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EFFECTS OF COPPICING ON YIELD OF COCOA PODS IN COCOA RESEARCH INSTITUTE OF NIGERIA (CRIN) DEMONSTRATION PLOT

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ABSTRACT

Poor condition of cocoa plantations, dominance of old and moribund cocoa trees on farmers' farms are the major causes of low cocoa output in Nigeria. Institutional efforts such as cocoa coppicing, distribution of improved cocoa varieties among others have proven to be the best methods of improving yield of cocoa. Various techniques of cocoa rehabilitation were perfected and demonstrated on-station but studies on the yield of most of these techniques have not been determined. The study provided a comprehensive picture of the yield derivable from some selected coppiced cocoa trees during the main and light seasons of cocoa production in CRIN demonstration plot. Coppicing was done in the month of November, 10 coppiced cocoa trees out of 40 coppiced trees were randomly selected while 10 un-coppiced cocoa were used as control for this experiment. Data were collected over the periods of five years. Results showed that coppicing was a good technique of cocoa rehabilitation as there was reduction over time in the weeding regime of the plot. This led to increased yield of cocoa pods. Coppiced cocoa trees had appreciable increased yield records in the fifth year as the mean yield increased to 78.4. The reduction in the mean yield of un-coppiced trees from 11.2 pods in the 3rd year to 7.8 pods in the 5th year implies a decline. The study revealed that coppiced cocoa trees in the first three years of production produced during the light season than in the main season. It is recommended that training on the application of different rehabilitation techniques should be demonstrated through participatory approach both on-station and on-farm.

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INTRODUCTION

Cocoa is a permanent tree crop originated from South America (Brazil) and was introduced to Nigeria in 1874 by Chief Squiss Ibannigo from Fernandopo (now Equatorial Guinea) (ICCO 2012). Government of Nigeria developed an interest in the cultivation of cocoa since 1887 when cocoa seedlings from the old Botanic Garden were sent to Ibadan for trial. Cocoa later spread to various part of Western Nigeria through sources such as Trade Agent, Ministries of Agriculturel and Rural Development and Research Institutes etc (Opeke, 1987).Olayemi (1974) observed that Nigeria's cocoa acreage in 1912 was 10,000 acres and increased to 400,000 ha by 1945. The hecterage remain at this level until the late fifties when further planting led to rapid increase in production. Also, the climatic compatibility of cocoa with the Nigeria environment coupled with successful mix-cropping of cocoa with arable crops equally promoted the thriving of cocoa. Sanusi and Oluyole (2005) noted that by 1965, Nigeria became the second largest cocoa producer in the world with an annual output of about 270,000 tons and that the advent of the oil boom in 1970s has made the cocoa sub-sector experienced a decline particularly, cocoa acreage actually declined for most part of the 1980s when some cocoa farms were abandoned due to old age of cocoa trees and prevalence of pests/disease (ICCO 1999). After some institutional efforts were put in place, such as cocoa trade liberalization, cocoa rehabilitation programme, distribution of improved cocoa varieties to cocoa farmers at subsidized rate and few new replanted were carried out from

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mid-1980s to most part of the 1990s, cocoahectarage has increased to about 700,000 hectares (Fashina 1999 and Aigbekaen 2004). Adebiyi and Okunlola (2009) observed that one of the reasons for low yield of cocoa tree is old age, prevalence of pests/diseases and deterioration of the soil nutrients, rehabilitation methods such as coppicing, planting under old trees complete replanting, phased replanting and grafting/budding are the best methods of rehabilitation of old and moribund cocoa trees. Montgometry (1981) and Olaiya (2001) in a separate studies observed that the highest cocoa yield is achieved between the ages of 15th and 25th years but as from 26th year, yield decline gradually and production cost rise steadily.

However, Olaiya *et al* (2003) opined that cocoa trees rehabilitated through coppicing is capable of producing one thousand eight hundred kg/ha (1,800kg/ha) in the 18th month, of coppicing. Cocoa farmers are being sensitized to rehabilitate their farms to increase been yield which will improve their standard of living and poverty reduction. Most farmers are showing interest to rehabilitate their moribund cocoa trees. However, appropriate techniques and periods of application must be taken into consideration to get the required results. The importance of rehabilitation to cocoa improvement cannot be over-emphasized. It is a technique of rejuvenating old and moribund cocoa trees to get optimum yield per ha. However, this technique has not been adequately demonstrated in the Institute despite over fifty years of research into the crops. Meanwhile, Adenikinju (1993) demonstrated cocoa rehabilitation through coppicing but could not conduct study on pod yield of both rehabilitated and un-rehabilitated trees over a period of time. There is need to conduct study on the effect of coppicing on the yield of cocoa trees in an on -station experiment in order to convince the adopters of this techniques the benefits derivable from rehabilitation of old and moribund cocoa farms. The objective of this study is to rejuvenate the moribund cocoa trees and improve plot's productivity.

MATERIALS AND METHODS

Moribund cocoa trees in the Extension demonstration plot were considered for this study. The plot which was established more than forty (40) years ago is already old and moribund. There are fifty (50) very old and moribund cocoa trees remaining on the plot. The whole plot was divided into 5 blocks after which 40 cocoa trees in the 4 blocks were coppiced in the month of November while 10 cocoa trees in 1 block that were randomly selected were left un-coppiced. Three months after coppicing, the chupons were found grown around the coppiced trees and the most basal and vigorous chupon was retained while others were removed. On interval of time, every emerging chupons on the coppiced trees except the earlierretained most basal chupons are removed and this continued until after 12 months when the retained chupon developed into a young vibrant cocoa tree. After about 15months of coppicing, a block of 10 trees in a coppiced block was randomly selected and a block contained 10 trees of un-coppiced cocoa trees was used as control. Records of weeding regimes from the commencement of the experiment was taken periodically while pod yield were collected for main season and light season from the selected block of coppiced cocoa tress for the period of five years and same was done to the 10 un-coppiced cocoa trees. The data collected were analyzed with the use of descriptive statistics.

Plate 1. Un-coppiced old and moribund cocoa tree

Plate 2. A stump of a coppiced cocoa surrounded by chuppons, 3 months after coppicing

Table 1. Weeding regimes of both coppiced and un- coppiced plots

	2010			2011			2012			2013			2014		
	N.W	% W	% R.D	N.W	% W	% R.D	N.W	% W	% R.D	N.W	% W	% R.D	N.W	% W	% R.D
Copied	5	100	-	3	60	40	2	40	60	2	40	60	1	20	80
Un-copied	4	80	20	3	60	40	3	60	40	3	60	40	3	60	40

Source: Field Survey: 2010 – 2014
Key: N.W = Number of weeding W = Weeding R.D = Reduction

Table 2. Cocoa pods harvested from rehabilitated (coppiced) and in rehabilitated (in coppiced) cocoa trees in CRIN experimental plot

	2010			2011		2012		2013		2014	
	No. of trees	P.H	Mean	P.H	Mean	P.H	Mean	P.H	Mean	P.H	Mean
Un-coppiced	10	38	3.8	88	8.8	112	11.2	96	9.6	78	7.8
Coppiced	10	-	-	58	5.8	255	25.5	496	49.6	784	78.4
Total	20	38	3.8	146	14.6	367	35.7	592	59.2	862	86.2

Source: Field Survey: 2010 – 2014
Key**:** P.H=Pods harvested

Table 3. Cocoa pods produced based on the season of production

	2010			2011		2012		2013		2014	
	No. of trees	M.S.	L. S.	M.S.	L.S.	M.S.	L. S.	M.S.	L. S.	M. S.	L. S.
Un-coppiced/Un-rehabilitated	10	11	27	51	37	69	43	81	15	68	10
Coppiced/Rehabilitated	10	-	-	17	41	145	110	205	291	361	423
Total	10	11	27	68	78	214	153	286	306	429	433

Source: Field Survey: 2010-2014
Key: M.S= Main Season L.S= Light season

Table 4. Pods processed and dried weight of cocoa bean in statistics and records unit of CRIN

Prod. Seasons	No. of pods	Dried weight	No. of pods	Dried weight
Light/off season Feb. – July	55,000	1,000kg	1	0.018kg
Main season Aug. – Jan.	30,000	1,000kg	1	0.033kg

Source: Secondary data 2010-2014

Plate 3. A retained chuppon developed to a young tree

Plate 4. A retained chuppon already develop to a matured cocoa tree with some pods

RESULTS AND DISCUSSION

Table1 showed the weeding regimes of both coppiced block and un-coppiced block from the commencement of the experiment. It showed that there was reduction by 80% in the fifth year of coppicing. This is an indication that the cost of maintaining the plot of coppiced plot has reduced to 20% of the cost incurred in an un-coppiced cocoa plot. This is an indication that there was comparative advantage on the cost used to maintain rehabilitated cocoa plot after a period of time. Hence, rehabilitation promotes less loss, big results. Table 2 showed that the mean production of un-coppiced cocoa trees in

the first year of treatment was 3.8 which showed that the un-coppiced trees produced pods but at a poor yield. The table also revealed that there was no record of pod produced in the coppiced trees because the old moribund stem has been removed and the retained chupon were yet to resume production. The table also revealed that, there was a slight increase in the yield of un-coppiced trees inthe second year; the reasons may be as a result of Good Agricultural Practices that was put in place in the plot. However, the coppiced cocoa trees resumes production with the mean of 5.8 which is an indication that the coppiced cocoa tree resumes production after about eighteenth months of coppicing. The table also revealed that un-coppiced trees recorded the highest yield with mean of 11.2 and declined to 9.6 and 7.8 in the fourth and fifth years of treatment which is an indication that the un-coppiced cocoa trees are being maintained at a loss on the plot. This finding corroborates the assertion of Olaiya (2001) that a cocoa tree with less than fifteen cocoa pods is unproductive and should be rehabilitated with appropriate techniques. It was also revealed that the mean yield of coppiced trees in the third years is 25.5, this was increased to 49.6 and 78.4 for the fourth and fifth years respectively, which is an indication that rehabilitation salvage downward declining of cocoa production. Unlike un-coppiced trees, the ideal height of 1.5m to 5m in coppiced trees gives the best output.

The appreciable increase in the yield of coppiced trees is an indication that the vibrant young trees from the coppiced old trees is increasing in size and height and is capable of carrying more cocoa pods. The mean pod production with is 78.4 in the fifth year of production from coppiced cocoa trees is an indication that an hectare of a coppiced cocoa tree in a right geometry with plant population of 1111/ha is capable of producing 2.352kg of dried weight of cocoa beans as shown in table 3, the secondary data obtained from record and statistical unit of Cocoa Research Institute of Nigeria. The 2.352kg of dried cocoa beans produced is an indication that the plot is productive and can be sustained if all necessary Good Agricultural Practices are put in place.The results in table 3 showed the cocoa pods produced according to season of cocoa production by both coppiced and un-coppiced cocoa trees. The result revealed that un-coppiced trees produced pods during the main season (August – January), than in the light season (February – July). The data revealed that, in the fifth year of production, during the light season the un-coppiced trees produced just 2.3% of the total production compare to 15.7% produced in the main season. The data in the fifth year also showed that coppiced trees produced more pods in the light season period that is 97.7% of the total pods produced compare to 84.1% produced in the main season. The high yield of coppiced trees might be due to the reason that the young and vibrant trees of coppiced cocoa trees resumes flower production in the months of October to December unlike un-coppiced trees that have been adapted to main season of cocoa production. The result in table 4 showed the number of pods required to produced 1000kg dried weight of cocoa beans, it was discovered that during the main season of cocoa production, about 30,000 cocoa pods when processed and well fermented will give 1,000kg dried weight of cocoa beans while during the light period about 33,000 pods are required to give 1,000kg dried weight of cocoa beans. The variation in the number of pods required is due to the fact that pod size and beans size during the main season is usually big and bogus while pod and bean size during the light season is smaller in sizes.

Conclusion and Recommendation

The study concluded that there is no agricultural improvements without technological advancement as rehabilitation techniques had effect on weeding regimes and the yield of cocoa pod. However, there was reduction in the weeding regimes and appreciable increase in the yield of coppiced cocoa trees. Unlike un-coppiced cocoa trees, in the first three years of production, the young and vibrant cocoa trees of the coppiced trees start flowering in the month of October and most of the pods are harvestable during the light period season. Hence, the yield of coppiced trees is high during the light period season in the first three years of treatment. The study therefore recommends that:

- Farmers should be trained on the application various rehabilitation techniques and this should be demonstrated through participatory approach on the farmers' farm.
- The virgin land for cocoa farm cultivation is exhausted, farmers should be educated on the need to remove most of the old and moribund cocoa trees on their farms and replace them with young trees without planting of new ones.

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