers who practice slash and burn. Some of the forest is being exploited for timber and clearing to extend farming land. The area is also very rich in planted eucalyptus vegetation even though most of the lowland areas have been cleared to make room for the cultivation of cash crops notably cabbage, Irish potatoes, carrots and spices. Mineral resources are limited to sand, stones and laterite quarries. Sand is gotten from Baligham and Akum. Stone quarries are dotted in the entire area. The products are either used for house or road construction.

Forestry activities in the area are not very prominent but the small pockets of forest are gradually coming into focus for community forestry. This is the case of Baba II which has a small community forest sponsored by the Bamenda Highland Forest Project as well as the Mbei Community Forest. Eucalyptus forest, which are man-made are also very common in the area. Remnants of the once flourishing Bafut-Ngemba Forest extended to part of the Santa sub division. Another forest reserve in the area is the Bali-Ngemba Forest that extends into Pinyin. However, the Pinyin forest, which has a number of rare tree species, is being exploited uncontrollably. Illegal timber exploiters are usually reprimanded from time to time. Wild tree species are found only in small patches, which have continued to reduce under the pressure of farmers and few unscrupulous exploiters. Bush fires have also done great harm to these patches of trees and natural vegetation in general.

The population of this area depends essentially on agriculture as the main source of family income. The people are mostly farmers carrying out subsistence and extensive farming with coffee as their main formal cash crop and have been replaced by vegetable gardening. The products are sold all over the country and to some neighboring countries like Chad, Gabon and the Republic of Central Africa. Crops such as Maize, Irish potatoes, sweet potatoes, plantains, bananas, beans, cassava and Kola nuts are grown for sale and home consumption in most households. However, small livestock rearing (pigs, cows, goats, sheep, and fowls) and petty trading constitute an important source of supplement to income from agriculture. Provision stores, beer drinking spots and raffia wine also occupy many people on the part time basis especially when the farmers return from their farms. Also some of the inhabitants of Santa subdivision also engage in other activities like commercial shops, tailoring, carpentry and transportation.

Sampling Techniques: The Study population comprised of Irish potato farmers, dairy farmers, pig farmers, and market gardening farmers from Santa Subdivision. These actors were chosen from the seven areas which where sampled from the total population of aid beneficiaries. The sampled areas included: Njong, Mbei, Santa Central, Ntarrah, Akum, Meforbe and Pinyin. The Sampling techniques that were employed in the case of this study were the simple random sampling and the purposive sampling techniques. This was possible because the area was divided into 20 sectors based on the number of communities that had benefited from different kinds of agricultural aid in Santa Subdivision. From the 20 sectors, seven sectors were randomly and purposefully selected based on their sizes and ease of access that is: Njong, Mbei, Santa Central, Ntarrah, Akum, Meforbe and Pinyin. Beneficiaries were then randomly selected from each of the seven communities that were chosen, with the number of beneficiaries selected per community being proportional to the size of the area that is; 14% of the total population per sampled community. The aim was to attain a sample size of at least 200 beneficiaries from the total population of beneficiaries.

The snow ball technique was used to identify the beneficiaries of Heifer Project International since their population was not known and most of them were difficult to locate. In this method, existing subjects were used to recruit future subjects from among their acquaintances. Therefore, beneficiaries who were interviewed were asked to identify others in the

population who had also benefited from the project. At the end, a sample of 202 agricultural aid beneficiaries was interviewed. Figure 2 shows the population of potato seed beneficiaries in Santa with a total of 2354 beneficiaries, while Table 1 shows the partitioning of beneficiaries from the seven selected communities of in proportion to their total population and the number of beneficiaries per aid donor.

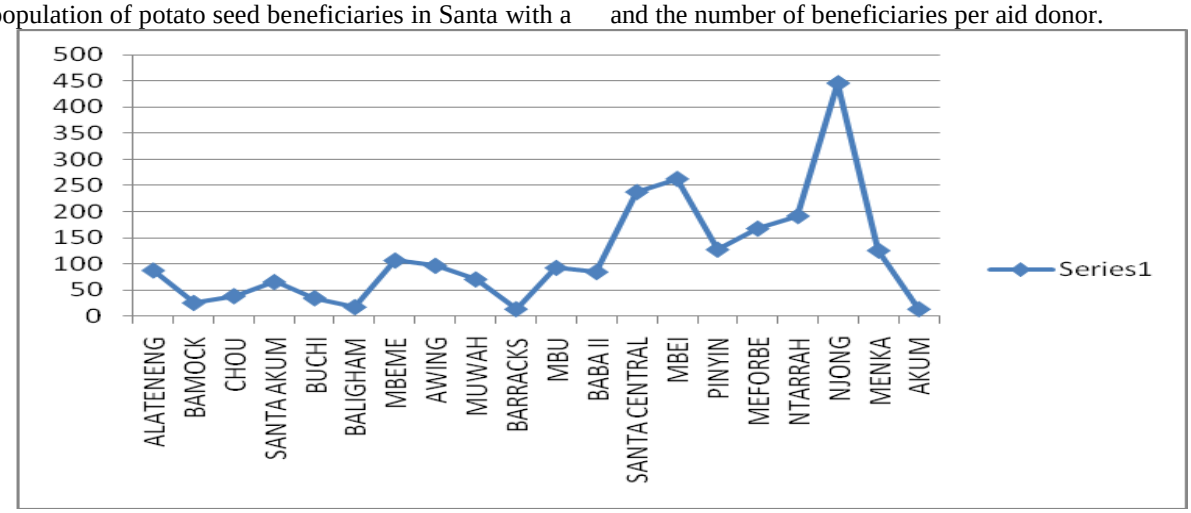

Figure 2: The population of potato seed beneficiaries in Santa
Source: Computed by author from Department of Agriculture, Santa

Table 1: Partitioning of beneficiaries from selected communities in proportion of their total population and the number of beneficiaries per aid donor.

nº	**Community**	**Total population of beneficiaries**	**Total beneficiaries interviewed per community. (14% * total population of beneficiaries)**
1	Njong	445	62
2	Mbei	262	36
3	santa central	237	30
4	Ntarrah	191	21
5	Akum	73	12
6	Meforbe	167	23
7	Pinyin	127	18
	Total	**1502**	**202**
nº	**Aid donor**	**Total population of beneficiaries**	**Total beneficiaries interviewed**
1	potato project	2354	125
2	ACEFA	not available (n/a)	23
3	Gp-derudep	n/a	27
4	Hpi	n/a	27
	Total	**2354**	**202**

Source: *Ministry of Agriculture and Rural Development, Santa*

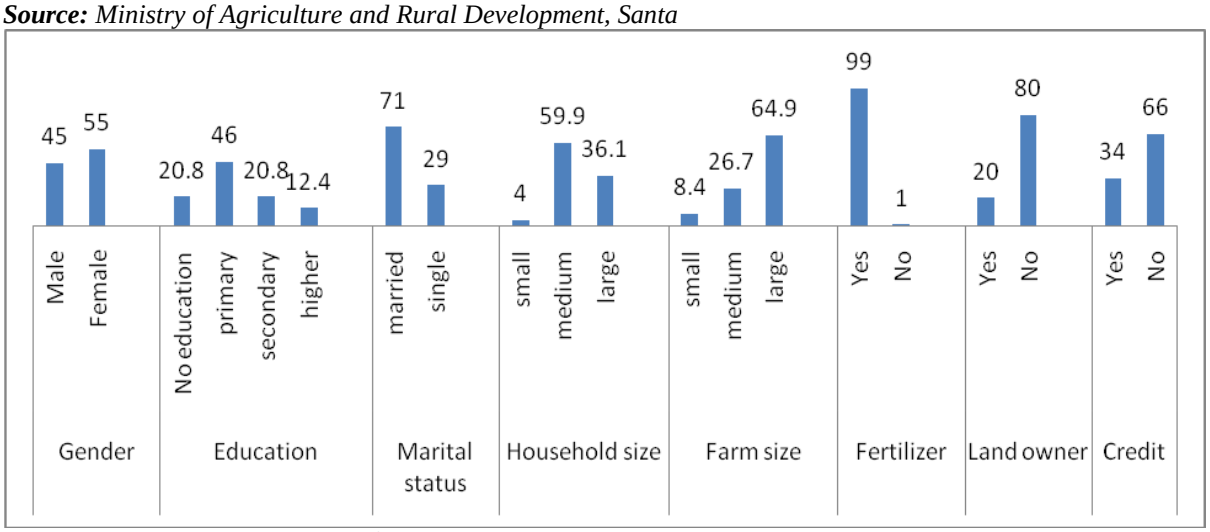

Figure 3: Socioeconomic Characteristics of Smallholder Farmers in Percentage
Source: Author, from field data

Sources of Data: Data for this study was gotten via a well-structured questionnaire with mostly closed ended questions which was pretested on 3 potato farmers and 3 dairy production farmers, after which some adjustments were made; it was then validated by supervisors and the researcher, before administered to respondents of the selected communities. The questionnaires were read to farmers who could not read and those who could read were given a chance to peruse before returning to the researcher who personally ticked the responses. Open ended questions were answered in the form of discussions with farmers on their personal opinions and conclusions were drawn from the individual responses of farmers. The questionnaires used to obtain quantitative data were shared based on a percentage of 14 per population size to the sample communities.

Information gotten from secondary sources of data was based on food security variables and the factors affecting food security, the importance of agricultural aid on food security, the role played by small holder farmers in guaranteeing food security, efforts made by the government of Cameroon to ensure food security in the country was also searched. The study comprised of, searching the internet, reviewing relevant books, journals, articles about the research issues to get information and concepts related to the study. The monographic study of Santa reports and workshops of GP-DERUDEP were reviewed to get secondary data that was supported by primary data.

Data Analysis and Estimation Technique: In analyzing our data, the socio-economic characteristics of smallholder farmers and nature of the aid offered to smallholder farmers are analyze in excel using descriptive statistics, principally bar charts and tables. The actual effect of agricultural aid on food security is estimated using logistic model while the constraints faced by smallholder farmers in their production process is analyze using a covariance matrix.

RESULTS AND DISCUSSION

The tables and figures presented in this section are based on data gotten from the field survey. The overall return rate of questionnaires for the study stands at 100 percent. Out of the 200 questionnaires envisaged for the study, 202 questionnaires were successfully administered. The high return rate stemmed from the great interest of farmers in general and the determination of the researcher to attain the envisaged number. The results are presented as follows: (1) description of the socioeconomic characteristics of smallholder farmers, (2) agricultural performance production function, (3) nature of aid offered to smallholder farmers and (4) its importance and constraints Faced by smallholder farmers.

Description of the socioeconomic characteristics of smallholder farmers: As demonstrated in Figure 3, the gender of smallholder farmers who have benefitted from agricultural aid shows that 55 percent of agricultural aid beneficiaries were men while 45 percent were female. This can be explained by the fact that men own most of the land in the area as compared to women, which is a necessary requirement for receiving aid. One of the main conditions for aid eligibility as gathered from the study was prove of land ownership. The results of this study were in line with those of Goheen, (1994) in the Grass field where they discovered that men own the land but the women are the major producers. Though education is gaining increasing popularity nowadays in Santa subdivision as in most of the households is found a member who is pursuing a higher level of education. This is however not the case among smallholder farmers, a majority of small holder farmers ended at primary education with a population of 46 percent. This is because most of the farmers in this category were of the middle and old population who did not really see education as a priority during their youthful days. Farming was the most popular and lucrative activity then, and it is still their main preoccupation today. This is also true for farmers who have no education making up to 20.8 percent of the population. Those who attended secondary and tertiary education made up 20.8 percent and 12.4 percent respectively. These groups of farmers are made up of some youths who carry out farming activities as a source of income to finance their education.

Marriage is a very important social value among farmers in Santa Subdivision. Not only it is an improvement in the individual's status and a good support mechanism, but it is also socially compatible with farming. Farmers get married to increase the size of their labour force. They give birth to children who assist them in their farming activities. At times the men engage in other income generating activities like petit trading, carpentry and craft work while their wives manage the activities of the farm. These are privileges they get as married persons unlike when they were single. The importance of marriage in this area is demonstrated in figure 3, where 71 percent of the population of smallholder farmers was married while 29 percent was single. Amongst the 29 percent of smallholder farmers who were single was found widows, the divorced and youths. This finding is consistent with Adams and Ohene-Yankyera (2014) who carried out a study on the socio-economic and farm characteristics of small ruminant farmers in three regions of Northern Ghana and reported that 73.5 percent of them are married, with the adult children and female spouses contributing meaningfully to small ruminant management practices.

Household size was captured with some variables which were defined in the questionnaire such that; less than 5 persons in a house indicates a

small household, between 5 – 10 persons is a medium household and greater than 10 persons is a large household. It was observed that the medium household size had the highest percentage of 59.9, while the small household size was second with a percentage of 36.1 and the large household size was last with a percentage of 4.0. Most of smallholder farmers' households were medium size because of changing economic conditions. Development has been accompanied with increasing challenges, and even though a large household size will supply cheap labour for their farms, it cannot easy providing food for a large household size. Consequently farmers prefer medium or small household sizes which are made up of the father, mother, children and grandchildren. This finding is consistent with the study of Minilik et al (2013) on the socio-economic characteristics of smallholder rice production in Ethopia in which they reported that average household size of smallholder rice farmers was 5 persons.

Farm size is very important in explaining agricultural productivity. For the purpose of this study, farm size is captured such that: less than $500m^2$ is small, between $500m^2$ - $1000m^2$ is medium and greater than $1000m^2$ is large. Figure 3 shows that many smallholder farmers owned large farm sizes making a percentage of 64.4 which is more than half of the total population. This can be explained by the ease of land ownership and acquisition which existed before in many villages in Santa subdivision. The village head locally known as the 'Fon' is the custodian of the land according to the traditional set up of most of the villages in the study area. It was therefore very easy to acquire land for farming because it required consulting the Fon only. This is however not the case nowadays where documents must be compiled and a land title made before a person is entitled to land. The large farm sizes also indicate the inheritance of farm land by smallholder farmers from their forefathers and fathers which is a common characteristic of most of the large farm size owners. Also, the large farm size does not indicate that all the farms are located in a single place, they include different plots of farm land located in different places which when combined form large farm sizes. Medium (26.7 percent) and small (8.4 percent) farm sizes are mostly owned by farmers who follow the legal procedure to acquire land which involves; compiling documents to make a land certificate and the spending of money. Also, majority of smallholder farmers who owned medium and small farm sizes were single women and youths who are not privileged both by the traditional and legal system to own large farm sizes.

Fertilizer is an important input in agricultural production and according to this study fertilizer could either be organic or inorganic. Organic fertilizer can be produced by the farmers themselves. It includes fertilizer that is made from natural residues like animal waste, plant residues and even human waste; no chemicals are added to it. Inorganic fertilizers on the other hand have been produced with the use of chemicals and cannot be produced by farmers who have limited knowledge on how to produce them. Inorganic fertilizer is bought by farmers from the market. According to figure 3, 99 percent of smallholder farmers applied fertilizer on their farms. The high percentage indicates a very high rate in the use of fertilizer given its increasing importance in agricultural production in recent time. The high rate of fertilizer use can also be explained by the decrease in soil fertility, population increase and the increased desire for money.

Land availability is a very necessary and important variable for agriculture. Its importance can also be seen in agricultural aid where farmers must show prove of land ownership before they are considered eligible to receive aid. The importance of land can therefore not be overemphasized; this can be seen in figure 15 which shows that 80 percent of smallholder farmers owned land while only 20 percent did not. Amongst the 80 percent of farmers who owned land was single women and youths but the majority was men. This is because of the culture of the area which gives the sole right only to men to inherit the land of their parents. Women and youths who owned land were mostly those who bought it or widows who inherited the lands of their husbands. This finding is in line with Murphy cited in IFAD and UNEP (2013) who reported that, overall, smallholder farmers are characterized by marginalization, in terms of accessibility, resources, information, technology, capital and assets, but there is great variation in the degree to which each of these applies.

Access to credit is another major input to agricultural production as it increases the scale of production and the possibility of making large profits. However, not all farmers have access to credit, and not all farmers are willing to take credit; some prefer to cultivate their crops with their own income. About 34 percent of smallholder farmers collected loan or had access to credit, while 66 percent did not. This is because not all farmers have access to credit, others do not even know how to go about getting a loan, some others are very skeptical about loans and while others lack the necessary collaterals security, further, others avoid the risk involved in loan acquisition and payment. This result is similar to the findings of Adams and Ohene-Yankyera (2014) as they reported that only 14.9 percent of farmers had access to credit.

Agricultural performance production function:

The result of the agricultural food security shows that agricultural aid is strongly correlating with food security at a one percent level of significance and by a percentage point of about 15.8 percent. The effect of this result imply that if all other factors that affect food security remain constant, a farmer that receives agricultural aid should be 15.8 percent producing higher than and contributing more to food security

than their counterparts who had not received any aid in agriculture. This observation is consistent with the views of Cargil (2014) who in a study on the important role of governments in achieving food security pointed out that smallholder farmers need training in agricultural best practices and access to inputs, credit, storage and technology to increase their productivity in a sustainable way, which raises their own living standards and produces surpluses to help nourish others. This result is also consistent with the findings of Adeke et al (2010) and Bader et al (2013). The low percentage point of 15.8 percent however, indicates that not very many agricultural aid donors are present in Santa and much more aid in kind is needed to boost the high agricultural potential of the area. The findings agree with the hypotheses of this study which states that; "agricultural aid to smallholder farmers has an effect on food security", and "there has been an increase in the productivity of smallholder farmers resulting from agricultural aid".

Table 2: Agricultural aid to Smallholder farmers and agricultural performance

Variable	**Coefficient**	**Standard Deviation**	**T-statistics**
	Agricultural Performance		
Agricultural Aid Acquisition	0.1579***	0.061	2.821
Size of Farm Land	0.8101***	0.162	5.001
Household Size	0.145**	0.069	2.096
Use of Fertilizer	0.045**	0.023	1.991
Use of New Seed Varieties	-0.053***	0.0143	-3.713
Access to Credit	0.626*	0.366	1.712
Storage Facilities	0.266**	0.117	2.276
Member of Professional Association	0.158**	0.075	2.106
Level of Education	0.930	0.633	1.470
Sex of Household Head	0.648	0.842	0.770
Age & Experience	1.413***	0.351	4.027
Ownership of land	0.394	0.368	1.071
Constant	0.002**	0.001	2.114
R-Square	0.7826	N/A	N/A
F-Statistics	37[11;0000]	N/A	N/A
Total Observation	**202**		

Source: *Author, from field data. N/B: *, **, ***, represent 10%, 5% and 1% percent level of significance respectively. N/B Dependent variable is food security captured by agricultural production.*

Other variables influencing food security in this study area are; farm size, household size, application of fertilizer, use of new seed varieties, access to credit, storage facilities, member of professional association, age and experience. The farm size variable has a strong correlation with food security indicating that the size of farm land has a high effect on food security. This is because a large farm size ensures a high cultivation of agricultural products and high production if every other thing remains the same. A medium household size supplies adequate labour input to realize an excellent production, application of fertilizer is a good farm input that increases output when properly managed. Access to credit and other factors numerated above have similar effects on food security. With credit many agricultural production can be expanded by purchasing more inputs like tractors, insecticide/pesticide, land, labour and so on which will increase production.

Good storage facilities are seen as a major factor affecting food security with a coefficient of 26.6 percent significant at 5 percent. This indicates that if smallholder farmers have access to good storage facilities, there is a high chance of food security. Farmers' access to good storage facilities will enable them to store their crops and be able to supply them all year round in the market. They will also be able to secure food not only for the market but for themselves and their families as well. Moreover, belonging to a professional group means increase in social capital that brings about much benefit in agricultural production. Professional group membership enables farmers to easily benefit from any available aid, have easy access to markets for their products and more labour for their farms. This variable strongly correlated with food security with a coefficient of 15.8 percent and a significance level of 5 percent. Age and experience also play a great role on agricultural production and subsequent food security. Middle age farmers with experience in farming for many years are very contributive in food security because they have the energy and the knowledge acquired over time to invest in agricultural production. A favourable blend of these complementary variables in association with agricultural aid will result to food security. The use of new seed varieties is negatively correlating with food security, with a coefficient of -53 percent and at a level of significance of 1 percent. This indicates that as the use of new seed varieties increase, food security decreases. This is possible because a majority of improved potato seed variety beneficiaries in the

study complained of their seeds getting rotten before harvest thereby reducing agricultural production and hindering supply in the market, thus affecting food security negatively.

The F-Statistics (37[11; 0000]) and the coefficient of determination (R-square = 0.7826) couple with the significance of our variables confirms that our result is robust. Hence, it can therefore be concluded that everything being equal, agricultural aid has a positive effect on food security in Cameroon.

The Nature of Aid offered to Smallholder farmers and its Importance: The nature of the aid as defined in the questionnaire refers do the different kinds of aid in kind offered by aid donors such as; farm inputs, equipment, infrastructure and capacity building. Table 3 and column 1 presents the nature of aid given to smallholder farmers and its importance. We observed that all the different aid donors offered farm inputs in different proportions to the farmers, some offered farm inputs, equipment and infrastructure only; this was the case with ACEFA that offered farm inputs only, to 9 out of 23 beneficiaries, equipment only, to 7 out of 23 beneficiaries and infrastructure only to 7 out of 23 beneficiaries. Farm inputs include improved seeds, pesticides and insecticides, equipment include wheelbarrows, sprayers and tractors, infrastructure includes irrigation infrastructure for market gardening farmers. All the mention kinds of aid offered by ACEFA are very helpful in boosting agricultural production and ensuring food security if properly managed.

Both farm inputs and capacity building were offered by the Potato Project and GP-DERUDEP to a total of 152 beneficiaries; 125 of the Potato Project and 27 of GP-DERUDEP. It was realized that a necessary condition of the aid donors of the Potato Project and GP-DERUDEP was that smallholder farmers must be trained on how to use the farm input (potato seed) before they receive it. Any farmer who did not attend the training did not benefit from the aid. Capacity building is therefore an important factor in ensuring food security because if farmers do not understand how to use a new technology like improved seeds and tractors for example, they will not be able to carry out agricultural production effectively which will be a hindrance to productivity and food security. Also as farmers attend many workshops and training, they gain a lot of experience and will be able to carry out agriculture better than those who do not attend training. This observation is consistent with the results of table 3 above where age and experience strongly correlates with food security at a 1 percent level of significance. It was also observed that some aid donors give farm inputs, equipment and capacity building all together; this was the case of Heifer Project International that offered farm inputs, equipment and capacity building to all its 27 beneficiaries. The procedure and duration to obtain the aid offered by Heifer Project International was longer compared to the procedure and duration of the other aid donors in Santa. This is because Heifer Project International focused on dairy products that need a longer period of training to be able to understand how to properly manage a dairy farm. Smallholder farmers had to attend a training of a minimum of 3 months in order to gain the necessary knowledge whereas the beneficiaries of the Potato Project and ACEFA attended a training of a maximum of 1 month because it did not take time to train them on how to use improved seeds. Heifer Project International also offered farm input and equipment such as improved pasture (Guatemala, Bracharia), maize (for pig beneficiaries), wheelbarrows and biogas infrastructure; this were all given after the farmers had received capacity building through training

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Table 3: Nature of Aid Given to Smallholder Farmers and Its Importance

						Structure of Aid			
Nature of Aid	Farm Input	Equipment	Infrastru cture	Capacity Building	F.I &E	Potato Project	ACEFA	GP-DERUDEP	Heifer Project International (HPI)
Farm Inputs (F.I)	09,09	Xx	xx	152,152	xx	125	09	27	Xx
Equipment	xx	07,07	xx	Xx	xx	xx	07	xx	Xx
Infrastructure	xx	Xx	07,07	Xx	xx	xx	07	xx	Xx
Capacity Building	152,152	Xx	xx	Xx	26	125	xx	27	27
F.I & E	xx	Xx	xx	27	xx	xx	xx	xx	27
Source: Computed by author, from field data x**x** indicates the absence of values				**TOTAL**		**125**	**23**	**27**	**27**
						202			

It was realized from table 3 and column 1 that the nature of aid given to smallholder farmers contributes to food security but at varying degrees. Those farmers who received only farm inputs, equipment or infrastructure will not produce higher than their counterparts who have benefited from farm inputs, equipment, infrastructure and capacity building. This result is consistent with the case of Bangladesh small

farmers from which Murshed and Pemsl (2011) concluded that building the capacity of farmers through training is more valuable than the provision of financial support in terms of raising production and income thus ensuring food security. The aid received does not only contribute to food security but it also improves the living standards of smallholder farmers as demonstrated in the example in column 1 above where the diary product and biogas infrastructure beneficiary was able to sell the milk from her cow and buy new clothes for herself and household equipment, use the waste produced by her cow to produce cooking gas for her food, and use bio-slurry from the biogas plant as manure for her farm. Another observation from table 3 was that there is no aid in cash. This is because aid donors no longer prefer to offer aid to farmers in the form of cash but in kind. The major reason being that, when aid is offered in kind farmers are more committed to agricultural production and it is therefore a better incentive to production than aid in cash which may push farmers to engage in activities that are not related to agriculture thereby threatening food security.

Constraints Faced by Smallholder Farmers:

Smallholder farmers contribute a lot to food security, but the extent to which they contribute is often limited due to several constraints that hinder their operations. The possible constraints faced by smallholder farmers that have been identified in this study and presented in table 4 are: accessibility to farm, farm to market infrastructure, storage facilities, appropriate market, acquisition of farm chemicals facilities and only 23 out of 202 have access to good storage facilities. Smallholder farmers are generally small scale producers who do not cultivate very many hectares of land. The revenue they earn from farming is usually used to meet more important needs as compared to establishing a modern storage facility for their farm products. Also, majority of the farmers in this study were averagely rich and the revenue they earn cannot be enough to establish a good storage facility which is costly.

They however have appropriate markets where they can sell their products as demonstrated in table 4 below where only 32 out of 202 farmers faced the challenge of an appropriate market, while 170 farmers out of 202 had no constraint finding an appropriate market for their products, thus giving a constraint difference of -68.4% (the negative sign indicates that there is no constraint). The reason for an appropriate market not being a problem to the farmers in this study is because they are aid beneficiaries and the aid donors create mediums whereby they can sell their products one of such are cooperatives.

Acquisition of farm chemicals, fertilizer and farm input was not a constraint to farmers as out of out of 202 farmers, 169 faced no challenge in acquiring farm chemicals while 33 farmers saw that as a challenge thereby giving a constraint difference of -67.3 percent. The acquisition of fertilizer and farm inputs had constraint differences of -89 percent and -60.4 percent respectively which showed that their acquisition was not a constraint to farmers.

Table 4: Matrix Showing the Constraints Faced By Smallholder Farmers

Challenges	Absolute Frequency	Constraint	Non Constraint	Constraint Difference	% of Constraint Difference
Accessibility to farm	202	0.790 (160)	0.207 (42)	0.583	58.3
Farm to Market Infrastructure	202	0.797 (161)	0.202 (41)	0.594	59.4
Storage Facilities	202	0.886 (179)	0.114 (23)	0.772	77.2
Appropriate Market	202	0.158 (32)	0.842 (170)	-0.684	-68.4
Acquisition of Farm Chemicals (Pesticides, Insecticides, Herbicide)	202	0.163 (33)	0.836 (169)	-0.673	-67.3
Access to Credit	202	0.663 (134)	0.327 (66)	0.337	33.7
Acquisition of Fertilizer	202	0.010 (2)	0.990 (200)	-0.890	-89.0
Acquisition of Farm Input	202	0.198 (40)	0.802 (162)	-0.604	-60.4
Application of Pesticide, Herbicide & Insecticide	202	0.886 (177)	0.124 (25)	0.752	75.2

Source: *Computed by author, from field data.* ***N/B:*** *Values in Parentheses represent the relative frequency of the variable modality*

The non-constraint existing amongst these variables is explained by the fact that they are necessary in agricultural production; farmers depend on farm chemicals, fertilizers and farm inputs in order to carry out agricultural production effectively, and to have very good harvests. They also have easy access to fertilizers because some of them rear animals from which they collect organic fertilizers (for example bio-slurry from biogas plant; in the case of biogas beneficiaries). However smallholder farmers still face a huge constraint in the application of pesticide, herbicide and insecticide with a constraint difference of 75.2 percent. This is because many of them have a very low level of education and even after attending trainings, they still find difficulties in applying the right doses in their own personal farms. This is consistent with the study of Munilik et al (2013) who found out that only 15.7 percent of smallholder rice farmers in Ethopia could only read and write. Consequently, they get low yields from production because crops are destroyed from the excessive or poor use of pesticides, herbicides and insecticides.

Finally, Access to credit is a constraint to smallholder farmers as demonstrated in table 4 below where 134 farmers faced the constraint of access to credit and only 66 did not. This is because many smallholder farmers are skeptical about taking loans and they lack the necessary collaterals to obtain loans from financial institutions, while some prefer to carryout agricultural production with their own income, others on the other hand are interested in acquiring loans but do not know or understand the procedure to follow in order to get a loan. This observation is in line with the study of Adams and Ohene-Yankyera (2014) where only 14.9 percent of small ruminant farmers in three regions of Northern Ghana have access to credit.

We observed that farmers face constraints in accessing their farms, farm to market infrastructure, appropriate storage facilities, access to credit, and in the application of pesticides, herbicides and insecticides. Areas that do not pose a problem to smallholder farmers in Santa subdivision are; appropriate market for their products, acquisition of farm chemicals, fertilizers and other farm inputs.

CONCLUSION

This study was carried out with the aim of analyzing the effects of agricultural aid to smallholder farmers on food security. It also aimed at describing the socio-economic characteristics of smallholder farmers, examining the actual effect of agricultural aid on food security, analyzing the nature of the aid offered and its importance to smallholder farmers and identifying the constraints faced by smallholder farmers. Data was collected from a sample of 202 stakeholders in Santa Subdivision of the Northwest Region of Cameroon.

Results from the logistic regression analysis showed that agricultural aid was strongly correlating with food security at a one percent level of significance. We observed that all aid offered was in kind and in the nature of; farm inputs, equipment, infrastructure and capacity building. Those farmers who received only farm inputs, equipment or infrastructure will not produce higher than their counterparts who have benefited from farm inputs, equipment, infrastructure and capacity building. The Covariance Matrix revealed that smallholder farmers face constraints, such as: access to farms, farm to market infrastructure, appropriate storage facilities, access to credit and application of pesticide, herbicide and insecticide. In terms of policy, government should create favourable economic climate and contacts for farmers to receive agricultural aid; this is a major way to have food security.

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