

Production Diversity and Constraints in Smallholder Farms in the Bamboutos Mountain

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ABSTRACT

Smallholder farmer agricultural productivity in developing countries is more often diverse and limited by diverse constraints. For optimal agricultural production and income crops for diversification must be carefully selected and the constraints properly addressed. The objective of this study was to establish a list of the major crops planted in the Bamboutos mountain landscape and the constraints faced by the smallholder farmers. During a survey, 261 household heads responded were randomly selected and the questions administered to them. A majority of the household heads were men and were literate and most of them were younger than 55 years. Crop and livestock production were the main income generating activities of the respondents. Most of the farmers' land sizes were less than 5a and land ownership was through inheritance, purchase or rent. The small holder farmers in the study area planted a variety of both annual and perennial crops. These crops were sold, consumed or had ornamental/cultural values. The farmers faced a number of problems in animal and crop production with the most cited constraints being lack of inputs, lack of capital, bad roads and climate change. The results of this study suggest that crop diversification should be encouraged within the study area, policy and stakeholder intervention should concentrate on solving the cited constraints for sustainable food production and conservation of biodiversity.

Key Words: Crops, Constraints, Diversification, Smallholders

INTRODUCTION

In Africa, the majority of the undernourished people live in rural areas. Many of them are smallholder farmers and diversifying production on these smallholder farms is widely perceived as a useful approach to food security ^[1]. Production should address not only the quantity of food or calories but high nutrient values such as vitamins, minerals and other micronutrients as well. Smallholder farmers' crop diversity improves farmers' dietary diversity ^[2]. Several recent development initiatives have promoted smallholder diversification through introducing additional crop and livestock species with the intention to improve household nutrition ^[3]. Since farm diversity can help to increase agrobiodiversity, this approach is also welcome from environmental perspectives. In agricultural ecosystems, maintenance of biological diversity is important both for food production and to conserve the ecological foundations necessary to sustain life and rural livelihoods. Agricultural biodiversity includes all the components of biological diversity of relevance to food and agriculture together with the components of

biological diversity that constitute the agro-ecosystem: the variety and variability of animals, plants and micro-organisms, at the genetic, species and ecosystem levels, that sustain the functions, structure and processes of the agroecosystem [4]. This diversity has been shaped by farmers and communities and remains a key element of the livelihood strategies of poor, small-scale farmers throughout the world. Production diversity is considered a critical measure of the agricultural health of the world. Not only does increased production diversity contribute to nutrient production and consumption, but it acts as a safeguard against food shortages due to pests and diseases by spreading the risk [5]. As a result, production diversity is often highlighted in global discussions related to food security. Individuals who are food secure and have the ability to acquire adequate food for a healthy and active life, are more likely to be able to contribute significantly to the economy than their undernourished counterparts [6].

Crop diversification is the introduction or development of additional crops to the existing farming system [6]. Horizontal crop diversification is the addition of more crops to the existing cropping system [7]. Crop substitution and adjustment which are related to the primary concept of crops diversification are ways of optimizing profit and managing land [8]. Diversification at farm level involves growing more than one crop in order to achieve self-sufficiency which is different from diversification at national level. At the national level, crop diversification will require additional resources and management of a specific or group of crops sold freshly or value added to increase profits [9].

Smallholder farming continues to play a key role in agriculture. However, they face a lot of constraints ranging from climate variability, lack of appropriate infrastructure, poor farming skills, soil degradation [10]. Drought, pests and diseases often worsen the situation in some cases

resulting in complete crop failure there by perpetuating poverty in rural communities. Soils in most smallholder's farms are highly degraded due to poor farming practices that lead to nutrient depletion without adequate replacement with fertilizers or manures. This often leads to low yields and low farm income.

Mount Bamboutos Landscape is a mountainous area which provides favorable growth conditions of several temperate crops already being cultivated in the area such as potato, cabbage, carrot, leeks etc. However, many more temperate crops could be added such as wheat, pear, etc. Production diversity would open the way for different crop rotation options which would help to curb disease and pest problems. Besides its biodiversity uniqueness, this mountain remains the only ecosystem in the country cutting across three administrative Regions which are West, South West and North West, and involving over 20 villages with a population of 20,000 to 30,000 people. Most of these people depend on the mountain and its biodiversity content for their livelihood; they practice slash-and-burn and clear the forest to make way for farmland leading to high rates of deforestation, destruction of water catchments, disappearance of fuel wood and loss in soil fertility [11]. The Environment and Rural Development Foundation (ERuDeF)- a Cameroonian non-governmental organization and other stake holders are preparing a 15 year management plan for the Bamaboutos Mountain which will help to restore its biodiversity. This study aims to understand the current production diversity and constraints of farmers in the Bamboutos Mountain. The results will be used by the intervening organisations as they develop and implement the Bamboutos management plan.

MATERIALS AND METHODS

The study Area

This study was carried out in the Bamboutos Mountain landscape of the

Western High Plateau of Cameroon. It lies between latitude 5°32' and 5°51' North of the equator and longitude, 956' and 1009' east of the Greenwich Meridian. The mean maximum temperature is between 20-22°C; mean minimum 13-14°C. November has the lowest mean minimum temperature and December the highest mean maximum. Rainfall varies from 1780-2290mm per year with July and September being the months with the highest rainfall. The monthly average humidity exceeds 80% in July and August while January and February have the lowest relative humidity (average 45 - 52 %). Three main categories of soils can be found in the Bamboutos mountain: soils with andic characteristics, ferrallitic soils and imperfectly developed soils. This offers the advantage that a variety of crops and animals can be produced in the area.

Data collection and Statistical analysis

Eleven villages were randomly selected and questionnaires administered to the farmers in these villages. On a whole, a total of 261 questionnaires were administered. Data gathered included; respondents demographic attributes, land tenure, farm size, agricultural activities, types of crops and trees planted, animal rearing activities, fish farming activities and constraints faced during agricultural production.

Data obtained from the study were analysed, using descriptive statistics (frequencies and percentages). Results were presented in tables and figures. Production diversity on farm was a simple count of different species produced [12].

RESULTS AND DISCUSSION

Demographic attributes of respondents in the study area

The results as presented in Table 1 show that most (69%) of the household heads were men. A majority (73%) of the sampled population were younger than 55 years, an indication of a very active farming population. There were very few illiterates (16%) with 49% respondent haven resided

in the village for more than 30 years. Duration in a village is an indication of the stability of the respondent. Farmers who stay longer in an area can acquire and own agricultural and livestock assets. The minimum household size was 1, the average 8 and the maximum household size was 45 persons. The large household size confirms the fact that some respondents were polygamists, thus having many wives and children. The mud brick house type was the most common in the study area. House type is sometimes used to characterized respondents into wealthy and unwealthy families. Cement block house owners are considered to be wealthier than mud bricks house owners.

Table 1. Socio economic characteristics distribution

Socio economic variable	variable	Freque ncy	Percent age
Sex	Male	180	69
	Female	81	31
age	16 -35	74	28.4
	36-55	117	44.8
	56-75	66	25.3
	>75	4	1.5
education level	Illiterate	42	16.1
	primary school	127	48.7
	secondary school	61	23.4
	high school	26	10.0
	university	3	1.2
	Degree holder	2	0.8
duration in village	1-15 years	51	19.5
	16-30	83	31.8
	31-45	55	21.1
	46-65	59	22.6
	>65	13	5.0
House hold size	1 – 5 people	93	35.6
	6 -9	98	37.6
	10 - 13	42	16.1
	14 & above	28	10.7
Housing type	Mud brick	209	80.1
	Cement blocks	27	10.3
	Mud bricks + cement block	12	4.6
	Others	13	5.0

Respondents farm sizes and tenure system in the study area

Table 2. Farm sizes and land tenure

Variable	Variable Details	Frequency	Percentage
Farm size	0.1-1.9ha	39	14.9
	2-3.9ha	29	11.1
	4-5ha	13	5.0
	>5ha	10	3.8
	Not known	170	65.1
Land tenure	Inherited	126	48.3
	Purchased	64	24.5
	Rented	62	23.8
	others	10	3.8

Land possession for agricultural practice is an important asset for providing food and non-food needs of the rural households [13] and access to land is a key factor in reducing rural poverty and ensuring food security [14]. Thus land ownership is very important for farmers. The results of this study show that a farmer can own land through; inheritance, purchase, rents or other means like share cropping. In this study most farmers acquired their land through inheritance (Table 2). Inherited land is handed from one generation to another. Farm sizes were generally small, less than 5ha. This is a typical characteristic of smallholder farmers. The land size is most often equal to the resources of the farmer. It is important to note here that most respondents (65%) were not able to know their farm sizes. This is a challenge that needs to be addressed especially when inputs are to be distributed to the farmers as a strategy to improved

production. The local agriculture extension service will be of much help to the farmers in this like.

Respondent’s major agricultural outputs and livestock reared in the study area

The main income generating activities carried out by farmers in the study area were crop production and animal rearing. Table 3 shows that most respondents (68%) were involved in livestock production and fish production was negligible in the study area. Pig and chicken were the most reared livestock. The number of animals/birds ranged between 1 and 50. This shows that the animal farms were generally small. Livestock contributes to food security status of households in different ways such as by providing cash income, nutrition, manure etc [1]. Studies have shown that households that own livestock are more likely to diversify their diet than those that do not own livestock [15]

Table 3. Major livestock reared

Activity/	livestock	Fishing	Cattle	Pig	Goat	Sheep	Chicken
Yes	178	9	20	177	96	31	179
No	78	242	237	81	162	226	79
number			1 - 50	1 - 30	1 - 50	1 - 50	1 - 50

Respondents` major perennial crops

Perennial crops cultivated in the study area had four major uses; for consumption, sale, medicinal and cultural. The most cultivated perennial crops were Avocado and Banana (Table 4). The climatic conditions of the study area are very suitable for these two crops; in fact the

study area is one of the best regions of the country for the cultivation of Avocado. Cocoa which is one of the least cultivated perennial crops is not a traditional crop of the area, it is just being introduced. This accounts for the fact that it is being planted in very few farms.

Table 4. Perennial Crops cultivated

Crop (common name)	Scientific name	Number of farms growing it	Frequency (number of farms)
Banana	Musa spp	89	34.0
Avocado	Persea americana	105	40.2
Kola nuts	Cola spp	51	19.5
Mangoes	Mangifera indica	11	4.2
Coffee	Coffea arabica	11	4.2
Raphia	Raphia vinifera	22	8.4
Citruses	Citrus spp	12	4.6
Guava	Psidium gaujava L.	18	6.9
Safou	Dacryodes edulis	6	2.3
Eucalyptus	Eucalyptus globulus	13	5.0
Sugar cane	Saccharum spp	4	1.5
Paw paw	Carica papaya	4	1.5
Pineapple	Ananas comosus	4	1.5
Cocoa	Theobroma cacao L.	2	0.8

Respondents' major annual crops

Annual crops are short cycle crops that are cultivated for consumption and sale. The most cultivated crops are potato, beans

and maize (Table 4). These are the stable crops of the study area [16]. Vegetables and spices are also cultivated for home consumption and sale.

Table 4. Major Annual crops

Crop (common name)	Scientific name	Frequency (number of farms)	Percentage
Potato	Solanum tuberosum	184	70.5
Cabbage	Brassica oleracea	45	17.2
Carrot	Daucus carota	77	29.5
Maize	Zea mays	78	29.9
Beans	Phaseolus vulgaris	85	32.6
Leeks	Allium porrum	69	26.4
Yams	Dioscoria esculenta	10	3.8
Persley	Petroselinum crispum (Mill)	11	4.2
Celery	Apium graveolens	19	7.3
Cocoyam	Xanthosoma sagittifolium	44	16.9
Onion	Allium cepa L.	10	3.8

Pattern of crop diversity practiced by the respondents

Table 5 presents the extent of crop diversification, where the study used descriptive statistics to describe the extent of crop diversification among the farming households.

Table 5. Crop diversity pattern

No of crops cultivated	Frequency	Percentage
1 - 3	166	63.6
4 - 6	66	25.3
7 - 9	29	11.1

From table 5 it is shown that 63.6% of households within the study area cultivated 1 to 3 different crops, 4 to 6 crops were cultivated by 25.3% of the respondents and 11.1% of respondents cultivated greater than 7 crops. The minimum number of crops cultivated by respondents was 1 and maximum was 9. Averagely, 4 different crops were planted by respondents. Crop diversification can be used as a tool to increase farm income, improve nutrition, generate employment, alleviate poverty, conserve soil and water resources and it is well known as an important strategy to overcome many of the emergencies faced by developing countries [17, 18]

Smallholder farmers' production Constraints

The results of this study show that most of the households depend on crop and animal production for their livelihoods.

There were several production problems raised by the respondents. If these problems are not properly addressed, the level of destruction of the biodiversity of the study area may not be checked. Major problems of crop production in the study area (Figure 1) were:

High cost of inputs (planting seeds, fertilisers and pesticides) were among the major problems faced by farmers in the study site (Figure 1). About 26% of the interviewed farmers cited high cost of inputs as a constraint. There is need for more seed producers to be trained and if possible provided with capital so that seeds can be available and affordable to local farmers. Commercial fertilisers are generally expensive, rendering most of the smallholder farmers in the area unable to purchase adequate quantities. On the other hand, organic fertilisers such as cattle manure, pig manure were often inadequate and of poor quality. The fertiliser shortage problem was compounded by the inherent poor soil fertility status of the land cultivated by these farmers as poor soils and soil erosion were among the challenges cited by them (Figure1).

Problems of lack of pesticides to control insect pests and diseases were a serious problem as pests and diseases was one of the greatest challenges faced by the farmers. Pesticides are essential for high yield and good quality vegetable production [10]. Problems of limited inputs and pests

and disease could account for the overall low yields cited as a constraint for these farmers.

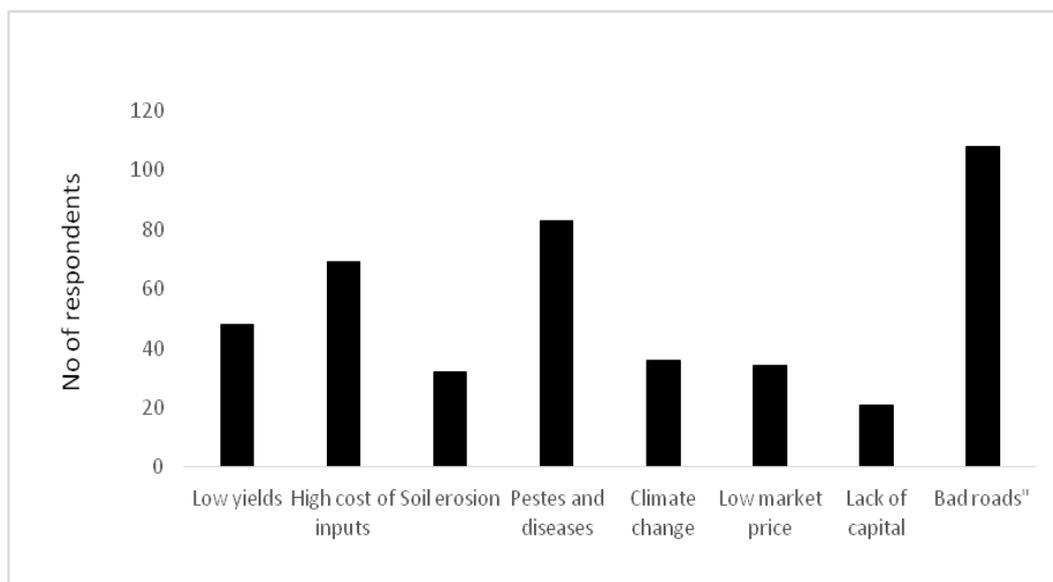


Figure 1. Crop production problems in the study area

Bad roads were the most cited (40%) constraint. Bad roads could account for the high post harvest loss and transportation cost. Harvested crops will not reach the market on time and with bad roads, farmers are asked to pay more money for transportation.

Climate change cited as a constraint by 14% of the respondents, has been associated to irregular rainfall, which can lead to crop failure especially in the study area where farmers have little or no irrigation facilities. Although a few persons mentioned animal ravaging as a constraint, it is important to look for a means to reduce it especially if the flora and fauna of this ecosystem is to be restored. When farmers' crops are destroyed by animals, there will be a tendency for the farmers to kill the animals. More so farmer grazer conflict must be avoided for peaceful coexistence. Lack of capital and low market prices were also cited as constraints. Access to markets is an essential requirement for the poor in rural areas to enjoy the benefits of agricultural growth. Limited access to agricultural markets by smallholder farmers in rural areas represents one of the most important challenges confronting policy makers in developing countries [19].

Formation of cooperatives could address the problems of low market prices and lack of capital. Farmers can sell their produce through cooperatives where the price will be better and they can borrow capital as members of the cooperatives.

If these problems are not addressed fully or partially, they will lead to more serious production and post-harvest losses, thereby impacting negatively on household incomes and food supplies. There is need for extension agencies and other stakeholders such as NGOs to assist farmers to tackle the above-mentioned problems.

The greatest problem faced by smallholder farmers in animal production is pests and diseases (cited by 30% of the respondents) (Figure 2). This is further aggravated by poor veterinary services. Similar constraints were encountered by rural farmers in Adamawa State, Nigeria [20]. Pests and diseases have been found as key threats that impact agriculture in developing countries [21].

If training institutions are built and farmers trained on long or short term, it will go a long way to solve the problems cited by farmers. Farmers will be trained on local production of feed which will solve the problem of lack of feed. Adequate training

will enable farmers to handle uncomplicated veterinary problems faced by their animals and birds.

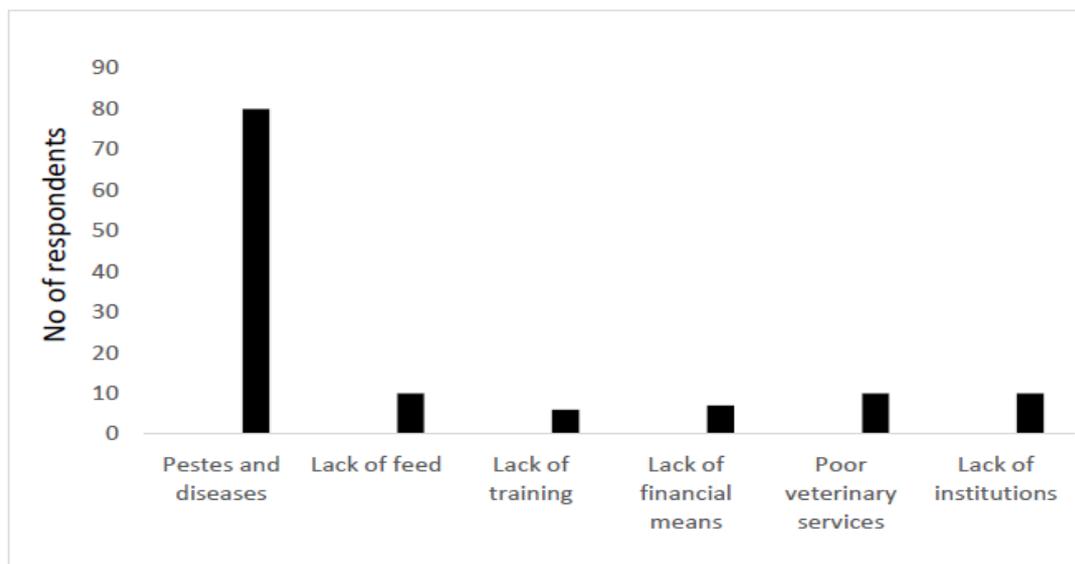


Figure 2. Animal production problems in the study area

CONCLUSION

This study documented production diversity in smallholder farms around the Bamaboutos Mountain. The smallholder farmers plant both annual and perennial crops that are either consumed, sold, used in medicine and/or as ornamentals. The outcome of the study suggests that crop diversification should be encouraged in the study area. The constraints face by these farmers in crop and animal production are many notably among them are; lack of inputs, pest and diseases, lack of technical know-how, bad roads and lack of capital. These identified constraints provide entry points for policy and stakeholder intervention, for sustainable livelihood development and a better management of the Mount Bamboutos ecosystem. Policy which improves rural farm household income should be put in place and activities that can help increase farm household off-farm income should be encouraged.

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