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# Cost Benefit Analysis of Certified Cocoa Production in Ondo State, Nigeria

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# 23- COST BENEFIT ANALYSIS OF CERTIFIED COCOA PRODUCTION IN ONDO STATE, NIGERIA

BY

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## ABSTRACT

The paper is on Cost-Benefit Analysis of certified cocoa production in Ondo state.Data were collected by purposively choosing three local government areas noted for certified cocoa production, namely Idanre, Ile oluji and Owo local government areas of the state. Simple random sampling technique was used to select thirty certified cocoa farmers from Idanre, twenty certified cocoa farmers from Ile oluji/Oke-igbo and ten certified cocoa farmers from Owo local government areas of the state making a total of sixty respondents in all. The data collected were analyzed using descriptive statistics, profitability analysis, gross margin analysis and cost benefit analysis.The profitability analysis, gross margin analysis and cost benefit analysis showed that conventional cocoa production is profitable with profit, GM, NPV, BCR and IRR of ₦5,713,329 ₦11,062,329 ₦428,306.3, 1.04 and 31.31% respectively. It was also revealed that certified cocoa production was more profitable than conventional cocoa production having profit, GM, NPV, BCR and IRR of ₦14, 889,098, ₦20,238,090, ₦5,253,237,1.45 and 59.64% respectively.The major identified constraints in certified cocoa production were: inadequate resources to finance their farming operations and unavailability of inputs. Recommendations from the study include among others: provision of inputs at subsidized rate to the farmers at reasonable and affordable interest rates, need for effective monitoring and evaluation team for certified cocoa farmers in order to reduce the share of certified cocoa sold into conventional channel, more awareness and sensitization programmes on cocoa certification so that more farmers and non-governmental organizations will be involved.

## 1.0 INTRODUCTION

Originally, cocoa was mainly cultivated in the tropical rainforests in South America. Once established in Ghana, cocoa production expanded rapidly in Africa and by the mid 1920s, West and Central Africa (WCA) became the main producer. Cocoa grows naturally in tropical rain forests. This habitat provides heavy shade and rainfall, uniform temperature and constant relative humidity and is typically only found within 10º of the equator. There are three main varieties of cacao: Forastero, Criollo and Trinitario. The first comprises 95% of the world production of cacao, and is the most widely used. Overall, the highest quality cocoa beans come from the Criollo variety, which is considered a delicacy. Criollo plantations have lower yields than those of Forastero, and also tend to be less resistant to several diseases that attack the cocoa plant, hence very few countries still produce it. One of the largest producers of Criollo beans is Venezuela (Chuao and Porcelana). Trinitario is a hybrid between Criollo and Forastero varieties. It is considered of much higher quality than the latter, but has higher yields and is more resistant to disease than the former. (ICCO, 2007)

WCA produces about 70% of world cocoa. About 90-95% of all cocoa are produced by smallholders with farm sizes of two to five hectares (ICCO, 2007). Cocoa is dependent on natural resources and unskilled or semi-skilled low cost labour rather than technology as the dominant portion of its total cost. (Bedford, 2002).

The Netherland is the leading cocoa processing country, followed by the United State of America. Cocoa and its products (including chocolate) are used world-wide. Per Capita consumption is poorly understood with numerous countries claiming the highest, various reports state that Switzerland, Belgium, and the United Kingdom have the highest consumption, but because there is no clear mechanism to determine how much of a country's production is consumed by residents and how much by visitors, these are all speculative (Schrage *et al*, 2005)

**Table 1.: World Cocoa Production (2010/2011)**

| Country | Amount Produced | Percentage of world production |
|---|---|---|
| Cote d'Ivoire | 1.30 million tonnes | 38.6% |
| Ghana | 720 thousand tonnes | 21.4% |
| Indonesia | 574 thousand tonnes | 17.0% |
| Nigeria | 212 thousand tonnes | 6.3% |
| Brazil | 180 thousand tonnes | 5.3% |
| Cameroon | 175 thousand tonnes | 5.2% |
| Ecuador | 118 thousand tonnes | 3.5% |
| Dominican republic | 47 thousand tonnes | 1.4% |
| Malaysia | 43 thousand tonnes | 1.3% |

**Source: Food and Agriculture Organization (FAO Statistics, 2011)**

Certified cocoa products are those differentiated on the basis of specific quality attributes that is certified under various schemes. Participation in markets for certified cocoa represents a good income generation opportunity for small farmers in developing countries. However, for famers to avail themselves of this opportunity they would have to comply with voluntary quality and safety standards and procedures. Such compliance involves quality and safety assurance, brand development, product niche definition and shifts in the chain coordination. In brief, it means changing the way cocoa farmers are doing business.( Haque, 2004)

Certification support long term positive changes in cocoa farming practices and help to improve the well being of cocoa farmers, improve the quality of output by ensuring Good Agricultural Practices (GAP), Good Environmental Practices (GEP) and Good Social practices (GSP). Implementation of certification process that addresses cocoa farming practices across often remote areas of West Africa has been challenging, resource-intensive and ground breaking. It has evolved the participation of numerous experts, Non-Governmental Organizations (NGOs) and West African governments. The efforts have produced a promising and expanding pilot activity in Ghana and Cot de voire. Equally important, the research and collaborative work to develop certification have generated practical, scalable and effective on-the-ground programmes. These programmes tremendously improved the quality of life.

Certification introduces sustainability and traceability holistically and guide farmers with respect to the principles of sustainable agriculture, the issue of sustainability and its related economic, social and environmental dimensions. It attempt to create a supply line of certified sustainable cocoa and to pioneer sustainable cocoa production for international market. According to Vogel (2009) the main objective of certified cocoa production is to improve the living conditions of cocoa farmers through the production of sustainable certified cocoa. More specifically,

i. Better market access for small holder farmers
ii. Increasing the income of farm households
iii. Improving the living and working conditions of cocoa farmers and their families and workers.
iv. Raising the opportunities for cocoa farmers to participate in the decision making processes behind cocoa marketing
v. Improving the conditions of the cocoa farmers' natural resources (Vogel, 2009).

Sustainability continue to be the key goal in global cocoa production, various aspects of the three pillars of sustainability-social, economic and environmental- that contributed to a sustainable future for cocoa production and long term improvements in the livelihood of smallholder farming communities.

In recent years there has been growing momentum towards developing a more sustainable and equitable cocoa supply chain. Some players, large and small, are recognizing the need for an

integrated, multi- livable income and safe working conditions. Stakeholder approach that addresses both social and environmental issues. Ideally, a sustainable cocoa supply chain would involve the use of environmentally-friendly practices and provide those involved in the cultivation, harvesting and processing of cocoa a liveable income and safe working conditions. (Savov *et al*, 2009)
Widespread implementation of certification schemes that verify that cocoa is produced in accordance with certain social and environmental standards is critical to the creation of a sustainable cocoa supply chain. (Chopra, 2001).

According to the Tropical Commodity Coalition, there is growing demand for products certified under all four schemes. However, current levels of certified cocoa production, expected to reach over 100,000 tonnes in 2013, represent only 3 per cent of global production. The International Labour Rights Forum has put out a call to all companies in the cocoa supply chain to commit to purchasing a minimum of 5 per cent of total cocoa purchases under Fairtrade certification.
Traceability is a critical requirement for any certification scheme, and necessary for achieving a sustainable cocoa supply chain. An effective traceability programme must provide farmers and their families with financial stability, be supported by governments of cocoa-producing nations, and be commercially viable. Additionally, in order for a traceability programme to be successful, it must be supported financially by all parties along the supply chain. (Gellynck *et al*, 2006).

There are four(4) major certification Schemes:
**Fair trade** certification for small-scale producers requires adherence to a set of environmental standards as well as robust social standards. It provides organized producers with a Fairtrade Premium, in addition to monies earned from the product, which is to be used for investment in socially, economically and environmentally sustainable development.
**Certified Organic** is based on four principles – health, ecology, fairness and care – that work to sustain the health of people, soils and ecosystems and to reduce poverty. Certification requires that cocoa be grown without the use of synthetic nutrients and that plant protection methods and soil conservation practices be employed.
**Rainforest Alliance** certified farms must meet the Sustainable Agriculture Network's criteria, which include environmental, social, labour and agronomic management. It aims to ensure that all farms benefit from the United Nation's Universal Declaration of Human Rights and Children's Rights Conventions, and that they adhere to International Labour Organization conventions and recommendations.
**UTZ Certified** aims to encourage socially and environmentally responsible cocoa production that is beneficial to both producers and the market. It requires producers to adhere to certain agricultural practices as well as social and environmental criteria.

Cost-benefit analysis (CBA) is a major tool employed to evaluate programmes**.** It provides the researcher or the planner with a set of values that are useful to determine the feasibility of a

programme from economic standpoint**.** Conceptually simple, its results are easy for decision makers to comprehend, and therefore enjoys a great deal of favour in programme assessments. The end product of the procedure is a benefit/cost ratio that compares the total expected benefits to the total predicted costs. In practice, CBA is quite complex, because it raises a number of assumptions about the scope of the assessment, the time-frame, as well as technical issues involved in measuring the benefits and costs. (Gittinger, 1982).

Costs associated with the programmes are usually easier to define and measure than benefits. They include both investment and operating costs. Investment costs include the planning costs incurred in the design and planning, the land and property costs in acquiring the site(s) for the programme including materials, labour, etc. Operating costs typically involve the annual maintenance costs of the programme, but may include additional operating costs incurred, as for example the costs of operating a new light rail system. (Shofield, 1989)

Cocoa is sourced from several regions around the world; West Africa is the largest producer, making up 70 percent of the world cocoa. The West African nation of Cot de voire alone grows 40 percent of the global supply of cocoa, with Ghana, Cameroon and Nigeria being the other major producers in the region. With more than 1.5 million small family farms across the region, thousands of communities depended on cocoa for their livelihood. Unfortunately, cocoa has not proved to be lucrative for most of the cocoa farmers in Ondo state, Nigeria. Nigerian cocoa farmers typically live in poverty and, as a result, instances of forced labour, human trafficking and the worst forms of child labour are found too often on cocoa farms in Ondo state Nigeria (CRIN, 2003). One of the major factors underlying violations of labour rights on cocoa farms is the low price paid to farmers for their cocoa beans, without receiving a fair price for their for their products, cocoa farmers do not have the means to hire adult workers whose rights are adequately respected, and who are in turn paid fair wages.

Also, there is growing demand among consumers for more information about the conditions under which their products are made. Consumers want to know that companies are making commitments to take responsibility for labour and environmental issues in their supply chains, to implement strong standards to protect workers, and to ensure through third party, independent monitoring and auditing that commitments on paper are effectively implemented. The social and environmental sustainability of production has become increasingly important for the development of the cocoa sector in Ondo state, Nigeria, in order to ensure sustainability and traceability of cocoa that is produced. Therefore, to analyse the cost- benefit of certified cocoa production in Ondo state the following research questions were generated.

The major objective of the paper is to carry out a Cost-Benefit Analysis of certified cocoa production in Ondo state. The specific objectives are to:

i. examine socio economic characteristics of certified cocoa producers in the study area
ii. determine the costs and returns associated with certified cocoa production in the study area.
iii. identify the perceived derivable benefits associated with certified cocoa production
iv. identify the constraints associated with certified cocoa production

## 2.0 RESEARCH METHODOLOGY

The study area for this project work is Ondo State. Ondo State is one the states carved out of the former western state. It shares a common boundary with Ekiti and Kogi States in the North; Edo State in the East; Delta State in the South east; Osun and Ogun states in the west and Atlantic Ocean in the south.

Agriculture is the main occupation of the people and it provides income and employment for over 75% of the population in the state. It also contributes well over 70% of the state's Gross Domestic Product (GDP) (Ministry of Agriculture, Fisheries and Forest Resources, Annual Report, 2006).

The farmers in the state grow food and other cash crops for both domestic consumption and export. These include cocoa, cashew, cassava, rice, palm produce, coffee, yam, timber, citrus, plantain, soya beans, cowpea and kolanut.

Cocoa is still the major cash crop of the state and the largest non-oil foreign exchange earner of the country. About 60% of the nation's output is produced in Ondo State (IITA, 2007).

Data for this study were collected from both primary and secondary sources. Three local government areas dominant in cocoa production namely; Idanre, Ile-Oluji, and Owo were purposively chosen. Using random sampling technique, thirty certified cocoa farmers were selected from Idanre local government area, twenty certified cocoa farmers from Ile oluji local government area and ten certified cocoa farmers from Owo local government area of the state making a total of sixty certified cocoa farmers. In addition, information about the conventional method of cocoa production which was previously practiced by the certified cocoa farmers were also obtained from the respondents.

Secondary data were collected from past projects, conference proceedings, Journal and Publications of CBN, Cocoa Association of Nigeria (CAN), Food and Agriculture Organization

Descriptive statistics was used to analyze the socio – economic characteristics of the respondents. Descriptive statistics such as mean, frequency, percentages and standard deviation were used. Also, Gross Margin Analysis and Profitability Analysis were used to determine the profitability of certified and conventional cocoa production in the state. Other analytical tool used include: Cost-Benefit analysis (CBA).

**Cost-Benefit Analysis**: The concept of Net Present Value (NPV) and the Benefit Cost Ratio (BCR) were used to compare the costs and returns of both conventional cocoa production and

certified cocoa production in the study area. The costs and benefits were discounted using the appropriate interest rate and the Net Present Value calculated on the average hectare in the study area.

$$\mathbf{NPV} = \sum_{t=1}^{n=1} \frac{\mathbf{B_t - C_t}}{\mathbf{(1+r)^t}}$$

The study also estimated the Benefit Cost Ratio (BCR):

$$\mathbf{BCR} = \sum_{t=1}^{n=1} \frac{\frac{\mathbf{B_t}}{\mathbf{(1+r)^t}}}{\frac{\mathbf{C_t}}{\mathbf{(1+r)^t}}}$$

Where Bt = benefit per ha in each year;
Ct = cost of production per ha in each year
t = 1, 2, 3, . . .n
n = number of years
r = interest rate
$\sum$ = summation sign

**Internal Rate of Return (IRR)**

The IRR determines the discount rate that makes the net present worth of the incremental net benefit stream or incremental cash flow equals zero. It represents the maximum interest that a project could pay for the resources used if the project is to recover its investment and operating costs and still break even (Gittinger, 1982).

$$\mathbf{IRR} = \text{Lower discount rate} + \text{Difference between the two Discount rates} \left( \frac{\text{NPV at lower discount rate}}{\text{Absolute difference between NPVs at the two discount rates}} \right)$$

**Decision Rules:**

For NPV, Project is desirable if NPV is greater than Zero
For BCR, Project is viable if BCR is greater than one
For IRR, Project is viable if the IRR is greater than the discount rate, the higher the IRR the more profitable project is.

**Gross Margin Analysis (GMA):** An enterprise gross margin can be estimated as enterprise output less variable cost. This analysis reveals the income accruable to the farmers in the study area. The variable cost incurred by the farmers include cost incurred on land preparation, planting materials, fertilizer, agrochemicals, harvesting, labour cost and transportation cost. This variable cost vary from one farmer to another because some farmers use hired labour while some engage both hired and family labour.

**GM= TR – TVC**

TR= Total Revenue

TC= Total Variable Cost

**Decision rule for apriori expectation**

If GM > 0 (greater than 0),then it is profitable

If GM < 0 (less than 0),then it is not profitable

If GM = 0 (equal to 0), then it breaks even

**Profitability Analysis:**

$\Pi = TR - TC$

$\Pi$ = Profit

TR = Total revenue

TC = Total cost

**Decision rule for apriori expectation**

If $\Pi > 0$ (greater than 0),then it is profitable

If $\Pi < 0$ (less than 0),then it is not profitable

If $\Pi = 0$ (equal to 0), then it breaks even

## 3.0 RESULTS AND DISCUSSION

This section is concerned mainly with the results and discussion of data collected from the field. The results and discussion is divided into four major sub – sections.

- Socio -economic characteristics of the certified cocoa producers.
- Costs and returns associated with conventional and certified cocoa production.
- Perceived derivable benefits associated with certified cocoa production.
- Constraints in certified cocoa production.

## 3.1 SOCIO- ECONOMIC CHARACTERISTICS OF THE CERTIFIED COCOA PRODUCERS

Table2: Distribution of respondents according to their socio economic characteristics

| Characteristics | | Frequency | Percentage |
|---|---|---|---|
| Sex | Female | 6 | 10.0 |
| | Male | 54 | 90.0 |
| | Total | 60 | 100.0 |
| Age | ≤ 30 | 2 | 3.0 |
| | 31-40 | 11 | 18.0 |
| | 41-50 | 14 | 23.0 |
| | 51-60 | 15 | 26.0 |
| | >60 | 18 | 30.0 |
| | Total | 60 | 100.0 |
| Marital Status | Married | 56 | 93.0 |
| | Single | 4 | 7.0 |
| | **Total** | **60** | **100.0** |
| Level of Education | Illiterate | 15 | 25.0 |
| | Pry school education | 14 | 23.0 |
| | Sec school education | 25 | 42.0 |
| | Tertiary education | 1 | 2.0 |
| | Others | 5 | 8.0 |
| | **Total** | **60** | **100** |
| Farming Experience | 2 | 20 | 35.0 |
| | 3 | 39 | 65.0 |
| | **Total** | **60** | **100.0** |
| Household Size | Two | 4 | 7.0 |
| | Three | 3 | 5.0 |
| | Four | 9 | 15.0 |
| | Five and above | 44 | 73.0 |
| | **Total** | **60** | **100** |
| Occupation | Farming | 59 | 98.0 |
| | Trading | 1 | 2.0 |
| | **Total** | **60** | **100** |
| Acquisition of cocoa plantation | Cultivated | 5 | 8.0 |
| | Inherited | 17 | 28.0 |
| | Inherited, cultivated | 1 | 2.0 |
| | Inherited, leased | 2 | 3.0 |
| | Inherited, purchased | 9 | 15.0 |
| | Leased | 5 | 8.0 |
| | Purchased | 17 | 28.0 |
| | Purchased, cultivated | 1 | 2.0 |

| | | | |
|---|---|---|---|
| | Purchased, leased | 3 | 5.0 |
| | **Total** | **60** | **100.0** |
| Source of Working Capital | Cooperative societies | 9 | 15.0 |
| | Cooperative societies and other sources | 1 | 2.0 |
| | Friends and relations, bank | 1 | 2.0 |
| | Personal savings | 21 | 35.0 |
| | Personal savings, cooperative societies | 11 | 18.0 |
| | Personal savings, friends and relations | 11 | 18.0 |
| | Personal savings, friends and relations and cooperative societies | 6 | 10.0 |
| | **Total** | **60** | **100.0** |
| Source of Improved seedling | Agricultural Development Project (ADP) | 2 | 3.0 |
| | Cooperative societies | 16 | 27.0 |
| | Cooperatives, from existing farms | 2 | 3.0 |
| | Cooperatives, Min. of Agric and Cocoa research Institute of Nigeria (CRIN) | 1 | 2.0 |
| | Cocoa Research Institute of Nigeria (CRIN) | 18 | 30.0 |
| | From existing farms | 5 | 8.0 |
| | Min. of Agric | 16 | 27.0 |
| | **Total** | **60** | **100.0** |
| Types of Labour | Family labour and hired labour | 10 | 17.0 |
| | Hired labour | 49 | 82.0 |
| | Hired labour and communal Labour | 1 | 2.0 |
| | **Total** | **60** | **100.0** |

| | | | |
|---|---|---|---|
| Days used in fermentation of cocoa beans | 5 | 47 | 78.0 |
| | 6 | 8 | 13.0 |
| | 7 | 4 | 7.0 |
| | 8 | 1 | 2.0 |
| | **Total** | **60** | **100.0** |
| Days used in drying cocoa beans | 5 | 19 | 32.0 |
| | 6 | 18 | 30.0 |
| | 7 | 19 | 32.0 |
| | 8 | 1 | 2.0 |
| | 10 | 3 | 5.0 |
| | **Total** | **60** | **100.0** |
| Method of disposal of used cans of agrochemicals | Burn | 2 | 3.0 |
| | Buried | 29 | 48.0 |
| | Buried and burn | 5 | 8.0 |
| | Buried, return to cooperative house | 7 | 12.0 |
| | Buried, return to cooperative house and dumping hill | 1 | 2.0 |
| | Dumping hill | 3 | 5.0 |
| | Return to cooperative house | 10 | 17.0 |
| | Refuse Disposal van | 3 | 5.0 |
| | **Total** | **60** | **100.0** |

**Source: Field Survey data, 2012**

Gender play important roles in farm activities carried out by farmers and determine their sources available for adoption of technologies. Female as well as their male counterparts have some specific responsibilities in farm labour which varies from one country to another and from one ecological zone to another.As shown in Table 2, majority (90%) of the cocoa farmers in the study area are male while only 10% of them are female. This implies that men dominate the production of certified cocoa. The female farmers have their own roles to play, especially in the maintenance and processing of cocoa beans as reported by Adetunji *et al* (2007).

Age has been found to affect the rate of farmer's adoption of innovation, which in turn affects household productivity and livelihood improvement strategies (Dercon and Krishnan 1996). Age

is very important in agricultural production, it affects attitude to work on the farm and efficient utilization of resources. The age of a farmer determines ability to adopt innovations.

Table 2 revealed that 26% of the cocoa farmers in the study area are within the age range of 51-60 years old, while 23% of them are between 41 and 50 years of age. Those that fell within 30 years and below, 31-40 years and 60 years and above are 3.%, 18% and 30%, respectively. Thus, the farmers are old and should be able to make rational decision with respect to cocoa production activities. This finding corroborates the findings of Amos (2007) that an average cocoa farmer in Ondo State is old.

Marital status of a person determines the degree of responsibility of that person in a household and in the society at large. The significance of marital status on agricultural production can be explained in terms of the supply of agricultural family labour. It is expected that family labour would be more available where the household heads are married.
Table 2 shows that majority (93%) of the respondents are married while only 7% of them are single. The implication of this is that farmers in the study area are matured and can effectively take crucial decisions jointly with their spouses.

. According to Obinne (1991), education is an important factor influencing adoption of farm innovations. Table 2 shows that about 25% of the respondents are illiterate, about 23% of the respondents completed primary education, 42% of the respondents finished secondary school and 2% and 8% have tertiary and other forms of education such as technical school, teacher training school respectively. It could be inferred that, cocoa farmers in the study area are literates who could read and write.
Farming experience is an important factor determining both the productivity and the production level in farming. But the effect of farming experience on productivity and production may be positive or negative. Generally, it would appear that up to a certain number of years, farming experience would have a positive effect; after that, the effect may become negative. The negative effect may be derived from aging or reluctance to change from old and familiar farm practices and techniques to those that are modern and improved.
Table 2 reveals that majority of the respondents (65%) had three years experience in certified cocoa production, 35% of them had two years experience while no farmer is yet to be certified in year 2012. The implication of this is that an average respondent had not had considerable certified cocoa farming experience.

Household size has a great role to play in family labour provision in the agricultural sector (Sule, *et al* 2002).
Table 2 revealed that majority (73%) of the cocoa farmers in the study area had a household size of five and above. while 15% of them had four people. Also, 5% and 7% of the respondents had three and two people respectively. This implies that the farmers have a fairly large household which could probably serve as an insurance against short falls in supply of farm labour.

Farmers engage in other non-farm occupations to complement their earnings from farming. Occupation plays an important role in the adoption of improved farming system. This is because the seriousness involved in the practice of improved farming comes from the level of commitment displayed by the respondents.
Table 2 shows that the major occupation of majority of the respondents (98%) is farming while 2% of them are engaged in trading activities as their major occupation. The implication of this is that the study area is predominantly an agrarian community.

In traditional agriculture, land is considered to be the most important factor of production. This arises as a result of the low level of technology that accompanies agricultural production and other related problems of land tenure that are commonly found in the agricultural sector of developing economies.

Table 2 shows that the farmers in the study area acquired their cocoa plantation through inheritance, purchased, leased and cultivated. 28% of the respondents acquired their plantation through inheritance and 28% of the respondents purchased their cocoa plantation while 8% cultivated and leased their plantation. The implication of this is that direct purchase and inheritance are the major methods of cocoa plantation acquisition in the study area.

Working capital is important because of its effects on the farm's profitability and risk, and consequently its value (Smith, 1980).Small scale farmers do not have adequate capital to expand their scale of operations and /or take advantage of profitable packages of technology to boost productivity. The price and exchange rate reforms that accompanied the Structural Adjustment Programme of 1986 have increased the costs of production and significantly increased the working capital needs of farmers. The long and cumbersome bureaucratic processes have prevented the flow of official credit through the government established credit schemes to the farmers.
Table 2 shows that about 35% of the farmers in the study area financed their farm projects through personal savings. 15% of them got loan from cooperative society to finance their cocoa farms and 2% of the respondents got loan from banks. This implies that personal savings constituted the main source of fund for maintaining cocoa farm in the study area. This agrees with the findings of Nkang *et al* (2006) that access to bank loan by cocoa farmers is a big problem due to lack of collateral and the risky nature of agricultural production.

There is a positive relationship between agricultural productivity and improved seedlings such as high yielding variety, high resistance to pests and diseases as this leads to increase in the farmer's output which consequently increases the farm revenue.

Table 2 shows that a fairly large percentage of the respondents (30%) got their improved seedlings from the Cocoa Research Institute (CRIN), while 27% of the respondents purchased their improved seedlings from Ministry of Agriculture and 27% as well got their improved seedlings from the cooperatives. The implication of this is that Ministry of Agriculture, Cocoa

Research Institute of Nigeria (CRIN) and cooperatives are the major sources of their improved seedlings.

The issue of how many labourers is working in non-agricultural production and how many in farming is of interest to many policy makers, yet as an important qualification of the Lewis, Ranis and Fei dualistic economic development model, the subject of those being treated as surplus labour remains a mystery and attracts academic interest.

Table 2 reveals that large percentage (82%) of the respondents made use of hired labour for their farming operations. The implication of this is that the respondents incurred more labour cost which increases their total cost of production and thereby reducing their profit.

Fermentation of cocoa can be conducted in a number of manners. The ways it can be fermented include: in baskets, in a heap covered with banana leaves and in boxes. The best results are obtained in fermentations where the maximum temperature reached is between $45^{o}$C to $50^{o}$C. As a general rule, the closer to $50^{o}$C, that fermentation reach, the better the quality of the dried cocoa is. A fermentation time of five days is recommended as brown bean counts increases with length of fermentation time.

Table 2 reveals that majority of the respondents (78%) fermented their cocoa beans for five days while 13%,6.7% and 2% of the respondents used 6, 7 and 8 days respectively. The implication of this is that the cocoa beans produced by the respondents have high quality flavour which increases the quality of cocoa beans they produce.

Drying of cocoa is an important step in cocoa processing as some of the reactions which produce good flavoured cocoa are still in progress during the drying process. Ideally, cocoa should be dried over a five to seven day period. This allows acids in the cocoa to evaporate off and produce a low acid, high cocoa flavoured product. If drying takes longer than seven days, mould contamination can occur and this leads to down-grading of the cocoa and buyers will pay less for it.

Table 2 reveals that 32% of the respondents dry their cocoa beans in five days, 30% of the respondents dry their cocoa beans in six days, 32% of the respondents dry their cocoa beans in seven days, 2% of the respondent dry their cocoa bean in eight days while ten days is used by about 5.0% of the respondents. The implication of this is that the respondents produce cocoa beans with a very low moisture content which increases the quality of cocoa beans they produce.

Table 2 revealed that farmers in the study area disposed their used cans of agro chemicals by burying, burning, dumping hill, refuse disposal van or return to cooperative house for proper disposal . Majority of the respondents (48%) buried them, 17% of the respondents and 12% of the respondents buried and at the same time return to cooperative house. The implication of this

is that a large percentage of the respondents in the study area are abiding by the socially acceptable methods of disposing used cans of agro chemicals.

**Table 3:** Descriptive statistics

| Items/ Variables | N | Minimum | Maximum | Mean |
|---|---|---|---|---|
| Experience in cocoa farming (Yrs) | 60 | 3 | 65 | 24.60 |
| Experience as a certified cocoa farmer (Yrs) | 60 | 1 | 3 | 2.63 |
| Farm Size in the study area (Ha) | 60 | 0.40 | 10.0 | 2.780 |
| Total cost of conventional cocoa production in the study area (₦) | 60 | 4,000 | 1,145,000 | 213,425.35 |
| Total revenue of conventional cocoa production in the study area (₦) | 60 | 30,000 | 1,200,000 | 308,647.5 |
| Total cost of certified cocoa production in the study area (₦) | 60 | 5,500 | 1,168,500 | 242,232.95 |
| Total revenue of certified cocoa production in the study area (₦) | 60 | 38,750 | 1,428,000 | 490,384.58 |
| Premium in the study area (₦) | 60 | 2,000 | 56,250 | 6,795.389 |

**Source: Field Survey data, 2012**

Ondo state's cocoa production is characterized by small-scale farms with an average farm size of approximately 2.780 hectares, this implies that the respondents are operating on a small scale. Their mean cocoa farming experience is 24.60 years with an average experience as a certified cocoa farmer of 2.63 years in the study area. Table 3 revealed that average cost of production under the conventional method is ₦213,425.35 while average cost of producing certified cocoa is ₦242,232.95. The implication of this is that there are some additional cost incurred in producing certified cocoa such as additional labour, improved varieties of cocoa, planting of shade trees, purchase of recommended chemicals such as ridomil and actara . The main cost the farmers bear

in the certification process is the additional cost on labour. Required investments such as training, purchase of motorbikes and computers, are usually financed by third parties such as exporters, NGOs or first-buyers, which have more ready access to the required capital.( Sustainable Cocoa Fund report, 2011)

Table 3 also shows that average total revenue of certified cocoa production is ₦490,384.58 which is far above average total revenue from conventional cocoa production of ₦308,647.5. This might be attributed to fact that the farmers practiced good agricultural, environmental, business and socially acceptable practices which led to increase in productivity and reward for producing certified cocoa (premium). The average premium paid to certified cocoa farmers in the study area is ₦6, 795.389 per metric tons per farmer.

## 3.3 COSTS AND RETURNS ASSOCIATED WITH CONVENTIONAL AND CERTIFIED COCOA PRODUCTION.

**Table 4: Comparative Agronomic practices, Costs and Returns Analysis of Certified and Conventional cocoa production**

| **Indices** | **Certified Cocoa Producers** | **Conventional Cocoa producers** |
|---|---|---|
| Use of child labour | No | Yes |
| Use of pregnant women to carry heavy load on the farm | No | Yes |
| Use of unapproved and unrecommended agrochemicals by NAFDAC | No | Yes |
| Non-payment of the correct wage rate to hired labour | No | Yes |
| Destruction of the ecosystem | No | Yes |
| Encroachment to government reserves | No | Yes |
| Discarding used cans of agrochemicals in nearby streams or rivers | No | Yes |
| Number of farmers | 60 | 60 |
| Total fixed cost (₦) | 5,349,000 | 5,349,000 |
| Total variable cost (₦) | 9,184,980 | 7,456,521 |
| Total cost of production (₦) | 14,533,977 | 12,805,521 |
| Output in metric tones | 82,900 | 61,729.5 |
| Selling price per metric tone (₦) | 350,000 | 300,000 |
| Amount received from sale of cocoa output (₦) | 29,015,346 | 18,518,850 |
| Amount received as premium (₦) | 407,723 | |
| Total Revenue (₦) | 29,423,075 | 18,518,850 |
| Profit (₦) | 14,889,098 | 5,713,329 |
| GM (₦) | 20,238,098 | 11062329 |
| NPV @ 24% discount rate (₦) | 5,253,237 | 428,306.30 |
| NPV @ 60% discount rate (₦) | -59,640 | -1,678,500 |
| BCR | 1.45 | 1.04 |
| IRR % | 59.64 | 31.31 |

**Source: Field Survey data, 2012**

Computation of the NPV, BCR, IRR and GM for **conventional cocoa production** using 24% interest rate which is the prevailing bank interest rate in Nigeria

**Profit(Π) =** Total Revenue – Total Cost

**Π** =₦18,518,850 - ₦12,805,521

**Π** = ₦5,713,329

**Gross Margin (GM)** = Total Revenue – Total Variable cost

GM =₦18,518,850 –₦7,456,521

GM =₦11,062,329

$$\textbf{NPV} = \sum_{t=1}^{n=1} \frac{B_t - C_t}{(1+r)^t} = \text{Discounted revenue} - \text{Discounted cost}$$

NPV = 9,957,669 – 9,529,363

NPV = 428,306.3

$$\textbf{BCR} = \sum_{t=1}^{n=1} \frac{\frac{B_t}{(1+r)^t}}{\frac{C_t}{(1+r)^t}} = \frac{\text{Discounted revenue}}{\text{Discounted cost}}$$

$$\text{BCR} = \frac{9,957,669}{9,529,363}$$

BCR = 1.04

$$\textbf{IRR} = \sum_{t=1}^{n=1} \frac{B_t - C_t}{(1+r)^t} = 0$$

$$\textbf{IRR} = \text{Lower discount rate} + \text{Difference between the two Discount rates} \left( \frac{\text{NPV at lower discount rate}}{\text{Absolute difference between NPVs at the two discount rates}} \right)$$

IRR = 24 + 36(428306.30/ 428306.30 - - 1678500)

IRR = 24 + 36(428306.30 /2106806.3)

IRR = 24 + 36(0.203)

IRR = 24 + 7.31

IRR = 31.31%

Computation of the NPV, BCR, IRR and GM for **certified cocoa production** using 24% interest rate which is the prevailing bank interest rate in Nigeria.

**Profit (Π) =** Total Revenue – Total Cost

**Π** =₦29,423,075- ₦14,533,977

**Π** =₦14,889,098

**Gross Margin (GM)** = Total Revenue – Total Variable cost

GM =₦29,423,075 –₦9,184,980

GM = ₦20,238,098

$$\textbf{NPV} = \sum_{t=1}^{n=1} \frac{B_t - C_t}{(1+r)^t}$$ Discounted benefit – Discounted cost

NPV = ₦16,779,460 - ₦11,526,220

NPV =₦5,253,237

$$\textbf{BCR} = \sum_{t=1}^{n=1} \frac{\frac{B_t}{(1+r)^t}}{\frac{C_t}{(1+r)^t}} = \frac{\text{Discounted revenue}}{\text{Discounted Cost}}$$

$$\text{BCR} = \frac{16,779,460}{11,526,220}$$

BCR = 1.45

$$\textbf{IRR} = \sum_{t=1}^{n=1} \frac{B_t - C_t}{(1+r)^t}$$

$$\textbf{IRR} = \text{Lower discount rate} + \text{Difference between the two Discount rates} \left[ \frac{\text{NPV at lower discount rate}}{\text{Absolute difference between NPVs at the two discount rates}} \right]$$

IRR = 2

IRR = 24 + 36 (5,253,237/5,253,296.64)

IRR = 24 + 36 (0.990)

IRR = 24 + 35.65

IRR = 59.65%

Table 4 clearly indicated that all the certified cocoa producers (100%) did not made use of child labour and pregnant women to work on their farms. They made sure they paid correct wages rate to hired labour, did not destroy the ecosystem in their farming , did not encroached on government reserves and did not discard used cans of agro chemicals in nearby streams or rivers. The reverse was the case under conventional cocoa production. Table 16 revealed that the Profit, GM, NPV,BCR and IRR for conventional cocoa production in the study area are ₦5,713,329 ₦11,062,329 ₦428,306.3, 1.04 and 31.31% respectively while the Profit, GM, NPV, BCR and IR for certified cocoa production in the study area are ₦14,889,098, ₦20,238,090, ₦5,253,237,1.45 and 59.64% respectively. Considering the decision rules highlighted for these economic indicators in chapter three, it is obvious that both conventional cocoa production and certified cocoa production are profitable but the certified cocoa production is more profitable with large significance differences in the values of the NPV, BCR, IRR and the GM. This might be as a result of improved productivity, training/seminar and payment of premium associated with certified cocoa production.

## 3.4 PERCEIVED DERIVABLE BENEFITS ASSOCIATED WITH CERTIFIED COCOA PRODUCTION.

Table 5: Distribution of respondents according to the perceived derivable benefits from certified cocoa production.

| **Perceived Benefits** | **Frequency** | **Percentage** |
|---|---|---|
| No benefit | 4 | 7.0 |
| Increased productivity and record keeping | 1 | 2.0 |
| Receipt of premium | 1 | 2.0 |
| Premium and Increased productivity | 4 | 7.0 |
| Receipt of premium, increased productivity and record keeping | 4 | 7.0 |
| Receipt of premium, increased productivity and supply of inputs | 1 | 2.0 |
| Receipt of premium, increased productivity, supply of inputs and training / seminar. | 1 | 2.0 |
| Receipt of premium, increased productivity and timeliness of sales | 1 | 2.0 |
| Receipt of premium, supply of inputs and timeliness of sales | 1 | 2.0 |
| Receipt of premium and training/seminar. | 6 | 10.0 |
| Receipt of premium and training/seminar and increased productivity | 11 | 18.0 |
| Receipt of premium and training/seminar, increased productivity and record keeping. | 9 | 15.0 |
| Receipt of premium , training/seminar, increased productivity, record keeping and supply of inputs | 2 | 3.0 |
| Receipt of premium and training/seminar, increased productivity and supply of inputs | 8 | 13.0 |
| Receipt of premium, training/seminar and record keeping | 1 | 2.0 |
| Receipt of premium, training/seminar and supply of inputs | 1 | 2.0 |
| Receipt of premium, training/seminar and timeliness of sales | 1 | 2.0 |
| Receipt of premium, training/seminar, increased productivity and timeliness of sales | 1 | 2.0 |
| Receipt of premium training/seminar, increased productivity and supply of inputs | 1 | 2.0 |
| training/seminar, record keeping and supply of inputs | 1 | 2.0 |
| **Total** | **60** | **100.0** |

**Source: Field Survey data, 2012**

Table 5 revealed that the farmers responses based on the benefits derivable from the cocoa certification process. The table shows that the farmers have benefited in terms of receipt of premium, increased productivity, training/seminar, record keeping, timelines of sale and supply of inputs. The table also shows the combination of those benefits which is derivable by the

farmers. Premium, training/seminar and increased productivity has the highest percentage (18%) followed by Premium and training/seminar, increased productivity and record keeping which has 15% while other combination of benefits follow while 7% claimed there is no benefit. The implication of this is that the perceived derivable benefits are majorly premium, training/seminar and increased productivity while other benefits such as record keeping, supply of inputs and timeliness of sales are not strong benefits.

## 3.5 CONSTRAINTS ASSOCIATED WITH CERTIFIED COCOA PRODUCTION

Table 6: Distribution of respondents according to the problems encountered in certified cocoa production.

| **Problems** | **Frequency** | **Percentage** |
|---|---|---|
| No problem | 2 | 3.0 |
| Inadequate capital | 8 | 13.0 |
| Inadequate capital and inheritance problem | 1 | 2.0 |
| Inadequate capital and poor transportation | 2 | 3.0 |
| Inheritance problem and low producer prices | 1 | 2.0 |
| Low producer prices | 3 | 5.0 |
| Poor transportation and inheritance problem | 1 | 2.0 |
| Unavailability of inputs | 4 | 7.0 |
| Unavailability of inputs and inadequate capital | 18 | 30.0 |
| Unavailability of inputs, inadequate capital and low producer prices | 8 | 13.0 |
| Unavailability of inputs, inadequate capital and poor transportation | 1 | 2.0 |
| Unavailability of inputs, poor transportation, inheritance problem and low producer prices | 2 | 3.0 |
| Unavailability of inputs and low producer prices | 4 | 7.0 |
| Unavailability of inputs and transportation | 4 | 7.0 |
| Others | 1 | 2.0 |
| **Total** | **60** | **100.0** |

**Source: Field Survey data, 2012**

Table 6 revealed the farmers responses based on the problems they encountered in the cocoa certification process. The Table shows that the farmers have constraints in terms of inadequate capital, land inheritance problem, poor transportation, low producer prices and unavailability of inputs. Table 6 also revealed the combination of those constraints which the farmers faced in their certified cocoa production process. Unavailability of inputs and inadequate capital has the highest percentage (30%) followed by unavailability of inputs, inadequate capital and low producer prices as reported by 13% and 3% of the respondents claimed there was no problem. The implication of this is that the constraints associated with certified cocoa production in the study area were majorly unavailability of inputs and inadequate capital while other problems such as land inheritance problem, poor transportation and low producer prices were minor problems.

## 4.0 CONCLUSION AND RECOMMENDATIONS

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Major players in the cocoa industry have made some progress in addressing sustainability and traceability in the cocoa supply chain. Certified cocoa production is not only profitable but it introduces sustainability and traceability into cocoa production by incorporating good agricultural, business, social and environmental practices which leads to improvement in the livelihood of the cocoa producers and increase in the quantity and quality of cocoa beans produced.

Based on the findings from this paper the following recommendations were made:

Certified cocoa farmers in the study area should be provided with timely subsidized inputs such as improved seedlings, fertilizers, herbicides and insecticides so as to boost their production activities. Certified cocoa farmers should be provided with credit facilities from formal credit institutions at affordable interest rates in order to boost cocoa production in the state. The Federal government should assist the pre-financing agencies and non-governmental organizations that finance the certification process with some tax reliefs so as to reduce the cost of certified cocoa production in the state. There is need for more awareness and sensitization programmes on cocoa certification so that more farmers and non-governmental organizations will be aware and involved in cocoa certification. There is need for effective monitoring and evaluation team for certified cocoa farmers in order to reduce the share of certified cocoa sold into conventional channel as a result of instant dire need of cash by cocoa farmers. Private input dealers and public extension services should inform farmers on safe and rational use of chemicals.

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