Profitability Analysis of Small Holder Maize Farm Systems in the Western Highlands of Cameroon: Evidence from Tubah Sub-division

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Abstract

This study to analysis profitability of maize production under the different farming systems practiced within Tubah subdivision. Purposive sampling technique was used to select 80 farmers from the 4 villages (Bambili, Bambui, Big Babanki, and Small Babanki) in the study area; 20 from each village. The study used primary data collected through the use of questionnaires and interviews. Results showed that there are basically two farming systems: mono-cropping and multi-cropping. Using the cost–return analytically technique, results of the NFI and profits per bucket under mono-cropping and multi-cropping farming systems in FCFA were (2,103,266), (6,707,250) and (3,322), (5,174.4) respectively. The result showed that maize production in the study area under both farming systems is not profitable. The findings were attributed to some constraints notably inadequate credit, access to improved seeds challenge, insufficient fertilizer application, and high cost of labour. The study recommends that for profitable maize production within the study area, the government, and NGOs should assist farmers to overcome the main challenges as well as organise farmers into cooperatives to ease marketing with a high bargaining power.

Keywords: *Profitability, Maize Farming Systems, Cost-Return Analysis.*

Intoduction

Maize is a widely consumed cereal across the world and according to research its production in developing countries is highly done by small holder farmers (Oladeebo, 2004; FAO, 2008; Paudyal *et al.,* 2001; Etoundi, (2007),). Cameroon often referred to as "Africa in miniature", has a highly diversified agro-ecology which supports agricultural production notably maize farming. As noted by GoC-FIDA (2010), agriculture remains a priority sector in the growth and poverty reduction drive of the Government of Cameroon.

Apparently, the high demand for maize be it for consumption or for production of animal feed (Etoundi, 2007), implies that other things being equal maize farming can be a profitable business. However, as observed by Takoutsing et al. (2012) most maize farmers in Cameroon use local variety seeds with no adequate measurements of the quantity of seeds planted per hectare given that planting is done manually, hence most farmers are unable to establish quantifiably benefits derived from their farming activities.

As observed by AGRIFIN, (2017) in Tubah Sub

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Profitability Analysis of Small Holder Maize Farm Systems in the Western Highlands of Cameroon: Evidence from Tubah Sub-division

13

Division, Maize is cultivated twice a year yet total output which stands at 1.8 ton/ha does not reflect the input largely due to the fact that farmers used poor quality seeds and lack of access to finance Takoutsing et al. (2012). Nguiffo and Sonkoue Watio, (2015), note that in Cameroon, agricultural production is highly subsistence with minimal intensive agriculture being practiced. Food crop production is subsistent in nature, controlled by small holder farmers, continuous to be the main source of survival for the people Achancho (2013).

It is worth mentioning that farming techniques in small holder agriculture in Cameroon include mixed cropping, monoculture, crop rotation and multiple cropping. This study thus seeks to analyze the level of profitability of maize production under the different farming systems practiced within Tubah subdivision; given the changes in the factors affecting maize production in the area.

Literature Review

Farming systems characterize a suitable combination of farm enterprises and available resources for the farmer to engage in them with a profit motive. As observed by Dixon et al. (2001) individual small holder farmers perceive farm systems typical with respect to attaining family goals. Hence, the interdependence and diverse nature of farm household activities coupled with the task of acquiring inputs and securing a market has continued to affect small holder farm systems, negatively impacting on profitability. Based on this high interdependence, Garrity, Dixon and Boffa (2012) argued that small holder farmers consider their farms as complex and risky systems, hence focusing activities on attaining basically family goals.

Dixon et al. (2001) explains that African farming systems are classified based on two main factors: the natural resource bas available and the

dominating pattern of farm activities in a particular area due to the technologies utilized. Apparently, this classification justifies variations especially in small holder farming systems across the world. Building from the above, it is thus clear that the natural resource base available and technology will influence the degree of profitability in the farming systems.

Tony (2007) describes subsistence agricultural as a hand-to-mouth type of farming system where the farmers focus on growing a range of crops and animals basically for family consumption and only surpluses are sold. According to Brüntrup and Heidhues (2002), intensive agriculture deals with agricultural production aimed for commercial purposes, using adapted machines, with less dependence on human labour and a high utilisation of chemical additives.

Generally speaking, research suggest that maize is cropped mostly in intercropping farming systems in Africa (Dowswell, Paliwal and Cantrell, 1996). Though yields continue to be questionable as many factors (planting distance, quality of seeds, timely weeding, sufficient soil nutrients etc) that contribute to productivity may be ignored by most small holder farmers practicing intercropping, the need to improve production and hence profits remains of paramount importance.

As observed by Sanchez, (2018), in Zambia and Malawi, farmers integrate leguminous shrubs and trees in maize production systems and this has positively affected soil fertility and hence yields. Studies in our parts of Africa especially where farmers have access to credit have also shown maize farming to be profitable (Lamba *et al.,* 2016; Jimjel *et al*., 2014)

Research Gap

From the works reviewed, profitability in maize

farming has been greatly studied with attention paid to medium and large scale farming systems, neglecting profitability analysis in small holder farm systems, a gap which this study focuses to fill. Furthermore, most studies on profitability analysis on maize farming systems reviewed have been foreign, using gross margin for analysis hence a gap in literature which through conducting this research in Cameroon using cost return analysis, this study seeks to fill.

Research Objective

This study seeks to analyze the level of profitability of maize production under the different farming systems practiced within Tubah subdivision; given the changes in the factors affecting maize production in the area.

Research Methodology

The case study approach was adopted. The purposeful sampling technique was employed. Data collection was from primary sources using questionnaire and interviews as tools. A sample size of 80 maize farmers was used for the study, selected from the 4 villages in Tubah subdivision namely: Bambili, Big Babanki, Small Babanki, and Bambui. The test re-test method, member check and triangulation were use to ascertain validity and reliability of data.

The cost and return analysis was used to determine the profitability of maize production under the different farming systems in the study area.

The cost and return analysis used is derived as follows:

$TC = TVC + TFC$

$AC = TC/Q$

$TR = \sum P_i Q$

$AR = TR/Q$

$TVC = \sum \gamma X_i$

$NFI = (TR - TVC) - TFC$

Where NFI is the net farm income, TR is the total revenue, AR is the average revenue, TVC is total variable cost, TC is the total cost, AC is the average cost, P is unit price of output, Q total output, X is variable input, γ is unit price of input X and TFC is total fixed cost.

Findings And Discussions

Part A: Findings

Cost and Returns under Mono-cropping

Mono-cropping maize farming system as practiced in the sampled villages showed varied cost and returns as can been seen in the table below.

Table 1:
Cost and Returns under mono-cropping

Variables	Bambili	Bambui	Big Babanki	Small Babanki	Total
TFC (FCFA)	116,700	157,538	221,450	178,528	674,216
TVC (FCFA)	706,800	806,800	783,800	715,600	3,013,000
TC (FCFA)	823,500	964,338	1,005,250	894,128	3,687,216
Q(bucket)	166	93	145	228.51	633.07
Av.Q	33.2	15.5	29	38.08	28.77
AR (FCFA)	2,370	2,467	2,650	2,525	2,502
TR (FCFA)	393,450	228,500	385,000	577,000	1,583,950
NFI (FCFA)	(430,050)	(735,838)	(620,250)	(317,128)	(2,103,266)
AC (FCFA)	4,960.8	10,369.2	6,932.7	3,912.8	5824.34

*Source: Field Survey
*total area cultivated under mono-cropping = about 10.5 ha

Results revealed that 27.5% of the sampled population are practicing mono-cropping. From this percentage, 6.3% are from Bambili representing 25% of the sampled population from Bambili, 7.5% from Bambui representing 30% of the sampled population from Bambui, 6.3% from Big Babanki representing 25% of the sampled population from big Babanki and 7.5% from Small Babanki representing 30% of the sampled population from Small Babanki.

Looking at the cost of production results showed that for all practicing mono-cropping, TFC = 674,216FCFA representing 18.29% of the total cost of production; with Big Babanki incurring the highest FC of 221,450FCFA and Bambili the smallest FC of 116,700FCFA. This can be attributed to the fact that there were more people in Big Babanki rent land for massive production for the market unlike Bambili where production is on family land mainly for home consumption. TVC for all practicing mono-cropping in all the villages was estimated at 3,013,000FCFA representing 81.71% of the total cost of production; with Bambui incurring the highest TVC of 806,800FCFA and Bambili the smallest TVC of 706,800FCFA. Hence results shows total cost (TC) of production of maize under mono-cropping stands at 3,687,216FCFA with Big Banbanki contributing 27.3%, Bambui 26.2%, Small

Babanki 24.2%, and Bambili 22.3%. Total Average cost (AC=TC/Q) of production equals 5,824FCFA. This implies to produce a bucket of maize under mono-cropping farming system, the farmer spends a sum of 5,824FCFA.

Results equally showed that, total output for all farmers under this farming system stands at 633.07tins per season giving an average output of 28.77 buckets/farmer. This implies that every farmer under this farming system is expected to produce at least 28.77 buckets of maize. As observed from analysis, engaging in mono-cropping, maize yields recorded were averagely: Bambili 33.4 buckets/farmer, Bambui 15.5 buckets/farmer, Big Babanki 29 buckets/farmer, and Small Babanki 38.0 buckets/farmer.

The average unit price varies from one village to another giving a calculated total revenue (TR) of 1,583,950FCFA for the four villages; with the highest revenue generated from Small Babanki 577,000FCFA (36.4%) followed by Bambili 393,450FCFA (24.8%), then Big Babanki 385,000FCFA (24.4%) and lastly Bambui with 228,500FCFA (14.4%). The Average revenue (AR=TR/Q) equals 2,502FCFA. This implies that every bucket of corn produced is sold at 2,502FCFA.

From the above, looking at the TR and the TC, results showed that all those producing maize under mono-cropping farming system are incurring a negative profit of (2,103,266) FCFA with Bambui incurring the highest losses of (735,838) FCFA followed by Big Babanki (620250) FCFA, then Bambili (430,050) FCFA and lastly Small Babanki (317,128) FCFA. Also, looking at the AR and the AC, results showed that for every bucket of corn produced under mono-cropping farming system, the farmer incurs a loss of 3,322FCFA (AR-AC).

Cost and Returns under Multi-cropping

Cost and returns under multi cropping maize farming system was also examined. Data generated from the study showed variations in the different villages sampled. The results as uncovered can be seen in the table below.

Table 2:
Cost and Return under multi cropping.

Variables	Bambili	Bambui	Big Babanki	Small Babanki	Total
TFC (FCFA)	491,476	391,150	501,283	405,490	1,789,400
TVC (FCFA)	1,899,850	1,722,500	2,229,650	2,434,100	8,286,100
TC (FCFA)	2,391,326	2,113,650	2,730,933	2,839,590	10,075,500
Q(bucket)	294.5	281.5	332.74	383.46	1,294.98
Av. Q	19.6	20.1	22.18	27.39	22.32
AR (FCFA)	2,477	2,507	2,813	2,600	2601
TR (FCFA)	729,500	705,750	936,000	997,000	3,368,250
NFI (FCFA)	(1,661,826)	(1,407,900)	(1,794,933)	(1,842,590)	(6,707,250)
AC (FCFA)	8,119.95	7,508.5	8,207.4	7,405.17	7,780.4

*Source: Field survey
*total area cultivated under multi-cropping = about 30.5ha

The cost of production under this farming system showed that for all practicing multi-cropping, TFC=1, 789, 400FCFA representing 17.75% of the total cost of production; with Big Bambili incurring the highest FC of 49,147,6FCFA and Bambui the smallest FC of 391,150FCFA. TVC for all practicing multi-cropping in all the villages stands at 8,286,100FCFA representing 82.25% of the total cost of production; with Small Babanki incurring the highest TVC of 2,434,100FCFA and Bambui the smallest TVC of 1,722,500FCFA. Hence results show total cost (TC) of production of maize under multi-cropping stands at 10,075,500FCFA with Small Banbanki contributing 28.2%, Big Babanki 27.2%, Bambili 23.7% and Bambui 20.9%. Total Average cost (AC=TC/Q) of production equals 7,780.4FCFA.

This implies to produce a bucket of corn under multi-cropping farming system, the farmer spends a sum of 7,780.4FCFA.

From results, total output for all farmers under this farming system stands at 1294.98buckets per season giving an average output of 22.32buckets/farmer. This implies that every farmer under multi-cropping is expected to produce at least 22.32buckets of corn. At this point, Bambili under multi-cropping is producing an average output of 19.6buckets/farmer, Bambui 20.1 buckets/farmer, Big Babanki 22.18 buckets/farmer, and Small Babanki 27.39 buckets/farmer.

Further, the average unit price also varies from one

Profitability Analysis of Small Holder Maize Farm Systems in the Western Highlands of Cameroon: Evidence from Tubah Sub-division

17

village to another and we have a total revenue (TR) of 3,368,250FCFA for the four villages; with the highest revenue generated from Small Babanki and stands at 997,000FCFA (29.59%) followed by Big Babanki 936,000FCFA (27.79%), then Bambili 729,500FCFA (21.66%) and lastly Bambui with 705,750FCFA (20.96%). The Average revenue (AR=TR/Q) equals 2,601FCFA. This implies that every bucket of corn produced is sold at 2,601FCFA.

From the above, looking at the TR and the TC, results suggest that all those producing maize under multi-cropping farming system are incurring a negative profit of (6,707,250)FCFA with Small Babanki incurring the highest losses of (1,842,590)FCFA followed by Big Babanki (1,794,933)FCFA, then Bambili (1,661,826)FCFA and lastly Bambui (1,407,900) FCFA. Also, looking at the AR and the AC, results suggest that for every bucket of corn produced under multi-cropping farming system, the farmer incurs a loss of 5,174.4FCFA (AR-AC).

Part B: Discussion

Small holder farming systems focused in food crop production in Cameroon remains a great challenge. As observed by Nguiffo and Sonkoue Watio, (2015), the new agricultural policy of Cameroon largely referred to as the Second Generation Agriculture has greatly ignored small holder farmers engaged in food crop production. With this, small holder food crop production continuous to be fragile, traditional with little use of inputs ((Nguiffo & Sonkoue Watio, 2015; Achancho, 2013) with the results being low yields and poor returns on investment.

Results from table 1 and 2 show that TFC of producing maize under multi-cropping which stands at 1,789,400 FCFA is higher than that under mono-cropping which is 674,216 FCFA. This

could be ascribed to the fact that there were more people practicing multi-cropping than those practicing mono-cropping. Also, results showed that TVC under multi-cropping which is 8,286,100 FCFA is by far higher than that under mono-cropping which stands at 3,013,000 FCFA. This could be attributed to the fact that cultivating many crops on the same piece of land year after year results to the rapid depletion of the soil nutrients. This is in accordance with Aweto *et al*., (1992) who based on a study of the intercropping of cassava and maize observed significant reductions in total nitrogen and phosphorous availability in the soil, thus an indication that intercropping which does not include legumes may require the application of fertilizer and manure to improve soil fertility and ensure high yields.

Given that TFC and TVC are both high under multi-cropping, it thus implies that TC of production is high under multi-cropping 10,075,500 FCFA than that under mono-cropping 3,687,216 FCFA. However, this might not necessarily mean that cost of production is higher under multi-cropping than under mono-cropping per say given that there were more people practicing multi-cropping than those practicing mono-cropping. Further, results showed that the average cost (AC) of production stands at 7,780.4 FCFA under multi-cropping and 5,824.3 FCFA under mono-cropping. This implies to produce a bucket of corn under multi-cropping, a farmer spends 7,780.4 FCFA while under mono-cropping; it will cost a farmer 5,824.3 FCFA. Apparently, the degree of labour engagement as highlighted by study participants is responsible for variations in AC as multi-cropping was said to be more labour intensive when compared to mono cropping. Similar studies (Aman et. al, 2004) have argued same indicating that in mono-cropping systems, farmers easily use sprays to kill weed, a practice not common in multi-cropping systems.

In terms of outputs, results showed that total output under multi-cropping stands at 1,294.98 buckets with an average output of 22.32 buckets per farmer which is lower than that under mono-cropping where by total output equals 633.07 buckets but with an average output of 28.77buckets per farmer. Apparently, the lower outputs in multi-cropping is due to the low inputs such as quantity of fertilizer given that the quantity of fertilizer put under maize is shared with other crops; and the poor adoption of technology required to manage maize on a multi-cropping farming system (FAO, 2005). Also, the high degree of maize susceptibility to weed competition may be a contributing factor if weeding is not done timely (Bangun, 1985). Considering that labour for farm activities in the study area is basically family labour, late weeding becomes a factor to consider when understanding the lower output under multi-cropping systems. Further, in accordance with Seini., (2002), the lower output per farmer under multi-cropping compared to that under mono-cropping could be as a result of seeds recycling practice where previous years seeds are use in the subsequent years, with some seeds being less resistant to pest and disease hence lower yields..

More still, results revealed that total revenue (TR) for all the farmers practicing multi-cropping stands at 3,368,250 FCFA which is higher than TR of the farmer practicing mono-cropping which stands at 1,583,950 FCFA. This could be explained by the fact that there were more people practicing multi-cropping than those practicing mono-cropping. However, from the results of average revenue (AR), it is clear that AR under multi-cropping, which stands at 2,601 FCFA is higher than AR under mono-cropping which stands at 2,502 FCFA. The low unit price commanded by maize in both farming systems could be as a result of a decrease in the demand for maize in the study area considering that most inhabitants in the study area are farmers and hence demand less. Also increased

production of maize in other localities has played down on the prices of maize. This findings are similar to those of Paudyal *et al*., (2001).

However, what is of great interest at this point is the profitability of each of the farming systems. As observed from results, the cost of producing a bucket of maize under mono-cropping stands at 5,824.3 FCFA while under multi-cropping it is 7,780.4 FCFA and that the revenue generated from a bucket of maize under mono and multi-cropping farming systems is 2,502 FCFA and 2,601 FCFA respectively. Showing that for a bucket of maize produced under mono-cropping, a farmer incurs a negative profit of (3,322.3) FCFA and under multi-cropping a negative profit of (5,179.4) FCFA. The high losses under both cropping systems are due to the high cost of production which most of the farmers do not take into consideration and thus are satisfied with their revenue which is not profits. For instance, most of the farmers do not value time spend in the farm, their personal labour, as well as attribute a cost for the farm land, solely because the lands are family land. This implies that should price tags be attributed to all factors employed in maize farming (as in this study) in Tubah Sub Division, farmers will basically end at the margins making no profits of very minimal. This truly explains why farmers in Tubah basically live at the margins of poverty.

Conclusion

This study analysed the level of profitability of maize production under two farming systems: mono-cropping and multi-cropping in the four villages under Tubah subdivision, using the cost and returns analyses to get the cost of producing a bucket of corn and also to get the revenue generated from a bucket of corn in the study area under both cropping systems and lastly the profits generated from a bucket of corn produced. Results showed that cost of production is generally high in

the study area while revenue generated is generally low per bucket of maize resulting to a loss under both farming systems with a greater loss witnessed under multi-cropping system. In sum, analysis showed negative profits in the sampled studied.

Recommendations

• The government and other NGOs should assist farmers by making quality and disease resistant seeds available to farmers. This will reduce seed recycling and may result in high yields and consequently profits.

• Given the low price commanded by maize, farmers in the different villages should come together and form maize farmer cooperatives. This will help them to be able to collectively determine prices as well as access the market hence high likelihood of making profits.

Limitations of the Study

• This study is crop specific that is analysing profits from maize only.

• Data employed in the study is solely that obtained from the rainy season maize farming period when prices and generally low.

Scope for Future Research

The researchers suggest that further research be conducted as guided below:

Other commodity specific studies be conducted and comparisons made with maize profitability to see which crop is more profitability.

Finally, the researchers suggest that the same methodology be employed and another study conducted in another sub Division in a different region to see if there will be any variation in results.

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