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Profitability Analysis of Sweet Orange Production in Mamfe Municipality, Cameroon

Mbu Daniel Tambi[1*], Arrey Thomas Mangeb[2]

[1]*Department of Economics, University of Bamenda- Cameroon*
[2]*Department of Agribusiness Technology, University of Bamenda- Cameroon*

ABSTRACT

This study aimed to investigate the profitability analysis of sweet orange production in Mamfe municipality, Cameroon. The study employed primary data collection through self-administered questionnaires to sweet orange farmers and a total of 200 samples were selected. The study used financial profitability analyses and percentage ranking to estimate the result. The gross return and net return for a hectare of the sweet orange orchard were 14155000 FCFA and 11759200 FCFA respectively for a 12 year sweet orange orchard. The NPV was estimated to be 4447824 FCFA per hectare of sweet orange orchard which indicates that sweet orange production fetches higher returns. The estimated BCR was 3.95 for a hectare of sweet orange orchard which shows that investment in sweet orange production is feasible for farmers. The production of sweet orange production was also found to be a profitable investment since the IRR was high (34.836%). The results also revealed that profits from sweet orange production have an impact on the livelihood of farmers. The result from the percentage ranking shows that the major constraints of sweet orange farmers are credit facilities, lack of agrochemicals, absence of extension services, high cost of farm inputs, high cost of labor, pests and diseases, and bushfires. The study concluded that sweet orange production was profitable and recommended that decision makers should promote sweet orange production via easy agricultural credits and others. This is a wise step towards improve well-being in Mamfe municipality in particular and Cameroon at large.

Keywords: *Profitability Analysis, Sweet Orange Production, Livelihood and Mamfe.*

1. Introduction

Fruits have been significantly singled out in human nutrition for the supply of minerals, vitamins, and some hormone precursors in addition to protein and energy [38]. Despite their importance in the diet, per capita consumption of fruits in Cameroon is only 100g compared with 400g of daily consumption per head as recommended by the World Health Organization. Numerous quantities of fruits, such as citrus species, pineapples, pawpaw, guava, coconut, mangoes, avocado pears, plantain, and bananas are produced in Cameroon and staggering figures are given as the estimated annual production level.

The neglect of the sweet orange fruit industry is more so since when investors are willing to invest in agriculture, they prefer to invest in food crops such as maize and cassava that can fetch them short-run quick returns, rather than invest in the fruits canning industries like sweet orange (citrus). This is because the sweet orange industry is constrained by many storage problems. Heavy crop losses usually occur while the citrus fruit is being transported along its marketing chain.

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Corresponding author: **Mbu Daniel Tambi**
E-mail: **tambi2015@yahoo.co.uk**

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Loss in transit is great for citrus fruit because the fruits are fragile and juicy as well [3]. At the marketplace, the seller is also faced with the problem of spoilage as the fruits have to be sold within the shortest time possible before they get spoilt. The sweet orange fruit perishability problem is also compounded by the poor storage/shelf life of the fruit [7]. Another problem is that of pests and disease attacks on the crop. Fruits such as the sweet orange are attacked by pests and diseases which reduce their quality and quantity. Aside from the perishable nature of sweet orange, the fruit marketers' inherent socio-economic factors in the marketing chain for these fruits are very crucial. All these factors as well as the frequent price fluctuations of sweet orange due to its perishability and seasonal nature discourage prospective investors from venturing into the sweet orange industry [4].

Citrus fruits (sweet orange) production is conducted traditionally in rural areas but provides food, income, and employment to over 38% of the rural population [8]. Most of the farmers cultivate small plantations of sweet orange orchard an average of two hectares in the rural areas. Several factors including natural and non-natural have already been identified to be behind the low production of sweet oranges in Cameroon. Factors such as the lower yields and profitability, price variability, low level of technology transfer, use of local seeds, high cost of fertilizer, and lack of modern agricultural implements are among the key challenges holding back productivity in the country in the country. To address this demand gap, sweet orange is imported from countries including Nigeria, South Africa, and France to compensate the supply gap.

Citrus (sweet orange) production plays an important role as a source of income for farmers, a nutritional requirement for the population, and as forest regeneration trees [19]. Citrus is grown in areas generally referred to as "citrus production basins" with characteristics that favor their growth.

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The smallholder farming sector continues to battle with the daunting task of moving from a "subsistence syndrome" to the "plane of entrepreneurship". The greatest challenge to the development in the sector is low productivity and the reasons for this are numerous. Producers have little access to financial resources and modern technologies and their organizational structures are weak. Besides, most of the past development initiatives have simply become poverty traps. The situation therefore seems similar to that of other developing countries, with the [11] who state that developing countries are characterised by a lack of proper institutions when it comes to rural development. In fact, the [11] attributes the failure of agricultural development in most developing countries to a lack of proper institutions.

The fruit tree production sub-sector suffered neglect during the colonial and post-independence era in Cameroon. On July 28, 2015 in Yaoundé, the Cameroonian Minister of Agricultural and Rural Development officially launched the Fruit Tree Cultivation Development Support Programme. The project needs 178.5 billion FCFA in financing, a portion of which was provided by the FAO in the framework of the pilot phase, while the government will raise most of the required amount. According to its initiators, the Fruit Tree Cultivation Development Support Programme aims to increase the number of orchards in production zones situated mainly in the Centre (Lekie, Mbam, and Inoubou divisions), Adamaoua (Vina and Mayo Danay divisions) of the Far-North (the Diamaré division and North (Bénoué and Mayo Louti divisions) regions. The cooperatives, joint initiative groups (GICS in French), and industrial producers, which will all start putting the orchards in place, will then receive multiple forms of support to create processing plants. The project's promoters indicate that the plan is to make Cameroon a juice exporter by 2025.

In Cameroon, citrus production is more concentrated in the Guinea and Sudan savannah zones with South West region giving the second highest annual production region of sweet oranges after the Centre region [23]. Cameroon has high potentials for increasing sweet orange production ranging from the increased population, availability of suitable citrus production ecosystems, adequate land, increased internal and external market demand, expansion of other sectors including the juice processors, and tourist industry. Several efforts have been repeatedly initiated and implemented by the government aiming at revamping the horticulture sector including introduction of adaptable seeds, the introduction of some programs to support citrus subsectors, introduction of financial support through small credits, and price control, especially with the imported sweet orange to protect local production. The major purpose of the government interventions is to enhance sweet orange productivity and benefit to farmers through increased income and food security.

Therefore, the current study was designed to determine profitability accrued by the farmers; to identify the key drivers and constraints perceived by farmers, income, and the effect to their livelihoods. The focus is given to sweet orange production because of the growing demand especially with an increasing household income in the cities. Sweet oranges from Mamfe has a high quality with sweet juicy, high demand and it is commonly called "Mamfe orange" Unfortunately, there have been few or no studies involving crucial role of sweet orange cultivation and it impact on farmers in the Mamfe community. This explains why this study examines the profitability analysis of sweet orange production in Mamfe municipality.

The objectives targeted are: to determine the profitability of sweet orange production amongst farmers in Mamfe municipality, Cameroon, and to verify the constraints associated with sweet orange production amongst farmers in the Mamfe municipality, Cameroon.

2. Literature review

Profitability is a key factor in the growth and development of each enterprise. Due to this, a large number of research papers are focused on giving an answer to the question which factors have an impact on the profitability. Research papers about profitability factors can be divided into three groups. The first group represents the investigation of external factors which influence on profitability, such as market, business, and economic environment [36]. The second group focuses on the internal factors of profitability such as the size of enterprises, indebtedness, growth, age, lagged profitability and other factors at the level of enterprises [21], [18].The third group includes research papers that investigate the influence of both internal and external factors on profitability [27].

[39] adopted this technique in determining the profitability of improved maize variety production in Sabon Gari Local Government of Kaduna State and found farming of improved maize variety to be profitable. [25], employed a costs-returns analysis in determining the profitability of soya beans marketing in Kuje Area Council of Abuja. [17], used this method to determine the profitability of cowpea storage using chemical and non-chemical methods and found that those using chemical storage method generated more profit than their counterparts using non-chemical method, even though, all the two cowpea method were found to be profitable ventures. One of the key observations in the review of the literature was that most of the studies that have been conducted on the profitability of bean production or other enterprises were done as part of other studies.

Several factors have been identified to influence agricultural profitability at farm level. These include; the farm gate price, government price policies, farm location, production costs, variety of seed used, yield, farm size, tillage practices, land tenure which also influences yield, experience in the production of crop which impacts on yield, education level of the household head, age of household head, gender of household head, household size, off-farm income received, extension services, and distance to market [33]. For farmers in Africa and elsewhere, net productivity is critically dependent on crop prices, level of output, and production costs [30]. [10] found that farm size, production costs, farm location, the interaction between production costs and farm gate price as well as the interaction between the varieties used and fertilizer applied were significant in explaining the observed sorghum gross margins. However, contrary to literature farm size was found to negatively influence the gross margins. Their view on the relationship between farm size and gross margins contrast with findings elsewhere such as those by Sulumbe et al (2010) and Ibro (2008) who found positive relationships between gross margins and farm size. The interaction between production cost and farm gate price was found to be positive and significant while the farm gate price alone was insignificant. The findings also showed that the variety used, tillage method, and the application of fertilizer were not significant but the interaction between variety used and fertilizer application was significant and positive.

[32] studied the "constraints in the production of walnut in India". The constraints that account for the productivity and quality of walnuts in India can grouped as (1) Production constraints, (2) Protection constraints and (3) Processing constraints. The constraints related with low production were the non-availability of suitable rootstocks, superior walnut strains and their multiplication, lack of standard propagation techniques, inadequate knowledge about the cultural practices, manure, fertilization, and pollination, etc. Problems with protection was that of non-availability of proper plant protection machinery, non-availability of water, provision of irrigation and carrying out plant protection measures need water, non-availability of suitable granular systemic insecticides or fungicides, gaps in knowledge about the biology of important pests and disease of walnuts. At last the constraints associated with the processing comprised with lack of knowledge about the proper stage of maturity of tree, proper methods of bleaching and removing of stains from walnut shell and non-remunerative usage of walnut shells, hulls, and other by products, which adds to the low returns.

[1] conducted a study on the constraints associated to horticultural development in Orissa and identified constraints such as no availability of planting material, lack of marketing support and price incentives in the producing areas, poor management, non-adoption of package of practices recommended and shortage of disease-free planting materials. The study emphasized the need for replacement of very old fruit trees with new ones, adoption of improved cultivars from the consumer's point of view. [35], studied the "prospects of fruits cultivation in canal command area of Bikaner, Rajasthan". They revealed constraints faced by the farmers in regard to the cultivation of fruit crops such as problems relating to soil salinity, technical know-how, post-harvest handling, marketing, and financial assistance.

[14] conducted a study on banana cultivation in Haveri district of Karnataka state and identified the problems faced during production were lack of technical know-how, lack of adequate credit facility, scarcity of water, etc. The farmers in the study area also expressed marketing problems like the involvement of intermediaries, lack of storage facilities and inadequate transportation. [6], studied the profitability analysis and perceived constraints of farmers in pineapple production in Edo State, Nigeria. The most prevalent constraints in the study were lack of credit facilities, weather and diseases, lack of road and high cost of transportation, low prices and lack of market outlet, high post-harvest losses, lack of herbicides, land and storage facilities and high cost of labor.

3. Methodology

This study was undertaken in Mamfe municipality which is in the Equatorial Rain Forest of Cameroon. Mamfe Municipal Council corresponds to Mamfe subdivision. Mamfe town is the headquarter of Manyu Division in the south west region of Cameroon. Mamfe Rural Council started as far back as 1917 as Mamfe Native Authority. It was comprised of the present day Nguti, Fontem, Widikum, Akwaya, Eyumojock, Tinto, and Mamfe Central councils. In 1978 when Eyumojock was created, it became Mamfe rural council. Tinto was later carved out in 1995 to let alone Mamfe Central. Before 1995, the government appointed the Municipal administrators.

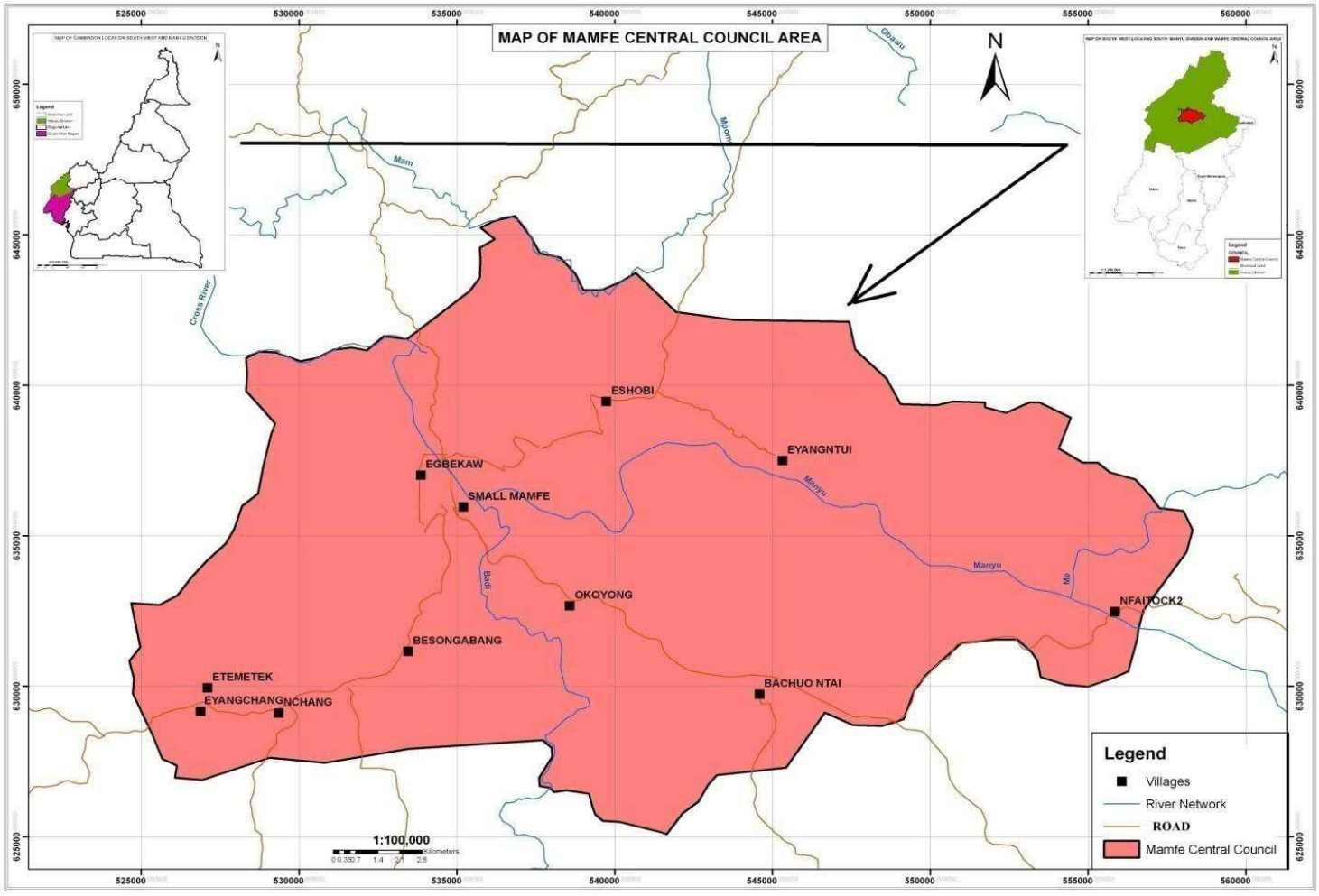

Figure 1: Map of Mamfe Muniipality in the South West Region of Cameroon

Mamfe municipality falls within the tropical evergreen rainforest zone of Cameroon. It is endowed with valuable forest resources including Timber, non-timber Forest Products (NTFPs), and wildlife. There is high exploitation of timber and NTFPs including wildlife within Mamfe municipality but no data on the quantities exploited in the municipality is available. They are exploited for home use and a substantial quantity is illegally exploited for commercial purposes to Nigeria and other areas within Cameroon. Timber and NTFP including wildlife (bush meat) provide income, and employment and serves as food sources for a good number of people in Mamfe municipality. Unlike two of its neighboring councils, the Mamfe council does not have a timber exploiting company in its municipality, but due to the transit nature of the municipality, timber and other forest products are transported through the municipality. A toll is collected during the transportation process; this source of revenue can bring in more income to the council if stricter measures are put in place. There are no forest reserves in the municipality however the Mamfe forest reserves extend to parts of Eyangntui and Eshobi villages.

Data presentation

The population of this study constituted two hundred sweet orange farmers, drawn from the Mamfe municipality. For this study, the researcher adopted the convenient sampling technique in selecting the respondents. From a total of 36500 populations, according to the 2015 National Population Census figure, the researcher adopted a sample size of 200 farmers from eleven villages in the Mamfe municipality. This is less than 5% of the entire population of the Mamfe municipality. This choice is informed by [29] submission as cited in [31] that "if the population is a few hundred, a 40% or more sample will do; if many hundreds, a 20% sample will do; if a few thousands, a 10% sample will do and if several thousands, a 5% or less sample will do". The population of this study will be less than 5% sample is considered appropriate. The study used simple random sampling to draw the population of the study. The use of simple random sampling helped to elucidate the research analysis. Simple Random Sampling gives equal chances of opportunity to the entire universe in the population and reduces the rate of errors.

The data collected were analyzed using descriptive statistics, Microsoft Excel computer spread-sheet software, and percentage ranking. The profitability indicators estimated were benefit-cost ratios (BCR), net present values (NPV), internal rates of return (IRR). A 10% discount rate was used in assessing the profitability of the technology [12]. Gross margin analysis involves evaluating the efficiency of sweet orange farmers (business plan) so that comparison can be made between the different farm business plans using IBM SPSS Statistics version 23. The Ordinary Least Square analysis was also used to analyze the factors of production of sweet oranges. The study adopted a quantitative and qualitative research approach so that, the theoretical orientation is informed by the concepts and ideas that link research to literature and the gathering of empirical evidence through questionnaires. This methodology was adopted for this study because; it allows the researcher to gather relevant information that helped to build up analysis and proposed recommendations. The adoption of the foregoing analytical method becomes necessary since the study relied principally on primary sources of data. The researcher used simple percentages, tables, and descriptive statistical methods in the analysis. Fieldwork was done from the 6th of May 2021 to the 30th of June 2021.

4. Results

4.1 Farm and Sweet Orange Farmers Characteristics

The result also revealed that 27.5 percent of the sweet orange farmers in the study area had between 1 and 9 years of experience, 42 percent had between 10 and 14 years of experience, 22 percent had between 15 and 19 years of experience and 8.5 percent had 20 years and above years of experience in sweet orange production as represented in Table 1. 72.5 percent had more than 10 years of experience in sweet orange farming.

The average farming experience for the pineapple farmers in the study area was 12.6 years. Therefore, it can be mentioned that the sweet orange farmers in the study area have sufficient experience in sweet orange farming. This situation agrees with the findings of [22] who reported that the average farming experience of sweet orange farmers in Benue State, Nigeria was 13.5 years. In other words, the cultivation of sweet orange was not a new subject to those farmers and they were knowledgeable with the operations and constraints of sweet orange production. Farming experience determines the ability of farmers to make farm management decisions effectively, not only by adhering to agronomic practices, but also concerning input combination or resource allocation. [2], opined that years of farming experience usually play a vital role in any farming enterprise.

The result in Table 1 revealed that 100 percent of the respondents had no contact with extension agents. This low frequency of contact with extension agents can be attributed to the limited number of extension agents (1:6000 farmers) in Cameroon which makes it impossible to reach all farmers by interpersonal means and MINADER does not have programmes to support citrus fruits and sweet orange farming in particular. This is in agreement with [9] reporting that that extension service in Nigeria is poorly organized and in some cases, unavailable.

Table 1. Farm and Orange Farmers Characteristics

Description	Percent
Distribution according to contact with extension workers	
No	100
Yes	0
Distribution according to farm size	
<3	47.5
3-6	38
7-10	13
>10	1.5
Distribution according to farm experience	
5 ≥ 9 Years	27.5
10 ≥ 14 Years	42.0
15 ≥ 19 Years	22.0
>20 Years	8.5
Distribution according to annual farm income	
<700000	41.5
800000≥1500000	43.0
1600000≥1900000	10.5
>2000000	5.0
Distribution according to motivation in sweet orange farming	
Good climatic conditions	78.5
Fertile soils	12
Availability of labor	5.5
Others	4

Source: Author from field survey

Table 1 indicated that 47.5 percent of sweet orange farm size were between 1-3 hectares, 38 percent were between 4-6 hectares, 13 percent of sweet orange farm size were between 7-9 and 1.5 percent of sweet orange farm land were 10 hectares and above. Some farmers practice mixed farming. Due to the farming system, some farmers may have a large portion of but produce a small quantity of output. These results subscribe to the findings of [8], who stated that farm size, does not affect greater returns because small farms can produce far more per hectare than large farms. The study also showed that 41.5 percent of sweet orange farmers earned less than 700,000 FCFA ($1,298.376) as annual farm income, while 43 percent of sweet orange farmers earned between 800,000-1,500,000 FCFA as annual farm income. 10.5 percent of sweet orange farmers earned between 1,600,000-1,900,000 FCFA and 5 percent of sweet orange farmers earned 2,000,000 FCFA and above. These results subscribe to the findings of [26], who stated that farmers in Bo District in Sierra Leone earned less than farmers who earned high annual farm incomes would likely adopt improved technologies than those who earn less income per year

The result from Table 1 indicated that, majority of sweet orange farmers 78.5 percent of the farmers are highly motivated in the production of sweet oranges, for due to the good climatic conditions in the area. 12 percent of sweet orange farmers were motivated by fertile soils, 5.5 percent by the availability of labour, and 4 percent by other factors like high demand for sweet oranges, culture of the people. Achievement of motivation is more of a psychological variable which differs from individual to individual. It is assumed that achievement motivation forces the individual towards reaching some goals, which he has set for himself. The higher the association with the individual, higher will be his efforts. This can be attributed to the social status of a respondent, who feels to keep greater goals. A similar finding was reported by [15].

4.2 Profitability analysis of sweet orange production

Technical and economic parameters

Every long durational horticultural crop has two phases that is establishment phase or the development phase and production phase. Estimation of capital investment for the establishment of sweet orange and the technical parameters of farm spacing, plant type, plant population, and initial input cost per hectare are presented in Table 2. The technical and economic parameters stated the prevailing wage rate as per the minimum wage and unit cost for the creation of a hectare of sweet orange orchard with activities under preparation of land, planting and control of exploitation in the first year. The investment costs for the creation of a hectare of sweet orange orchard were estimated in FCFA (1 FCFA = $539.14 US). All the labour inputs are hired labour and paid according to the farm size.

Sweet oranges are grafted plants for commercial cultivation in the study area. Selection of suitable rootstock and proper mother plant are important steps. Many rootstocks have been used for different sweet orange cultivars. The field is generally prepared by giving three to four ploughings with a mould board plough. These ploughings are spread out over the year, some during the summer and some in rainy season. This brings the soil into good condition. A good planking and breaking of clods in the field is essential before the planting of plants in the study area. Planting is done during rain (June-September) in the study area. Sweet oranges are planted in pits of 50 cm x 50 cm x 50 cm size in a square system with spacing of 7m x 7m, accommodating 204 plants/ha. Before planting, the farmers filled pits with 20-25 kg decomposed farm yard manure mixed with surface soil.

As per the observation on average, 204 mandarin plants per hectare were observed in the study area.

Table 2. Technical and economic parameters

Items	Setting
Orchard specificities	***Nature***
Spacing	7m x 7m
Plant type	Grafts
Plant population (plants/ha)	204
	Cost (FCFA)
Preparation of land	
Clearing of land and cutting of trees (2M/d x ha)	60000
Creation of track (2M/d x ha)	3000
Tracing of exploitation (2M/d x h)	4000
Gathering and burning (2 M/d x ha)	15000
Digging of sweet orange seedling holes (2 M/d x h)	10200
A lining of holes (2M/d x h)	5100
	FCFA
Planting	
Tearing of plastic bags and placing of plants beside holes (2M/d x h)	15300
Transportation of plants (2M/d x h)	20400
Planting and staking (2M/d x h)	20400
Treatment of nematode (2 M/d x h)	10200
Control and replacement of death plants (2 M/d x h)	3000
Control of exploitation	
Clearing of farm and lines (4 Passages = 1 H/d x h)	80000
Phytosanitary protection (2 M/d x h)	5100
Application of fertilizer (2 M/d x h)	5100
Purchase of sweet orange seedlings (1500/Plant)	306000
N/B: M/d (men/day): It is the quantity of work realize by men par day **Source:** Author, from field survey	

1 FCFA = $539.14 US

Project cost for the creation of one hectare of sweet orange orchard

The grower has to invest a considerable amount for establishing a sweet orange orchard before it starts bearing. This period is called as gestation period and the sweet orange farmers do not get any returns from the orchard. Therefore, the cost of the establishment of sweet orange orchards can be regarded as an investment capital. The study found that farmers planted 204-277 trees per hectare. Farmers have the option to do intercrop with sweet orange orchard up to 3-4 years of age. Generally, after the fourth year of sweet orange farmers did not cultivate any kind of intercrop. The study also found that only 18% of the respondents do intercrop in one or two years in their orchard and they did it with different crops. Due to the complexity in accounting costs and return of intercropping, the present study does not cover costs and return of intercropping in determining profitability of the sweet orange production.

The per hectare cost of establishment of sweet orange orchard are present in Table 3. This has been achieved by detailed study of the investment incurred in the establishment cost and maintenance cost of sweet orange. The costs incurred in cultivation have been classified into following two categories; establishment and maintenance costs. Sweet orange farmers have to invest a considerable amount on the establishment of sweet orange orchards in the initial years before the first harvest. During this period, usually four years commonly known as gestation period. The investment made by the farmers in establishing the crop right from the pre-planting stage to the first cutting is termed establishment cost.

The cost of establishing of sweet orange orchard was estimated by aggregating the cost of various items like land preparation, cost of planting, cost of farm materials, cost of manures, fertilizers, manures and fertilizers application, plant protection measures, application of plant protection, cost of seedlings etc. Since investment for establishing the sweet orange crop continues for four consecutive years, various types of costs incurred in the establishment of sweet orange have been presented in Table 3. The total cost per hectare for establishing a hectare of sweet orange orchard was 1230800 FCFA. The variable cost accounted for 845800 per hectare (68.72 percent), while the remaining 385000 FCFA per hectare (31.28 percent) of total establishment cost was fixed cost. Hires labour is ranked the highest variable cost. The cost of seedling (306000 FCFA) constituted the highest cost in the first year with a total cost of 651800 FCFA. Total cost for the second year was 128400 FCFA, 131800 FCFA in the third year, 152800 FCFA in the fourth year and 166000 FCFA in the fifth year.

Table 3. Project cost for the creation of one hectare of sweet orange orchard

Items	Years/FCFA					Total
	1	2	3	4	5	
Variable cost (FCFA)	566800	53400	56800	77800	91000	845800
Land preparation	97300	0	0	0	0	97300
Planting	69300	0	0	0	0	69300
Purchase of farm materials	25000	0	0	0	0	25000
Cost of Farm Yard Manures (FYM)	7200	3600	4800	6000	9600	31200
Cost of fertilizers	5400	6000	8200	9300	15000	43900
Manures and fertilizer application	5100	5100	5100	5100	9000	29400
Plant protection measures	17500	17500	17500	35000	35000	122500
Application of plant protection	4000	7200	7200	8400	8400	35200
Purchase of seedlings	306000	0	0	0	0	306000
Miscellaneous	30000	14000	14000	14000	14000	86000
Fixed cost	85000	75000	75000	75000	75000	385000
Clearing of orchard	70000	60000	60000	60000	60000	385000
Rental value of land	15000	15000	15000	15000	15000	75000
TOTAL COST (A+B)	651800	128400	131800	152800	166000	1230800
Source: Author, from field survey						

The cost and return from a hectare of sweet orange orchard

The sweet orange plants start bearing from the fifth years from the year of orchard. The average costs per hectare and returns from sweet orange orchards have been given in Table 4. It reveals that a plant of sweet orange tree produces an average of 0.25 bags of 100kg of oranges in the fifth year and 50.5 bags of 100kg whole year. A bag of 100k is sold at an average cost of 10000 FCFA. The maintenance cost was calculated as 166000 FCFA. Thus the surplus in the fifth year is 343000 FCFA. The average gross return per year was 505000 (0.25 x 202 x 10000) in the fifth year. The gross returns in the sixth, seventh, eighth, ninth, tenth, eleventh, and twelfth year were; 843000, 1363000, 1854000, 1953000, 2055000, 2156000, and 2257000 respectively.

Table 4. The cost and return from a hectare of sweet orange orchard

Items	Year/FCFA							
	5	6	7	8	9	10	11	12
Income								
Yield (Bag per plant)	0.25	0.5	0.75	1	1.05	1.1	1.15	1.2
Yield (bags per ha)	50.5	101	153	202	212.1	222.2	232.3	242.4
Total Income	**505000**	**1010000**	**1530000**	**2021000**	**2120000**	**2222000**	**2323000**	**2424000**
Expenditure								
Cost of FYM	9600	9600	9600	9600	9600	9600	9600	9600
Cost of fertilizers	15000	15000	15000	15000	15000	15000	15000	15000
Manures and fertilizer application	9000	9000	9000	9000	9000	9000	9000	9000
Plant protection measures	35000	50000	50000	50000	50000	50000	50000	50000
Application of plant protection	8400	8400	8400	8400	8400	8400	8400	8400
Clearing/pruning of orchard	70000	60000	60000	60000	60000	60000	60000	60000
Rent value of land	15000	15000	15000	15000	15000	15000	15000	15000
Total Cost	166000	167000	167000	167000	167000	167000	167000	167000
Surplus	343000	843000	1363000	1854000	1953000	2055000	2156000	2257000

Source: Author from field survey, 2021

Economic feasibility of sweet orange production

The profitability of sweet orange production was measured based on Gross Return, Gross Margin, and Net Return. At the same time, capital budgeting was also done by calculating Net Present Value, Benefit Cost Ratio, and Internal Rate of Return of the sweet orange orchard. Some sweet orange trees start producing fruits in the third and fourth years. So, gross margin and net return became negative up to the fourth year of plant age as total cost was high enough at that time. Then net return increased substantially. Fruit yields keeps on increasing in the 5-15 years. After 15 years of plant age, the quantity of fruits starts decreasing. Per hectare average sweet orange yield was found in 50.5 bags of 100 kg and gross return and net return were 505000 FCFA and 343000 FCFA respectively in the fifth year of the sweet orchard as presented in Table 4. The discount rate was specified by assuming the opportunity cost of capital which is 10% for most of the developing countries (Gittinger, 1984). The discount factor (DF) was used in the calculation of the discounted cost and discounted benefit per year.

The Net present value (NPV): It is evident from Table 5 that NPV of the sweet orange orchard is positive and greater than zero. Therefore, sweet orange production is an acceptance practice and feasible from a financial point of view. Further, it also implies that the owner became able to increase his wealth by 4,447,824 FCFA per hectare of sweet orange production at the end of 12 years of plants age. Benefit-cost ratio (BCR): BCR was emerged to be 3.95 (Table 4) showing that investment in sweet orange production can be considered substantial and economically justifiable. It indicates that the sweet orange farmers earned a gross income of 3.95 FCA by investing 1 FCFA per one hectare of sweet orange orchard.

Internal rate of return (IRR): IRR was determined by following a 'trial and error' approach at different discount rates. By using the formula, IRR was calculated and it was 34.836%. It is evident from Table 5 that IRR of the sweet orange orchard stood at 34.836% which is sufficiently greater than existing bank interest rate (10%). All these measures indicated that sweet orange production in Mamfe municipality of Cameroon was profitable. So, it assures that investing in sweet orange orchard was very much feasible and it ensured a reasonable profit for the investors and agribusiness entrepreneurs and youth in the region.

Table 5. Economic feasibility of sweet orange production

Items	Year/FCFA											
	1	2	3	4	5	6	7	8	9	10	11	12
Cost of investment	651800	128400	131800	152800	166000	0	0	0	0	0	0	0
Maintenance cost	0	0	0	0	0	167000	167000	167000	167000	167000	167000	167000
Total cost	651800	128400	131800	152800	166000	167000	167000	167000	167000	167000	167000	167000
Gross return	0	0	0	0	505000	1010000	1530000	2021000	2120000	2222000	2323000	2424000
Net return	-651800	-128400	-131800	-152800	343000	843000	1363000	1854000	1953000	2055000	2156000	2257000
DF at 10%	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386	0.35	0.319
Disc. Cost	592486.2	106058	98981.8	104362	103086	91368	85671	77989	70808	64462	58450	53273
Disc. Benefits	0	0	0	0	313605	569640	784890	943807	898880	857692	813050	773256
Net discounted benefits	-592486.2	-106058	-98981.8	-104362	210519	478272	699219	865818	828072	793230	754600	719983
NPV	4447824											
BCR	3.95											
IRR	34.836											

4.5 The constraints encountered by sweet orange farmers.

The major constraints to the effective production of sweet oranges in the study area were ranked according to their severity as presented in Table 6. The most prevalent constraints in the study area are the lack of credit facilities, lack of agrochemicals, absence of extension services, high cost of farm inputs, pests and diseases, bush fire high cost of labour. This conformed to some of the findings of [20] they observed that inadequate planting materials, unhealthy (diseased) planting materials and poor farming practices, little access to credits, high transport costs, poor routes from the farms to the main highways and lack of adequate market information were the constraints to small-scale pineapple growing in Jammu region of J and K State. In addition, [35] observed the shortage of high-quality planting materials (valuable genotypes and free of pathogens), high perishability of fruits, low sale price, lack of access to credit, and plant diseases as the most prevalent constraints to sweet orange production in Tunisia.

Table 6: Rank of constraints encountered by farmers

Challenges	Frequency	Percentage	Ranking
Credit facilities	71	35.5	1
Lack of agrochemicals	38	19	2
Absent of extension services	31	15.5	3
High cost of farm inputs	28	14	4
High cost of labor	22	11	5
Pests and diseases	7	3.5	6
Bush fire	3	1.5	7
Total	200	100	

Source: Author from field survey

Lack of credit facility (71%) is the major constraint in sweet orange production in the study area. Access to agricultural credit has been positively linked to agricultural productivity in several studies [28]. Yet this vital input has eluded farmers in Cameroon. Banks and microfinance institutions with large loan funds are generally difficult to reach since issues of collateral and high-interest rates screen out most rural farmers. Meetings, friends, and family members dominate the sources of farm credit among the farmers in the study area. Lack of agrochemicals (38%) ranks second in the most serious constraints faced by farmers in the study area. Agrochemicals used to treat sweet orange trees are scarce in the study area. Some of the agrochemicals available are not effective for killing pests and diseases. Absent of extension services (31%) is ranked as the next most severe constraint. All the sweet orange farmers have never received extension workers or training in sweet orange farming.

MINADER does not support sweet orange farmers in the study area. About 28% of the farmers complained about the problem of the high cost of farm inputs. The prices of farm inputs such as agrochemicals and fertilizers are very high. This is why most farmers do not use fertilizers in their sweet orange orchards and only go for agrochemicals when they are infected by pests and diseases.

Marketing of horticultural crops, such as pineapples is quite complex and risky due to the perishable nature of the fruit, post-harvest food losses, seasonality of production, and bulkiness. About 22 percent of farmers complained about the problem of pests and diseases which causes farmers to the majority of their sweet orange fruits when attacked. This is dangerous to an orchard because if not well treated if can spread to all the trees in an orchard. Farmers who have suffered from it, do not know the appropriate agrochemicals to use. About 7 percent of farmers complained about the bush fire which was ranked one before last. This problem is common in the dry season. Fire from a nearby farm can easily cross to an orchard and cause a lot of damage to the orchard. In the study area, most farmers use first to burn their farmlands after clearing. The last of the constraints and high cost of labour (3%) is considered the least among all the constraints faced by the sweet orange farmers in the study area. This can be linked to the family size of the farmers in the study area which constitutes a large percentage of family labour in sweet orange production in the study area. Most of the labourers come from Nigeria, Akwaya and Bamenda who work as in farms in the study area on "shared cropping" system.

5. Conclusion

This study aimed to evaluate the profitability of sweet orange production among farmers in the Mamfe municipality, Cameroon. Primary source of information was used to collect data from a sample of 200 farmers who were randomly selected from eight villages in the Mamfe municipality and Cost, income, and percentages, were used to analyse data collected from sweet orange farmers.

The calculation of gross return was zero from the first to the fourth year, 505000 FCFA in the fifth year, 1010000 FCFA in the sixth year, 1530000FCFA in the seventh year and 2424000 FCFA in the twelfth year. Net return was negative in the first four years at -651800, -128400, -131800 and -152800, 1st year, 2nd year, 3rd year and 4th year respectively. The net return was 343000 FCFA in the 5th year, 843000 in the 6th year, 1363000 FCFA in the 7^{th,}and 2257000 FCFA in the 12th year. The figures of total cost and total benefits were discounted at the rate of 10% to calculate the discounted cost, benefits, and net discounted benefits. The NPV was 4447824 FCFA, BCR was 3.95 and IRR was 34.836 which was more than the current rate of interest (10%). Therefore, sweet orange production is profitable in the Mamfe municipality, of Cameroon. Farm inputs such as seedlings, fertilizers, agrochemicals are expensive for farmers in the Mamfe municipality. The cost of labour is high since sweet orange production is labor intensive, requires a big surface area. Farmers hired workers to do the job manually. Diseases and pets also affected some sweet orange plants in Okoyong, Egbekaw and Bachuo Ntai. Finally, bush fire is a human constraint which occurs in the dry season and comes from farms beside sweet orange orchards.

The study suggests that farmers need to be trained through increased engagement of agricultural extension officers to teach them the most efficient ways of production to guarantee sustainable production of sweet oranges in Cameroon. They also need to adopt new technologies in sweet orange production such as grafting, budding, marcotting, application fertilizers, and agrichemicals to ensure the production of sweet oranges during the dry season. Sweet orange farmers should form a cooperative to be able to access loans at low interest rates, instead of relying on personal savings. There is also a need to minimize the gender gap in profitability through affirmative action such as provision of special credits and access to modern technologies by female farmers. Farmers should not sell their fruits in trees but in bags to increase their profit margin and thus their livelihoods.

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