

## ANALYSIS OF THE ADOPTION OF COCOA PRODUCTION TECHNOLOGIES BY COCOA FARMERS IN CROSS RIVER STATE, NIGERIA

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### Abstract

*This study was carried out in Cross River State to analyse the adoption of cocoa production technology by cocoa farmers. Specifically, the study identified the cocoa production technologies in the study area, ascertain the extent of adoption of the technologies and determine the constraints to adoption of the technologies. The study adopted a multi-stage sampling procedure in sampling 324 respondents. Data for the study were generated using questionnaire and analysed using frequency, percentage, mean and ranking. Results showed that a variety of cocoa technologies were available in the study area such as, fermentation, sun-drying etc. results on the extent of adoption showed that some technologies like fermentation were highly adopted while the use of organic manure was not highly adopted. Results of the constraints to the adoption of the technologies showed that the greatest constraints were lack of farm credit with mean of 3.93 and ranking first. The study therefore recommended that cocoa farmers in Cross River State should be supplied with farm inputs at subsidized rate.*

### Introduction

The agricultural sector accounts for approximately one third of the Gross Domestic Product (GDP) worldwide, (FAO 2020). Agriculture has been recognized as the main source of income for farmers in most developing countries and accounts for approximately 60% of the world's population (Lennzen et al., 2020). Innusa et al (2015) noted that agriculture is a major contributor of GDP, foreign exchange earner, source of employment driver of industrialization and a source of food. Fadipe et al (2017), observed that cocoa is a major cash crop in Nigeria and a major foreign exchange earner among other agricultural commodity exports of the Nigeria economy. According to FOASTA (2021) cocoa is an important foreign exchange for the country with an annual average of USD 670 million since 2016. Furthermore, cocoa production is a major source of livelihood for between 300,000 to 350,000 small holder farmers across the entire value chain from farm labour suppliers to processors (small and large scale), licensed buying agents, ware housing agents and brokers (Akinngbe 2017). Cocoa production in Cross River State started in the 1950s with the establishment of a cocoa plantation in Ikom by the late Michael Okpara and currently, the crop is cultivated in commercial quantity in seven Local Government Areas which include Etung, Ikom, Boki, Obanliku, Akamkpa, Obubra and Obudu making Cross River State the second largest cocoa producer in Nigeria after Ondo state (Ministry of Agriculture and Natural resources (MANR) (2018).

According to the National Bureau of Statistics (2019), cocoa production in Nigeria is undertaken mostly by poor, small scale and smallholder farmers who face difficulties in adopting most cocoa production technologies resulting to low yield of the crop.

In addition, cocoa research Institutes all over the country in collaborative efforts with the universities have generated a lot of improved technologies that are consistent with sustainable natural resources management (Kehinde and Adeyemo, 2017).

Many strategies have been put in place to increase cocoa production in Nigeria including the dissemination of recommended technologies to cocoa farmers for adoption.

Akintelu and Mele (2019) noted that despite several policy intervention programs and initiatives deployed to solve the problems of cocoa farmers, cocoa beans production has continued to experience a downward trend. This study therefore tends to empirically provide information on cocoa production technologies employed by cocoa farmers in Cross River State with the following objectives:

1. To identify the types of cocoa production technologies available in the study area.
2. Ascertain the extent of adoption of cocoa production technologies in the study area and;
3. Analyse the constraints to the adoption of cocoa production technologies in the study area.

## **Methodology**

This study was carried out in Cross River State. The state is located in the south-south geopolitical zone of Nigeria. It is located between latitude  $4^{\circ}28^1$  and  $6^{\circ}55^1$  North of the equator and longitude  $7^{\circ}5^1$  and  $9^{\circ}28^1$  East of the Greenwich Meridian. It shares boundaries with Benue state in the North, Akwa Ibom state and the Atlantic Ocean to the south, the republic of Cameroon to the east and Enugu and Abia states to the West. It covers a land mass of about 23,000 square kilometres and a population of about 3,353,766 people (state Bureau of statistics, 2011). The state has two seasons, the rainy or wet season and the dry season. The state has a tropical hot and humid climate with average temperature ranging between 15 and  $30^{\circ}\text{C}$ , annual rainfall between 1300 and 3000mm and soils dominated by clay-loam textural classes (Federal Ministry of Agriculture and Rural Development (FMARD, 2019). The population of this study consisted of registered cocoa farmers in the study area. A multi-staged sampling procedure was adopted in selecting respondents for the study. Stage one involved the purposive selection of six agricultural blocks from the three agricultural zones in Cross River State. They were, Obudu and Obanliku from Ogoja agricultural zone, Obubra, Etung and Boki from Ikom agricultural zone and Akamkpa from Calabar Agricultural Zone. These blocks were selected because cocoa in Cross River State is produced there in commercial quantity (Federal Ministry of Agriculture and Natural Resources 2019). Stage two involved the purposive selection of four cells from each of the seven blocks giving a total of twenty eight cells. Stage three entailed the use of simple random sampling to select registered cocoa farmers from the selected cells. Finally, a sampling frame containing the list of registered cocoa farmers for cell obtained from the Cross River State Agricultural development programmes was used to select 20% of the registered cocoa farmers per cell giving a sample size of 235. Data were generated from the respondents using questionnaire. objective one was analysed using frequency and percentage, objective two was analysed using a 3 point likert type scale often use (3), occasionally use (2) and never use in (1). The mean cut off value was derived by adding  $3+2+1$  and dividing by 3 to get 2. Any variable with mean score greater or equal to 2 shows that the technology is adequately utilized while any technology with mean value less than 2 shows that the technology is not adequately utilized. Constraints to the adoption of cocoa production technology were measured using a 4-points likert type scale of strongly agree (4), Agree (3), disagree (2) and strongly disagree (1). The mean cut off mark was derived by adding  $4+3+2+1$  and divided by 4 giving a mean of 2.5. Any variable with a mean of 2.5 and above shows that it is a serious constraint while any variable with mean value of less than 2.5 shows that it is not a serious constraint. Data obtained were analysed, using descriptive statistics.

## Results and Discussion

### Cocoa production technologies available in the study area

Results on table 1 show the cocoa production technologies available in the study area. The results reveal that all (100%) of the respondents identified sun-drying and fermentation implying that these technologies were inevitable in cocoa production and all the respondents adopted them. Results also show that storage of beans in bags (96.6%), manual weeds control (97.4%) watering of young seedlings (94.4%), use of nursery to raise seedlings (65.0%) and control of black pods using fungicides (59.0%) were also prevalent in the study area and respondents adopted the technologies. The results of this study are similar with the findings of Omoare et al (2016) which showed that cocoa farmers in Ondo state adopted a variety of cocoa cultural management practices which are otherwise known as cocoa technologies and included; spraying prescribed insecticide and fungicides, fertilizer application, pruning of excess branches, weeds control, nursery beds construction, etc. The results of this study are also similar with the fundings of Job et al. (2015) which revealed that cocoa farmers in Ondo state adopted cocoa technologies such as pruning and fermentation, storage of beans in bags, use of agro chemicals, use of hybrid cocoa seedlings, fertilizer application etc.

Results further show that some technologies were insufficient. For instance, fertilizer application (26.9%), control of capsids using insecticides (47.9%), chemical weeds control (37.8%), pruning (31.6%), farm rehabilitation (30.3%), and the use of organic manure (3.8%) were poorly adopted. The reason for their insufficiency in the study area could be as a result of their high cost, complex technology involved or the lack of technical know-how needed for their application by cocoa farmers.

**Table 1: Distribution of respondents based on cocoa production technologies available in the study area.**

<b>Cocoa production technologies</b>	<b>Available</b>	<b>Percentage</b>
Use of improved cocoa varieties	81	34.6
Fertilizer application	63	26.9
Control of blackpod using fungicide	38	59.0
Control of capsids using insecticides	112	47.9
Use of nursery to raise seedlings	152	65.0
Chemical weeds control	79	37.8
Manual weeds control	228	97.4
Pruning	74	31.6
Watering of young seedlings	221	94.4
Farm rehabilitation (replacing old stems with new seedlings)	71	30.3
Storage of beans in jute bags	226	96.6
Cocoa beans drying technology	15	6.4
Sundrying	234	100.0
Fermentation	234	100.0
Use of organic manure	09	3.8

**Source:** Field Survey 2025 \* available technology > 50%

### Extent of adoption of cocoa production technologies in the study area

Results on Table 2 show the extent of adoption of cocoa production technology in the study area. Results show that some cocoa technologies such as fermentation ( $X = 3.0$ ) and ranking 1<sup>st</sup>, sundrying ( $x = 2.98$ ) ranking 2<sup>nd</sup>, storage of beans in bags and watering of young seedlings with mean values of ( $X = 2.36$ ) and both ranking 3<sup>rd</sup>, manual weeds control ( $X = 2.24$ ) ranking 5<sup>th</sup> and the use of nursery to raise seedlings ( $x = 2.12$ ) ranking 6<sup>th</sup> Had high extent of adoption. Other cocoa technologies with a high extent of adoption were; control of blackpod using fungicides, with mean value of 2.05 and ranking 7<sup>th</sup>. The implication of these results is that these technologies were available in the study area and the respondents adopted them. The result of this study is similar with the findings of Omoare et al. (2016) which revealed that cocoa farmers in Ogun and Ondo state carried out cultural management practice otherwise known as cocoa technologies. Results further show that some cocoa production technologies that had low extent of adoption and include; use of organic manure, cocoa beans drying technology, farm rehabilitation technology, pruning, chemical weeds control, control of capsids, fertilizer application and the use of improved cocoa varieties with mean values of 1.53, 1.64, 1.55, 1.73, 1.93, 1.72 and 1.86, respectively ranking 15<sup>th</sup>, 13<sup>th</sup>, 14<sup>th</sup>, 11<sup>th</sup>, 9<sup>th</sup>, 8<sup>th</sup>, 12<sup>th</sup> and 10<sup>th</sup>, respectively. The implication of these results is that the low extent of adoption of these technologies could be as a result of the technicalities needed, financial requirement as well as the awareness and availability of these technologies in the study area. The findings of this study are similar with the results of a study by Matanmi et al. (2015) which showed that some cocoa farmers do not adopt some cocoa technologies due to factors such as inadequate technical know-how, poor extension service and lack of safety measures to handle agro chemicals.

**Table 2: Distribution of respondents by extent of adoption of cocoa production technologies in the study area**

Cocoa production technologies	Always use (3)	Occasionally use (2)	Never use in	Total	Mean	Rank
Use of improved cocoa varieties	52 (156)	99 (198)	83 (83)	437	1.86	10 <sup>th</sup>
Fertilizer application	45 (135)	78 (156)	111 (111)	402	1.72	12 <sup>th</sup>
Control of blackpods using fungicides	71 (213)	101 (202)	62 (62)	479	2.05	7 <sup>th</sup>
Control of capsids using insecticides	63 (189)	102 (204)	69 (69)	462	1.97	8 <sup>th</sup>
Use of nursery to raise seedlings	80 (240)	103 (206)	51 (51)	497	2.12	6 <sup>th</sup>
Chemical weeds control	58 (174)	101 (202)	75 (75)	451	1.93	9 <sup>th</sup>
Manual weeds control	100 (300)	90 (180)	44 (44)	524	2.24	5 <sup>th</sup>
Pruning	46 (138)	79 (158)	109(109)	405	1.73	11 <sup>th</sup>
Watering of young seedlings	119 (357)	81 (162)	34 (34)	554	2.36	3 <sup>rd</sup>
Farm rehabilitation	30 (90)	70 (140)	134 (134)	364	1.55	14 <sup>th</sup>
Storage of beans in bags	120 (360)	80 (160)	34 (34)	554	2.36	3 <sup>rd</sup>
Cocoa beans drying technology	39 (117)	73 (146)	122	385	1.64	13 <sup>th</sup>
Sundrying	230 (690)	4 (8)	-	698	2.98	2 <sup>nd</sup>
Fermentation	234 (702)	-	-	702	3.0	1 <sup>st</sup>
Use of organic manure	28 (84)	69 (138)	137 (137)	359	1.53	15 <sup>th</sup>

Source: field survey 2025, \*means > 2.0

### Constraints to the adoption of cocoa production technologies in the study area

The results of the constraints to the adoption of cocoa production technologies are shown on Table 3. Results show that out of the of variables presented to farmers, 5 of them were perceived as constraints and include; lack of farm credit, high cost of labour, high cost of farm inputs, lack of technical know-how and poor extension contacts. Results imply that despite the availability of cocoa production technologies in the study area, farmers were faced

with the listed difficulties adopting them. This result aligns with the findings of Adebisi and Okunlola (2013) which revealed that certain factors determine farmers' adoption of cocoa technologies such as the number of visits by extension agents and farm credits. The results are also similar with the findings of Matanmi et al (2015) who sighted poor extension services limited capital access, lack of technical expertise and insufficient safety precautions as barriers to farmers adoption of agro chemicals.

**Table 3 Distribution of respondent based on the constraints to the adoption of cocoa technologies in the study area**

Constraints	SA (4)	A (3)	D (2)	SD (1)	Total	Mean	Rank
Lack of farm credit	123 (493)	86 (258)	19 (38)	6	794	3.39	1 <sup>st</sup>
High wages of labour	139 (556)	41 (123)	39 (78)	15	772	3.29	2 <sup>nd</sup>
High cost of farm input	116 (464)	79 (237)	29 (58)	10	740	3.16	3 <sup>rd</sup>
Lack of technical know-how	104 (416)	53 (159)	49 (98)	25	698	2.98	4 <sup>th</sup>
Unavailability of some technologies	6 (24)	18 (54)	68 (136)	142	356	1.52	6 <sup>th</sup>
Poor extension contact	100 (400)	80 (240)	6 (12)	15	667	2.85	5 <sup>th</sup>
High cost of farm machines	5 (20)	18 (54)	68 (136)	143	353	1.51	7 <sup>th</sup>

**Source: field survey 2025 \* mean > 2.5**

### Conclusion and Recommendations

While cocoa is produced in Cross River State, commercial production is limited to seven local government areas. Although various cocoa production technologies were available in the study area, their uptake was hindered by certain constraint, resulting to limited widespread adoption. Based on the findings of this study, the following recommendations were made;

1. Extension agents in Cross River State should teach farmers the different cocoa production technologies and how they can be applied.
2. Farm inputs such as fertilizers and agro chemicals should be made available to farmers at subsidize rate by the extension agency.
3. Farmers in Cross River State should be provided with low interest loan by the state ministry of agriculture to enable them purchase and use farm machines and inputs.

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