

**COCOA, COLA COFFEE, CASHEW AND TEA
RESEARCH ABSTRACTS IN NIGERIA**

VOLUME I

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INTRODUCTION

The Cocoa Research Institute of Nigeria (CRIN) Ibadan, Oyo State of Nigeria, formerly is one of the research institutes under the supervision of the Federal Ministry of

Agriculture and Rural Development. The Institute is charged with the following responsibilities:-

- (a) Improvement of genetic potential, agronomic and husbandry practices, including processing and storage of the crops.
- (b) Identification of the ecology and methods of control of pests and diseases affecting the crops.
- (c) Investigating the effective utilization of the crops and their by- products, and the feasibility of small- scale production of such end-use products.
- (d) Integration of the cultivation of the mandate crops into farming system where each crop is grown by farmers.
- (e) Translation of research results and improved technologies into practice among farmers and manufacturers in order to improve production and socio-economic life of the people.

The Institute shall also:-

- (f) carry out extension research liaison with producers of her mandate crops, industries and other users of research results on Cocoa, Cola, Coffee, Cashew and Tea.
- (g) Provide laboratory and other technical services on Cocoa, Cola, Coffee, Cashew and Tea to farmers, industries and others concerned with CRIN mandate.
- (h) In carrying out this mandate the institute shall collaborate with all other relevant Research Institute and organization.

In 2005, the Library, Information and Documentation Division of the Institute embarked on a special collection of literature of “Cocoa, Cola, Coffee, Cashew and Tea in Nigerian”. The yearly addition to this collection forms the content of this volume of the “Cocoa, Cola, Coffee, Cashew and Tea Research Abstracts in Nigeria”. The unit tagged “Nigeria Cocoa, Cola, Coffee, Cashew and Tea information Centre was created in 2005 performs these functions:

- (a) Acquire both current and retrospective literature on Nigerian Cocoa, Cola, Coffee, Cashew, Tea Research and related disciplines and index them for ease of retrieval.
- (b) Produce Nigerian Cocoa, Cola, Coffee, Cashew and Tea Research Abstracts.
- (c) Compilation of specialized bibliographies.
- (d) Carry out reference services.

This volume I, covers documents from 0001-0250. It is hoped that by this abstract, scientists would have idea of what we have in our collection from time to time and join us in building this unit by sending a complimentary copy/copies of their past, present and future publication for inclusion in the special collection.

FREQUENCY

Issued annually," Nigerian Cocoa, Cola, Coffee, Cashew and Tea Research Abstracts provides citation of Research literatures available in the special collection of the Library of Cocoa Research Institute of Nigeria, Ibadan.

COVERAGE

As the name of this publication implies the abstract covers articles produced on Nigerian Cocoa, Cola, Coffee, Cashew and Tea Tree Crops Research. It is an effort to systematically collect literature produced in Nigeria on the subject. It is therefore retrospective. Hopefully when the back log of published articles have been acquired the abstract will be current in nature.

INDEX

Each issue carries author, subject, species, and geographic indexes. The subject index compiled using the AGROVOC multilingual Agricultural Thesaurus.

ARRANGEMENT

Journal Article

[1]
00120

[2]
CRIDAN 598

[3] Field evaluation of five brands of copper sulphate on the control of *phytophthora* pod rot disease of cocoa in Nigeria.

[4](En). [5]Iremiren, G.O, Agbeniyi, S.O, Ibiremo, O.S.and Ogunlade, M.O. [6] (Cocoa Research Institute of Nigeria, Ibadan (Nigeria). [7] 4 tables; 8 ref; Summary (En) [8] MICCO'05, 18-19 July 2005, Kuala Lumpur.[9] (2005).v.10p.111-115

[10]The control of *Phytophythora* pod rot disease in Nigeria is largely through the use of copper-based fungicides. Majority of Nigeria cocoa farmers still use copper sulphate for *Phytophthora* pod control despite the introduction of more efficacious fungicides that have metalaxyl in the past decade. This calls for the continuous evaluation of the various brands of copper sulphate in the Nigeria market. The field study in 2003 and 2004 reports on the efficacy of Nispra1, Tismac2 Kopesra3, Mistai4, and Mag5, which are brands of copper silphate on the control of *Phytophthora* pod, rot disease of cocoa. Mistai 4 gave the lowest pod rot control (49.84%). While the highest control (70.27%) was achieved with Tismac 2 compared with the unsprayed cocoa plots. Thus the efficacy of Tismac 2 recommended its continued use by the peasant cocoa farmers in Nigeria who can not afford the recently introduced fungicides

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- [1] Database Serial Number (MFN)
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- [3] Title

- [4] Language of Document
- [5] Author
- [6] Address of first author
- [7] Notes
- [8] Journal Title
- [9] Collection
- [10] Abstract of the document

Publications in proceedings

- [1] 00023
- [2] NIFFIC 519

[3] Arabical coffee –soil relationship at sites on the mambilla plateau, Nigeria. [4] (En). [5]Owaiye, A.R and Fagbami, A. [6] (Agronomy department, University of Ibadan, Ibadan.). ISBN 978-24535-30-7 [7] Ibadan(Nigeria) Organization of African unity scientific technical and research commission (1995). [8] p.571-578. [9] 8 tables: summary (En). [10] proceedings of third African soil science society conference on rehabilitation and management of African soils for sustainable productivity and environmental protection. Ilorin (Nigeria).vol 28,1995.

Three-year Arabica coffee (*coffea arabica* L.) yield and 27 soil variables, measured at 0-20cm (topsoil) and 20-50cm (subsoil), respectively, from five farmers field, were used for this evaluation.

The farmers field had previously been classified at the sub-group level of Soil Taxonomy.

Significant ($P < 0.05$) differences were found between the soil taxa (5) and their coffee yield potential. Multiple, Linear, stepwise regression showed that the taxa yield differences were due to inverse iron-manganese relationship in the topsoil ($R^2 = 0.89$) while soil acidity ($R^2 = 0.82$) and clay content ($R^2 = 0.17$) were important in the subsoil. All regression were significant at $P < 0.05$. Coffee yield declined with topsoil manganese toxicity, however, subsoil hydrogen ion toxicity and high clay content. Topsoil, manganese toxicity, however, showed up as the most important soil fertility constraint of arabica coffee. The latter in fact determined critical levels of Mn (ug/g), Fe/mn (ratio), PH (NkCL), base saturation are presented as a guide for site selection and/or on site fertility management of arabica coffee in the area.

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- [1] Database serial number (MFN)
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- [4] Language of document
- [5] Author(s)
- [6] Address of first author
- [7] Imprint
- [8] Collation
- [9] Notes
- [10] conference Name
- [11] Abstract of the document.

CRIDAN 0001

A study on nut and apple development in cashew *Anacardium*

occidentale, Linn (En). Aliyu M.O, and Hammed L.A (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). En 3ref 2 tab
Nigeria Journal of Tree Crop Research; ISSN 0794 –6455. 2000. Vol. 4 (2):p

Growth and development of cashew nut and apple 3-9 weeks after pollination (WAPo) were studied and the results revealed an initial similar growth patterns and a later differential growth patterns between the nut and apple of cashew.

CRIDAN 0002

Potentials of fresh kola testa as a sole feed for *Archachatina marginata* snail raised under kola plantation.(En).Hamzat R.A and. Longe O.G (Cocoa Research Institute of Nigeria,Ibadan,Nigeria) ., En. 13 ref., 2 tab
Nigeria Journal of Tree Crop Research ISSN 0794 –6455. 2000.Vol. 4 (2):
p

This experiment was set up to assess the potential of fresh kola testa in feeding African giant land snail (*Archachatina marginata*) raised under kola plantation. The result showed no significant difference ($P>0.05$) in feed intake and shell breadth but significant difference ($P<0.05$) was observed for weight gain, shell length and carcass analysis.

CRIDAN 0003

Evaluation of the adaptability of three tea clones to southwest lowland conditions in Nigeria.(En) Godomu K.G., Fasina, A.S, Obatolu,C.R., Esan,E.B.,and Sanni, M.A (Cocoa Research Institute of Nigeria ,Ibadan, Nigeria) En 3 tab., 3 diag., 10 ref Nigeria Journal of Tree Crop Research, ISSN 0794 –6455 .2000. Vol 4, (2):p

Three highland tea clones(143,318 and 35) were evaluated (two years) for their adaptability to lowland site conditions in southwest Nigeria where more land is available as compared to the tea growing highland areas(with sub-tropical climate) where they are usually grown.

CRIDAN 0004

Comparative weed control studies in young cocoa plantation

with formulated mixture of glyphosate and terbuthy lazine and the conventional hand slashing treatment.(En).Adeyemi, A.A. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria) En 4 tab. 12 ref. Nigeria Journal of Tree Crop Research ., ISSN 0794 –6455 .2000. Vol 4.,(2):p

The studies were carried out to determine the effectiveness of formulated mixture of glyphosate (N(phosphonemethyl) glycine) and terbuthylazine(2-tertbutylamino-4-chloro-6-ethylamino-s-triazine) (Folar 525 sc) in the control of weeds in young cocoa plantation as well as its selectivity on the test crop. Growth performance of young cocoa was best under herbicide treatments of 2.10 and 3.15kg a.i./ha while % survival of cocoa wqs similarly highest in the two treatments.

CRIDAN 0005

Evaluation of the formulated mixture of glyphosate and terbuthylazine in the control of weeds in mature cocoa plantation. (En). Adeyemi,A.A. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria) En 2 tab. 8 ref. Nigeria Journal of Tree Crop Research ., ISSN 0794 –6455 .2000. Vol 4.,(2):p

Formulated mixture of glyphosate (N(phosphonemethyl) glycine) and terbuthylazine(2-tert-butylamino-5-triazine (Folar 525 sc) was evaluated for effective weed control in mature cocoa plantations for three years. Folar 525 was generally more effective in the control of weeds under mature cocoa than weeded control through handslashing.

CRIDAN 0006

Effects of hot water dip, chemical treatment and polyethylene film packaging on storage life of cashew apple.(En) S.O.Ogunwolu (Cocoa Research Institute of Nigeria, Ibadan, Nigeria) En 2 tab. 11 refs. Nigeria Journal of Tree Crop Research ., ISSN 0794 –6455 .2000. Vol 4.,(2):p

The effects of hot water dip, chemical treatment and film packaging (applied singly or in combination) on the storage life of cashew apple were investigated all samples sealed in polyethylene bags stored better than others, other method of storage and the film packaged was found to have protection against loss in fresh weight of the apples.

CRIDAN 0007

Observations on some epiphytes and mistletoes and minerals contents of

infected cacao stems. Adenikinju, S.A., Abiola F.O., and Olaiya A.O (Cocoa Research Institute of Nigeria, Ibadan, Nigeria) En. 3 diags, 3tab. 11 refs. Nigeria Journal of Tree Crop Research. ISSN 0794 –6455 .2000. Vol 4., (1): p

The objectives of the studies reported were to determine the percentage stem covered by the bryophyte class of degradation agents in cacao plots, to identify the degradation agents in cacao plots, to identify the degradation agents as much as possible and determine the mineral contents of the barks of healthy and infested cacao stems. It was found that young cacao stems initially get infested with lichens (thaliphyta) while the bryophytes later invaded the items and spread over the lichens.

CRIDAN 0008

Observations on the effect of intercropping systems on the populations dynamics of some insect associated with *Carabica L. Mambilla*, Nigeria (En) Ojelade K .T.M (Cocoa Research Institute of Nigeria, Ibadan, Nigeria) En. 3 diags, 2tab. 9refs. Nigeria Journal of Tree Crop Research. ISSN 0794 – 6455 .2000. Vol 4., (1): p

The effect of various intercropping systems including (i) sole coffee (ii) coffee/cowpea/ maize (iii) Coffee/ groundnut/ maize and (iv) coffee/ cocoyam/ maize, on the population dynamics of scale insects.

CRIDAN 0009

Comparative studies on the establishment of three commercial clones *Camellia sinensis* L. at Ikorodu, Lagos state of Nigeria (En). Fasina A.S., Akinwumi A.O., Obatolu C.R., Esan, E.B and Godonu K.G (Cocoa Research Institute of Nigeria, Ibadan, Nigeria) En. 5 diags, 2tab. 12refs. Nigeria Journal of Tree Crop Research. ISSN 0794 –6455 .2000. Vol 4., (1): p

Three commercial tea clones (143, 318 and 35) being evaluated for their relative adaptation characteristics were established on alagba soil series in Ikorodu, a lowland area in Lagos state, Nigeria. At the end of twelve months clone 143 exhibited superior field performance. It established better than the other two clones 318 and 35. Clone 35 performed least.

CRIDAN 0010

Agronomy of the production of cocoa, coffee, kola, cashew, and tea in

Nigeria. (En). Obatolu. C.R., Adeyemi A.A, and. Ibiremo O.S, (Cocoa Research Institute of Nigeria, Ibadan, Nigeria) En., 2tab. 8refs Agronomy in Nigeria , a book on the theory and practice of agronomy as it has been in the last 33 years from July 1967 to the presents in support of the activities of the department of agronomy.

CRIDAN 0011

Effects of NPK fertilizers and rehabilitation methods on growth and development of cocoa theobroma cacao.(En) A.A Adeyemi (Cocoa Research Institute of Nigeria, Ibadan, Nigeria) En., 6tab. 17refs Nigerian Journal of Tree Crop Research. ISSN 0794 –6455. 1998. Vol 2., (1): p

Investigations were carried out both at Ibadan and Ibeku headquarters & substation of C.R.I.N. from 1984 to 1985 & 1986-87 respectively to determine the influence of NPK fertilizer application and rehabilitation techniques on the growth and development of cocoa seedlings. Results showed that rehabilitated cocoa in fertilizer-applied plots performed better than those without fertilizer application irrespective of the rehabilitation technique used.

CRIDAN 0012

Influence of some inorganic salts on vitro pollen germination of cola nitida, cola acuminata and their interspecific hybrids.(En) Adebola P.O (Cocoa Research Institute of Nigeria, Ibadan, Nigeria) Encl., 2tab. 11refs Nigerian Journal of Tree Crop Research. ISSN 0794 –6455. 1998. Vol 2., (1): p

The influence of boric acid (50 ppm), magnesium sulphate (150 ppm), potassium nitrate (50ppm) was studied in an attempt to enhance pollen germination in cola nitida, cola acuminata and their interspecific hybrid. The result showed that a simple 7.5% aqueous solution of the sucrose best promote the pollen germination in the studied plants.

CRIDAN 0013

Numerical analysis of variations in leaf morphometric characteristics of tea clones (*Camelia sinensis* (L.) O.Kutze) in Nigeria.(En) Esan E.B, Aikpokpodion O.P, and Obatolu C.R(Cocoa Research Institute of Nigeria, Ibadan, Nigeria) Encl.,4 diags,7tabs. 17refs Nigerian Journal of Tree Crop Research. ISSN 0794 –6455. 1998. Vol 2., (1): p

Numerical analysis of leaf characters was carried out on 29 cultivars of *camellia sinensis* (L) O. kuntze germplasm in Nigeria. Seventeen leaf characters were examined. The analysis revealed that the characters most useful for discrimination were the leaf size, extent of serration and the entire margin above serrated margin. Eight definable groups were established and their characteristics presented.

CRIDAN 0014

Initiation and prevalence of fungal rot of pseudoapples of cashew in the plantation. (En). Olunloyo O.A. (Cocoa Researech Institute of Nigeria, Ibadan, Nigeria). Encl 7tabs and 14refs. Nigerian Journal of Tree Crop Research , ISSN 0794 – 6455, 2000. Vol. 4 (2) (1): p.

Field observation indicate that large quantities of cashew pseudoapples are lost to fungal rot annually in Nigeria. Studies carried out showed that the pseudoapple became infected by a complex of fungi. The study suggested that predisposition of the pseudoapples instigated by large populations of fruit flies found during fruiting appeared to be a critical factor in the commencement of the fungal rot disease.

CRIDAN 0015

Persistence of fungicide- insecticide combination on cashew flowers: A system for timing spray schedule. (En). Olunloyo O.A. (Cocoa Researech Institute of Nigeria, Ibadan, Nigeria). Encl 5tabs and 8refs Nigerian Journal of Tree Crop Research, ISSN 0794 – 6455, 2000. Vol. 4 (2): p.

A system for timing chemical spray schedules in the field was developed by relating the extracts of cashew flowers treated with benomyl- dimethoate mixture with their ability to inhibit growth of *lasiodiplodia theobromae* in bioassey tests. Results showed that benomyl persisted for 14 days after spray application at both prebloom and full bloom stages while dimethoate applied alone on the flowers persisted for 21 days after treatment. The mixture of benomyl and dimethoate applied on cashew inflorescence persisted for 28 days after treatments.

CRIDAN 0016

Effect of intercropping of weed incidence in cashew (*Anacardium occidentale*) plantations. (En) Adeyemi A.A. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl 4tabs, 2 digs, and 13 refs. Nigerian Journal of Tree Crop Research ISSN 0794 – 6455, 2000. Vol. 4 (2):p

The effects of intercropping cashew (*Anacardium occidentale* L.) with maize (*zea mays* L.) cassava (*Manihot esculata* crantz). cowpea (*vigna unguiculata* L.) and plantain (*musa*, AABCV Agbagba) within the first three years establishment were investigated in Ibeku, Umuahia (5 29' and 7 33' F). Among the intercropped treatments weed suppression was best in plots carrying cashew/ cassava and cashew/ plantain/ cassava mixtures with 56-60% reduction in the frequency of weeding per annum.

CRIDAN 0017

The effect of long term fungicide spraying on selected soil micronutrients in Mambilla plateau of Nigeria. (En). Obatolu C.R (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl 3tabs and 10 refs. Nigerian Journal of Tree Crop Research ISSN 0794 – 6455, 2000. Vol. 4 (2):p

The paper examines the effect of ten years spraying of orthodipholatan, procida, brestan, sicarol and machechine on coffee arabica(L) grown on an ultisol in Mambilla plateau. Results obtained showed that the long term usage of these fungicides had no significant effect on the soil reaction at both the, surface soil level (0-15cm) and the sub-soil level (15-30cm). Na and K levels of the 0-15cm level were not affected by the long term application of the fungicides.

CRIDAN 0018

Suitability evaluation of major soils in Lagos state for cashew and coconuts production (En). Fasina A.S . Dept. of Crop Production & Horticulture, School of Agriculture, Lagos State Polytechnic. Encl 3tabl, 13 refs. Nigeria Journal of Tree Crop Research ISSN 0794 – 6455, 1998. Vol. 2 (2):p.

The major soils of Lagos as located on three land types in South-western Nigeria were evaluated for suitability for cashew and coconut cultivation using field data from 40 pedon representing 21 soil series. The major limitations to coconut production was climate (low rainfall) and physical characteristics (soil texture) for

cashew. The land evaluation method useful and found to be accurate in evaluating these soils.

CRIDAN 0019

Influence of lesion age on germination and infection of *hemileia vastatrix* spores. (En). Fawole E.A. (Cocoa Research Institute of Nigeria Ibadan, Nigeria). Encl.3tabs. and 13 refs. Nigerian Journal of Tree Crop Research ISSN 0794 – 6455,1998 Vol.2 (2):p.

Observation revealed that a high percentage of *Hemileia vastatrix* 1998. uredospores collected from naturally infected coffee leaves used to inoculate healthy coffee leaves did not germinate. This was attributed to low viability of the spores. Results showed that highest germination values and infectivity were observed with uredospores from mature lesions while uredospore from old lesions had the lowest viability.

CRIDAN 0020

Earthworm abundance under the plant residues-kernel husk, cocoa pod and kola pod. (En). Owa S.O,Yeye J.A,Oludimu and Obatolu C.R. (Cocoa Research Institute of Nigeria Ibadan, Nigeria). Encl 2 tabs and 12 refs. Nigerian Journal of Tree Crop Research. ISSN 0794 – 6455, 1998. Vol.2 (2):p.

Abundance of earthworms under four types of dumped plant residues (palm nut pericarp, maize husk, cocoa pod peel, and kola pod peel) was investigated. They were more abundant under palm nut pericarp than any of the others and least abundant under the kola pool peel.

CRIDAN 0021

Determination of managerial capability in small holder cocoa agriculture in south western Nigeria .(En). Ajobo A.S, Bamire, and Tijani A.A (Cocoa Research Institute of Nigeria Ibadan, Nigeria). Encl 3tabs and 13 refs. Nigerian Journal of Tree Crop Research ISSN 0794 – 6455, 1998 Vol.2 (2):p

Principal component analysis was used to examine certain socio-economic characteristics of seventy-two cocoa farmers in an old cocoa growing area near Ibadan. With an index of 0.80, the entire variable taken together are not two different one from another and they reasonably account for all the identified components.

CRIDAN 0022

Review of twenty years of cashew (*Anacodium occidentale*) entomology in Nigeria. (En). Ojelade K.T.M. (Cocoa Research Institute of Nigeria Ibadan, Nigeria). Encl.21 refs. Nigerian Journal of Tree Crop Research ISSN 0794 – 6455, 1998 Vol.2 (2):p

This review work highlights the progress made so far in the last two decades on cashew-entomology in Nigeria. This was related to the current level of cashew production in the country in view of the present valuable price of cashew at the export trade.

CRIDAN 0023

Studies on the distribution of the kola stem borer *phosphorus virescens* OLIV and its damage in Nigeria.(En). Ndubuaku T.C.N. (Cocoa Research Institute of Nigeria Ibadan, Nigeria). Encl 2 tabs.,3 digs, and 6 refs. Nigerian Journal of Tree Crop Research ISSN 0794 – 6455, 1998 Vol.2 (2):p

A survey of the distribution of the kola stem borer *Phosphorus virescens* Oliv. on *cola nitida* in Nigeria was carried out in 1987. Its distribution was patchy as the incidence of the borer was recorded in only 18 out of the 34 localities.

CRIDAN 0024

Evaluation of copper accumulation in soils under cocoa sprayed with copper-based fungicides and the effects of different copper levels on growth of cocoa (*Theobroma cacao* L) seedlings.(En). Ndubuaku, U.M. and Lucas, E.O. (Cocoa Research Institute of Nigeria Ibadan, Nigeria). Nigerian Journal of Tree Crop Research ISSN 0794 – 6455, 1998 Vol.2 (2):p

Investigations were carried out to evaluate the accumulation of copper (Cu) in soils of old cocoa plantations. These soils were found to contain substantial amount of Cu the levels of which increased with age of plantation and frequency of spraying. The result of Cu uptake in the different parts of the seedling showed highest accumulation of Cu in the roots followed by the stem and then the leaves.

CRIDAN 0025

Utilization of Alkali- treated cocoa husk in broiler finisher diet.
(En).Sobamuwa,O and Longe, O.G. (Cocoa Research Institute of Nigeria
Ibadan, Nigeria). Nigerian Journal of Tree Crop Research ISSN 0794 –
6455, 1999. Vol. 3 (1):p

The effects of dietary inclusion of alkali- treated cocoa husk
(ACH) on growth performance, nutrient retention and economics
of production of broiler chickens were investigated. It was
concluded that up to 10% ACH (mainly at the expense of maize) is
economically viable in broiler finisher feeds.

CRIDAN 0026

Weed infestation in cocoa(*theobroma cacao*) ; physiological basis of the
effects of weeds on the establishment and growth of cocoa seedlings and
after transplanting to the field. (En). Adeyemi,A.A (Cocoa Research
Institute of Nigeria Ibadan, Nigeria). Encl.6 tabs. Nigerian Journal of Tree
Crop Research ISSN 0794 – 6455, 1999. Vol. 3 (1):p

Investigations were carried out to determine the physiological
causes of the suppressed growth of young cocoa (*theobroma cacao*
L.) from weed- infested plantation. The study suggest that
suppressive effects of weeds become manifested in cocoa seedlings
at 12-18 months after transplanting to the field when reduction in
growth parameters such as height, girth and leaf area begins.

CRIDAN 0027

Evaluation of fabric pot in raising cocoa(*theobroma cacao*); The effects of
Poton the growth and field. (En). Adeyemi,A.A. and Chude,V.O.
(Cocoa Research Institute of Nigeria Ibadan, Nigeria). Encl 4 tabs and 18
refs. Nigerian Journal of Tree Crop Research ISSN 0794 – 6455, 1999.
Vol.3 (1):p

Pot effects on cocoa seedlings (CV.F3 Amazon) raised in three
different sowing pots were further investigated on the field of
establishment at the Cocoa Research Institute of Nigeria, Ibadan
(7025'N and 30522'E). cocoa raised in the fabric pot performed
best in height, stem girth, number of leaves and leaf area followed
by those sown in the 30x12.5cm polythene pots while those in the
small polythene pots (15.0 and 12.5cm size) had the poorest
growth.

CRIDAN 0028

Comparative study of the physico-chemical properties and the effect of different techniques on the quality of cashew juice from Brazilian and local varieties. (En). Akinwale, T.O (Mrs) and Aladesua, O.O. (Cocoa Research Institute of Nigeria Ibadan, Nigeria). Encl 3 tabs and 6 refs. Nigerian Journal of Tree Crop Research ISSN 0794 – 6455, 1999. Vol.3 (1):p

Comparative study of the chemical properties and the effect of different processing techniques on the quality of cashew juice of Brazilian and local varieties was carried out. The local types were found to contain more vitamin C (170mg/ 100g of apple) the local red (160mg/ 100g) and 108.5mg/100g of apples respectively.

CRIDAN 0029

Efficacy of Milton solution and wood ash in the control of storage rot of kolanut (*Cola nitida*) (VENT) (SCHOTT and ENDL.). (En). Agbeniyi, S.O. (Cocoa Research Institute of Nigeria Ibadan, Nigeria). Encl. 1 diag, 1 tab and 13 refs. Nigerian Journal of Tree Crop Research ISSN 0794 – 6455, 1999. Vol.3 (1):p.

The efficacy of Milton solution (containing 1% v/v sodium hypochlorite) and four wood ashes prepared from *Vernonia amygdalina* (VA), *Tectona* spp (TS) *Gliricidia sepium* (GS) and *Cassia siamea* (CS) were tested against storage rot of kolanuts. The effects of the nut-treatments on microbial contaminations caused by *Botryodiplodia theobromae* and *Fusarium pallidroseum* were also investigated. Each ash treatment resulted in a major reduction in kolanut deterioration four months after storage.

CRIDAN 0030

Micropropagation of *Cocoa theobroma cacao* L. biotechnology in agriculture and forestry. (En). Esan, E.B. (Cocoa Research Institute of Nigeria Ibadan, Nigeria). Encl 7 tabs, 9 diags and 50 refs. Nigerian Journal of Tree Crop Research, ISSN 0794 – 6455, 1992. Vol.18 (2):p.

CRIDAN 0031

Status of in-vitro regeneration of tropical plantation crops. International Institute of Tropical Agriculture (IITA) (En). Esan, E.B. (Cocoa Research Institute of Nigeria Ibadan, Nigeria). Encl 67 refs. Nigerian Journal of Tree Crop Research ISSN 0794 – 6455, 1992. Vol.2 (2):p.

CRIDAN 0032

Effects of some selected herbicides on weed control and growth performances of cocoa (*Theobroma cacao* L.) seedling in the early years of establishment. (En). Adeyemi, A.A. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl 5 tabs and 5 refs. Nigeria Journal of Weed Science. ISSN 1993 p.

CRIDAN 0033

The nutritive value of alkali treated cocoa husk meal in broiler chicks diets. (En). Sobamiwa, O & Longe, O.G. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl 5 tabs and 15 refs. Animal feed science and technology 1994. Vol.46, p 321-330,

CRIDAN 0034

Physico-chemical, microbiological profiles of blends of tea and mistletoe- a highly medicinal mix. (En). Akinwale, T.O, Aroyeun, S.O. & Obatolu, C.R. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl 3 tabs and 15 ref. Journal of food technology in Africa ISSN 2000. Vol.5 (4): p.123-125

Sample of tea obtained from Mambilla, Nigeria highland was blended with mistletoe- a known medicinal parasitic plant of cocoa. The ratios of the blends were Tea(T)/Mistletoe (M) 90:10, 75:25, 25:75, and 50:50 while ordinary tea and mistletoes served as control samples. Chemical analyses of blends were done followed by organoleptic assessment and microbial analysis. The chemical analyses indicated a higher value of 16.52% ash for mistletoes than tea which was 4.93% and this value increased with increased level of mistletoe in the blends. Blends were found to vary in alkalinity of ash (A.A), water soluble ash (WSA) acid insoluble ash (AIA), moisture content and total ash. The low fungal count recorded in the fresh state of mistletoe and tea was as a result of adequate drying of the leaves. Sensory analysis carried out indicated that at 5% significant level, there were differences in the attributes of colour, taste, flavour and overall acceptability. In all the blends, the control sample (Tea) was highly rated followed by the sample containing 90% of tea blended with 10% of mistletoe.

CRIDAN 0035

Nutritional qualities of snails (*Archachatina marginata*) fed solely with fresh kola testa(En). Hamzat, R.A, Jaiyeola, C.O, & Longe, O.G. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl 3tabs. And 11 refs
Journal of nutrition & food Science, ISSN 2002.Vol.32 (4): p.134-136

Food presently represents proportionately more than 0.85 of the total cost of livestock production under intensive management, the result of which is that prices of animal products are beyond the reach of most of the population (Salawu *et al.*, 1994) with the shortage of animal protein as well as the serious search for a meat containing little or no cholesterol in the development countries.

CRIDAN 0036

Production and nutritional composition of non-conventional chocolate En). Ogunwolu, S.O, & Akinwale T.O(Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl 6 tabs. And 6 refs. 2003. p. 120- 124

The need to increase the utilization and consumption of cocoa beans in the producing countries cannot be over- emphasized, particularly with the glut in world supply and the unstable price of cocoa in the world market. Chocolate is the major product of cocoa beans in the western world, and chocolate's role as a symbol of pleasure has remained intact in the western world and has contributed greatly to their economy.

CRIDAN 0037

Optimisation of the utilization of cashew apple in yogurt production(En). Aroyeun,S.O (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 4 tabs and 13 refs In the Journal of Nutrition &Food Science, ISSNVol. 34. (1) 2004. p.17-19

Cashew apple was used as a nutritional additive in the production of yogurt. The yogurt so produced (CAY-A) had a higher vitamin C with values 14.1/100ml of vitamin C respectively. The cashew apple fortified yogurt was evaluated for physicochemical parameters like PH, refractive index, specific gravity, titratable acidity, ash, moisture, protein and fat and the values 4.10(PH), 20o Brix soluble solid content, specific gravity 1.023, titratable acidity(0.78g/100ml lactic acid), 0.84 per cent ash, 77.0 per cent moisture, 3.22 per cent protein and 3.2 per cent fat were obtained.

CRIDAN 0038

Development of wine from infused tea leaves (*Cammellia sinensis*)(En)
Aroyeun,S.O, Olubamiwa,O & Ogunjobi, M.A.K (Cocoa Research
Institute of Nigeria, Ibadan, Nigeria). Encl. 6 tabs and 32 refs. In the
British Food Journal, ISSN 2005 Vol. 107 (1): p.34 - 41

Tea and herbs teas are popular beverages with potential health
benefits. This study evaluates thse potential for the development of
wine using infused tea leaves as a raw materials. The taste of the
wines produced from tea leaves and the aroma compared
favourably with other commercially known tropical fruit wines
used in the assessment.

CRIDAN 0039

Flowering pattern in cultivated cacao *theobroma cacao* L. and some
related species in Nigeria (En). Aikpokpodion, P.O, Badaru, K,&
Williams, J.A (Cocoa Research Institute of Nigeria, Ibadan, Nigeria).
Encl. 4 tabs.7 diags.and 8 ref p. 2-12

CRIDAN 0040

Evaluation of the optimal biological and economic level of cocoa husk
inclusion in production diets for broiler starter. (En).Olubamiwa, O &
Longe, O.G. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria).
Encl.2 tabs. And 12 refs In appl. trop.agric. 1999. Vol. 4, (2), pp 149-153,

CRIDAN 0041

Principal component analysis of variation pattern among *cola nitida*, *cola*
acuminata (Sterculiaceae) and their interspecific hybrids.(En) Adebola,
P.O (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 1 tab.,4
digs. and 9 refs. Feddes Repertorium 111 (2000) p.3-4, 183- 188.

CRIDAN 0042

Studies on the effect of some cultural operations on kola (*Cola nitida*) pod
infestation by Kola weevils (*Balanogastris Kolae an d sophrorhinus*
spp). (En) Ojelade, K.T.M (Cocoa Research Institute of Nigeria, Ibadan,
Nigeria). Encl. 2 tabs. And 13 refs. Moor journal of agricultural research.
2000. Vol.1 (1):p.

The effectiveness of cultural maintenance operations including weed management and timely harvesting of kola pods in the control of damage attributable to weevil infestation the field were ascertained. Timeliness in harvesting operation and weed management were observed to be relevant cultural maintenance operations towards improving the quality of kolanut produced.

CRIDAN 0043

Morphometric studies in cashew nut (*Anacardium occidentale*) In relation to its physico-chemical properties. (En) Aliyu, O.M. & Yahaya, L.E. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 4 tabs., and 20 refs. Moor journal of agricultural research. 2001. Vol.2 No. (2):P

Ten quantitative characters of cashew nut (*anacardium occidentale* L.) from twelve selected accessions (brazilian type) were studied and the study revealed that for the purpose of industrial applications of CNSL, accessions GO51,7,9,23 and 24 have been found desirable and could be recommended for planting towards high quality CNSL production.

CRIDAN 0044

Potassium extraction from wastes. In soil science society of Nigeria (ISSN) BENIN1999 proceedings of the 25th annual conference at Performance characteristics of broiler finishers-fed kola (*cola nitida*) Ventenat (*schott Et. Endl*) pod husk- base d diets (En) Hamzat, R.A & Babatunde, B.B. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 3 tabs &28 refs. In Moor journal of Agric. Research. 2001. Vol. 2 No. (2). p

CRIDAN 0045

Cocoa IPM research and implementation in Nigeria. (En) Idowu, Ojelade, K.T.M. & Adebola, P.O. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria.) West Africa Regional cocoa IPM workshop cotonou, Benin. November 13-15, 2001 proceedings edited by Janny Vos and Peter Neuenschwander.

CRIDAN 0046

A review of breeding work on disease resistance of cocoa in Nigeria. (En) Badaru K, Esaan, E.B. &Williams, J. (Cocoa Research Institute of

Nigeria, Ibadan, Nigeria.) Encl. Refs. Proceedings of the international workshop on the contribution of Resistance Disease to cocoa variety improvement on 24th-26th November,1996 Salvador ,bahia, Brazil. ISBN 1 90 0527 01 4. 1999 p 167.-171.

Although breeding activities on cacao started in Nigeria in 1912, deliberate genetic manipulation of the crop started in 1931 while breeding for disease resistance was not embarked on until about 27 years later. Since then, disease resistance has featured as an integral part of all the cocoa breeding programme phases to date. The most economically significant diseases of cacao in Nigeria in order of importance have been those caused by fungi of the phytophthora species, the Cocoa Swollen shoot Virus (CSSV) and nematodes.

CRIDAN 0047

The search for phytophthora pod rot resistance and escape at the Cocoa Research Institute of Nigeria during the 1960s. (En) Toxopeus, H Encl. 4 tabs., 2 digs.Refs. Proceedings of the international workshop on the contribution of Resistance Disease to cocoa variety improvement on 24th-26th November,1996 Salvador ,bahia, Brazil. ISBN 1 90 0527 01 4. 1999 p 159.-166

The research effort towards economic control of phytophthora pod rot (Ppr) disease carried out in the 1960s at Cocoa Research Institute of Nigeria CRIN consisted of,apart from efforts at chemical control, an intensive search for genotypes resisting and/or escaping the disease in the field. From among 152 clones carefully observed for natural infection for 3-6 years, 19 were identified as possibly resistant. Clones were shown to differ in seasonal pod production periodicity, and several escaped the epidemic altogether.

CRIDAN 0048

Potassium extraction from wastes.(En). Ipinmoroti, R.P., Adeoye,G.O.& Sridhar, M.K.C. Cocoa Research Institute of Nigeria, Ibadan, Nigeria.) Encl, 4 tabs and 14 refs. Soil science society of Nigeria (ISSN) BENIN'99 proceedings of the 25th annual conference at precious palm royal hotel from 21st-25th November,1999.p 87-90.

Attempt to extract potassium (K) mineral nutrient from various farm wastes was made. The initial chemical analysis on the farm wastes used indicated that the waste differ in their K content depending on the part of the waste material used. The farm waste

cocoa husk and water hyacinth were analysed and extracted for potassium.

CRIDAN 0049

Use of organic materials for raising cocoa seedlings. (En). Obatolu, C.R & Ibiremo, O.S. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria.). Encl 4 tabs, 1 diag & 15 refs. Proceedings of the 25th annual conf. At precious palm royal hotel, from 21st-25th November, 1999.

Ten organic fertilizer formulations from four different organic materials were used as fertilizers to raise cocoa seedlings at the cocoa research institute of Nigeria Ibadan between August and December 1998. Ten materials were used and were evaluated. The results indicate significant effect on plant height at 20 weeks after planting and 14 weeks after planting and 14 weeks after planting for number of leaves when *Chromolaena odorata* and cowdung were used. In all cocoa seedlings tended to perform better with cowdung and *Chromolaena odorata* applied sole or in combination.

CRIDAN 0050

Development of an Integrated Pest Management Programme for major Pests of cocoa in Nigeria : evaluation of farmer-oriented monitoring and damage assessment methods. (En). Idowu, O.L. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria.) Encl. 1 tab. and 2 refs. First International Cocoa Pests And Diseases Seminar Accra, Ghana. 6-10 November, 1995.

CRIDAN 0051

Determination of miridicidal efficacy of Basudin 600 EC and its residue in cocoa beans from sprayed plots in Nigeria. Idowu, O.L (Cocoa Research Institute of Nigeria, Ibadan, Nigeria.) Encl. 6 tabs. and 3 refs p.63-69. First International Cocoa Pests And Diseases seminar Accra, Ghana. 6-10 November, 1995 p 63-69.

Two methods of monitoring the cocoa mirids, direct counts and knockdown methods and damage estimate were evaluated from July 1994 to August 1995, at Ibadan in Nigeria. The results of the trial at Ibadan showed that the knockdown method (B) though

more efficient than the direct-count method (A) was more tedious, and complex for ready adoption by peasant farmers.

CRIDAN 0052

Efficacy of herbal plant substances in the control of black pod disease of cocoa- preliminary results. (En). Olunloyo, O. A. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria.) Encl. 3 tabs., 2 digs. And 6 Refs. First International. (Cocoa Pests And Diseases seminar Accra, Ghana. 6-10 November, 1995.

Cocoa is a crop of considerable economic importance very often infected by phytophthora megakarya in areas suited to its culture in Nigeria. Methods of controlling black pod disease of cocoa in Nigeria include cultural practices and the use of agrochemicals. Biological control offer another possibility. The composition of the extract is principally made up of herbs and other farm materials of know origin in Nigeria.

CRIDAN 0053

Using food crop/cacao intercropping as insect IPM tool for cocoa production in Nigeria. (En). IDOWU, O.L. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria.) Encl. 2 tabs and 6 refs. 12th inter., cocoa res., conf. 1996. p. 3-7.

In order to identify the cacao/food crop intercropping systems most deleterious to major insect and rodent pests of cacao in Nigeria, and use the information for developing cacao IPM strategies, the succession and abundance of the pests and their damage to cacao were studied in newly established cacao planted either solely(mono\crop) or intercropped with the following staple foods crop, cassava (*Mannihot esculenta*), maize (*zea mais*), cocoyam (*colocasia esculentum*), okra (*hibiscus esculentus*), yam (*dioscorea spp*), cowpea (*vigna unguiculata*),and melon (*citrus vulgaris*).

CRIDAN 0054

A revist to the west African Amelonado in cocoa improvement programme in Nigeria. (En). Esan, E.B, Badaru, K, Akinwale, S.A, Adebola, P.O, and Williams, J.A.(Cocoa Research Institute of Nigeria, Ibadan, Nigeria.) Encl.3 tabs, 1 dig and 31 refs 12 International Cocoa Research Conference. Salvador, Bahia Brasil. 17-23 November 1996.

The west African Amelonado (WAA) cocoa is the original local commercial material cultivated in Nigeria. For more than 50 years

its annual production averaged about one ton per hectare. It was however disrecommended for commercial cultivation by the research sector in the mid-50's mainly because of its C.S.S.V. and for its other related commercial demerits.

CRIDAN 0055

NPK fertilization in rehabilitated cocoa: Effects on the growth and development of cocoa under different rehabilitation methods. (En). Adeyemi, A.A. Cocoa Research Institute of Nigeria, Ibadan, Nigeria.) Encl.7 tabs. And 20 refs. 12 International Cocoa Research Conference. Salvador, Bahia Brasil. 17-23 November 1996.

Investigations were carried out at the Idi-Ayunre Headquarters of the Cocoa Research Institute of Nigeria from 1984 to 1985 and at the Ibeku – Umuahia substation of the Institute between 1986 and 1987 to determine the influence of NPK fertilizer application and rehabilitation techniques on the growth and development of cocoa seedling and/or chupons evolving from the rehabilitation of old unproductive cocoa plantation.

CRIDAN 0056

Development and organoleptic assessment of soy fortified chocolate and effect of (Different level of) cocoa powder on the nutritive value and consumer acceptability of extruded soy-based snacks. (En) Akinwale, T.O. Cocoa Research Institute of Nigeria, Ibadan, Nigeria.) Encl.6 tabs. And 6 refs. 12 International Cocoa Research Conference. Salvador, Bahia Brasil. 17-23 November 1996.

Studies were carried out to develop soy-fortified chocolate products by substituting 25-100% of the animal milk powder content of the chocolate with the soya flour. The triangle test procedure was used to detect the odd sample. Results obtained from this produce showed that soy-chocolate containing 25% soy flour compared favourably with the reference milk chocolate sample.

CRIDAN 0057

Effective management of cocoa plantations in Nigeria for profitability.(En). Adeyemi, A. A. (Cocoa Research Institute of Nigeria,

Ibadan, Nigeria.) Encl. 3 tabs. And 47 refs. 12 International Cocoa Research Conference. Salvador, Bahia Brasil. 17-23 November 1996.

The current high price of dry cocoa beans in Nigeria as a result of the free or deregulated market that is presently existing for the commodity\cash crops produced in the country has more than ever before drawn attention of the Nigeria farmers to their cocoa farms some of which had been previously left in abeyance.

CRIDAN 0058

Performance and nutrient utilization of growing rabbits fed urea-treated and untreated cocoa husk based diets. (En). Oduguwa, O.O, Sobamiwa, O, Sani, D.I and Akintunde A.Y (Cocoa Research Institute of Nigeria, Ibadan, Nigeria.) Encl. 2 tabs. And 9 refs.12 International Cocoa Research Conference. Salvador, Bahia Brasil. 17-23 November 1996.

Rabbits (*oryctolagus cruniculus*) are pseudo-ruminants which have enlarge caeca that harbour microbes. Urea treatment of a high fibre stuff like cocoa pod husk (CPH) for this species of animals may have the advantages of increasing the population and activities of caecal microbes thereby causing a reduction in the content of lignin, hemicellulose and other indigestible polysaccharides, with the resultant enhancement of digestibility.

CRIDAN 0059

Cocoa-pod husk utilization in animal feeds:summaries and strategies. (En). Sobamiwa, O. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria.) Encl. 36 refs.

12 International Cocoa Research Conference. Salvador, Bahia Brasil. 17-23 November 1996. Research into the utilization of cocoa pod husk (CPH) in animal feeds has been vigorously pursued in some cocoa-growing countries particularly nigeria and Ghana for about two decades. A wealth of information has accumulated over the period. CPH is a high-fibre (23-33% crude fibre),low protein (6-7%) and moderate-energy (2000-2100 kcal/lg metabolizable energy) feedstuff.

CRIDAN 0060

Government policy on cocoa processing in Nigeria:Implications for Production and trade.(En). Daramola, G.A and Okunlola, J.O. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria.) Encl.3 tabs and 10 refs.

International Cocoa Research Conference.Salvador, Bahia Brasil. 17-23 November 1996.

In this paper, the objective is to review the federal government of Nigeria's policies affecting cocoa processing in the hope that they will have implications through derived-demand relationship for production and the form in which Nigeria trades in cocoa. This is particularly relevant for a country that has been undergoing macroeconomic adjustments for almost a decade.

CRIDAN 0061

Quality depression in the face of cocoa boom: A consequence of production cycle or market failure?. (En). Oduwole, O.O (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 2 tabs., and refs. 12 International Cocoa Research Conference. Salvador, Bahia Brasil. 17-23 November 1996

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There are a number of questions in the mind of cocoa experts as regards the trend in production and quality such as (1) is low quality a result of genetic trait of the bean and not fermentation? (2) why is there strong demand for low quality beans in the world market? (3) can price incentive improve fermentation efficiency? (4) what kind of intervention would be appropriate to bring about a sustainable high quality bean in cocoa market.?

CRIDAN 0062

Comparative toxicity of three insecticides for mirid control in Nigeria. (En). Idowu, O.L (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl.3 tabs., and refs. 13 International Cocoa Research Conference. Vol:1, Kota Kinabalu, Sabah, Malaysia 9-14 October 2000. p

Effort being made to stop the use of lindane-based insecticides in cocoa production in Nigeria necessitated our search for less toxic, and more environment- friendly insecticides for the protection of small-holder cocoa farms against insect pests, especially the cocoa mired *sahlbergella singular*, the most economically important insect pest of cocoa in this country.

CRIDAN 0063

Comparative efficacy Of IPM strategies and routine spraying against characoma stictigrapta hamps- the cocoa pod-husk.Borer, In Nigeria. (En). Idowu, O.L and Ojelade, K.T.M. (Cocoa research Institute of Nigeria,

Ibadan, Nigeria). Encl.4 tabs., and refs. 13 International Cocoa Research Conference.Vol:1, Kota Kinabalu, Sabah, Malaysia 9-14 October 2000.

In Nigeria, the pest status of *characoma stictigrapta* Hamps varied from minor to major, depending on time and location in the cocoa producing areas of the country. Currently, most small-holder cocoa farmers control this pest by routine spraying of pure emulsion of approved cocoa miridcides or a cocktail of the miridcides with Boardeau mixture, commencing from the early rains until farmers considered it safe to stop spraying against the black pod disease.

CRIDAN 0064

Recent observation on the source of inoculum for the spread of cacao black Pod disease in Nigeria. (En) Agbeniyi, S.O and Adenikinju, S.A (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 3 tabs., and refs. 13 International Cocoa Research Conference. Vol:1, Kota Kinabalu, Sabah, Malaysia 9-14 October 2000.

It has been observed that despite regular application of fungicides every rainy season coupled with regular farm sanitation-to achieve a lasting control of the cacao black pod disease in Nigeria there are still regular outbreaks of the disease every rainy season. Researchers have therefore continued to locate all the sources of inoculum responsible for these regular outbreaks of the disease.

CRIDAN 0065

Extraction of pulp from fresh cocoa beans for wine production; physico-chemical and sensory evaluation of the wine, and effect of pulp removal on the quality of cured cocoa beans. (En). Akinwale, T.O (Cocoa research Institute of Nigeria, Ibadan, Nigeria). . 13 International Cocoa Research Conference Vol 11,kota kinabalu, sabah, Malaysia, 9-14 oct,2000. pg 835.

Cocoa is a cash crop in Nigeria and most of the produce is exported hence subject to international market fluctuation. The potential of harnessing cocoa residues and by-products is very significant, since less than 10% of the fresh weight of the ripe fruit is used. The mucilage can attain up to 40% of the seed fresh weight depending on the variety, season, region as well as the pod ripene

CRIDAN 0066

Nutritional value of urea-treated cocoa husk in pullet growers' mash. (En) Olubamiwa, O (Cocoa research Institute of Nigeria, Ibadan, Nigeria).

(Encl. 3 tabs., and refs. 13 International Cocoa Research Conference. Vol:1, Kota Kinabalu, Sabah, Malaysia 9-14 October 2000

The utilization of cocoa husk meal (CHM; the dried, ground form of cocoa-pod husk) in poultry feeds has been consistently shown to be limited by its high fibre and low crude protein contents. Urea treatment has been identified as a cheap, effective means of improving fibre utilization and upgrading the crude protein content of fibrous, low-protein crop by-products. The present study was conducted to test the utilization of urea-treated CHM (UCHM) by the growing pullet, a poultry breed which has been neglected in CHM feeding trials.

CRIDAN 0067

Effect of bulk sweetener and vegetable fats in developing thermoresistant chocolate products for the tropics. In (En). Akinwale, T.O. and Aina, J.O. (Cocoa research Institute of Nigeria, Ibadan, Nigeria).). Encl. 6 tabs., and refs. 13 International Cocoa Research Conference. Vol:1, Kota Kinabalu, Sabah, Malaysia 9-14 October 2000.

Most of the brands of chocolates imported and sold in Nigerian readily melt at ambient tropical temperature (25-33°C). This has made the market of chocolates to be limited and unpopular. This problem also causes bloom formation, which is a major quality control problem in chocolate making. In order to tackle these problems, the use of bulk sweetener and some vegetable fat in developing tropical chocolate was investigated.

CRIDAN 0068

Practical Inclusion of cocoa bean shell in poultry feeds:
A preliminary report (En). Olubamiwa, O., Odewumi, W.O, Longe, O.G and Hamzat, R.A (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 3 tabs. and 17 refs. 13 International Cocoa Research Conference. Vol:1, Kota Kinabalu, Sabah, Malaysia 9-14 October 2000.

One of the ways towards the sustainability of the cocoa and chocolate industry is through economic waste/by-product (BP) management. This can be achieved by diverting the BPs into economically rewarding products such as livestock feeds. Whereas much has been achieved on the inclusion of cocoa husk and cocoa bean cake in livestock feeds, there is paucity of information in this regard on cocoa bean shell (CBS). CBS constitutes 10% of cocoa bean but to date remains a disposal problem in the cocoa processing factories in Nigeria

CRIDAN 0069

The Physico-Chemical and sensory evaluation of some non-conventional chocolate products for the tropics. (En). Akinwale, T.O. and Aina, J.O. (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 5 tabs., and 6 refs. 13 International Cocoa Research Conference. Vol:1, Kota Kinabalu, Sabah, Malaysia 9-14 October 2000.

Chocolates sold at present in Nigeria are primarily developed to suit the taste of consumer in the manufacturing countries. Hence Nigerians who eat chocolates are those who have acquired or are at least being exposed to the food habit of the western world. In order to improve the general eating habits of chocolate products particularly in Nigeria, the need to incorporate some other tropical crops like kolanuts, coffee and cashew meal into the recipe was studied.

CRIDAN 0070

Cocoa production and socio-economic problems. (En). Akinwale Ojo. (Cocoa research Institute of Nigeria, Ibadan, Nigeria). 13 International Cocoa Research Conference. Vol:1, Kota Kinabalu, Sabah, Malaysia 9-14 October 2000.

Cocoa is grown mainly by small holders in Nigeria, particularly in Ondo State, which accounts for about 60% of Nigeria's output. It is the principal source of income for millions of such farmers, their families and workers. It provides essential sources of earning for the people and benefits the economy of the state.

CRIDAN 0071

Sustainable cocoa production in Nigeria: Farmers perception of technology characteristics and socio-economic factors in adoption decision. (En). Oduwole, O.O (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 4 tabs., and 11 refs. In 13 International Cocoa Research Conference. Vol:1, Kota Kinabalu, Sabah, Malaysia 9-14 October 2000

As a contribution towards ensuring sustainable cocoa production in Nigeria, an assessment was made on the level of adoption of recommended dosage of fungicide to control black pod disease which is a major source of yield loss in cocoa. A total of 300 farmers in six major cocoa producing states of Nigeria were interviewed. Though 98% were using fungicides, only 13% were using the recommended dosage rates.

CRIDAN 0072

Evaluation of the formulated mixture of glyphosate and terbuthylazine in the control of weeds in mature cocoa plantation. (En). Adeyemi, A.A (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 2 tabs., and 11 refs. 13 International Cocoa Research Conference. Vol:1, Kota Kinabalu, Sabah, Malaysia 9-14 October 2000.

Formulated mixture of glyphosate (N(Phosphonomethyl) glycine) and terbuthylazine (2-tert-butylamino-4-chloro-6-ethylamino-s-triazine(folar 525 Sc) was evaluated for effective weed control in mature cocoa plantations for three years at owena in idanre local government of ondo state in the rainforest belt of Nigeria.

CRIDAN 0073

Comparative weed control studies in young cocoa plantation with formulated mixture of glyphosate and terbuthylazine and the conventional hand-slashing treatment. (En). Adeyemi, A.A. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 4 tabs., and 12 refs. 13 International Cocoa Research Conference. Vol:1, Kota Kinabalu, Sabah, Malaysia 9-14 October 2000.

The studies were carried out at Owena in idanre local government area of ondo state in the rainforest belt of Nigeria from 1998 to 1999 to determine the effectiveness of formulated mixture of glyphosate (N(Phosphonomethyl) glycine) and terbuthylazine (2-tert-butylamino-4-chloro-6-ethylamino-S-triazine) (folar 525 SC) in the control of weeds in young cocoa plantation as well as its selectivity on the set crop.

CRIDAN 0074

Effect of pre- budwood collection treatment on budding success iags., and in cacao (*Theobroma Cacao L*). (En). Badaru, K and Aikpokpodion, P.O (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 2 tabs., 2 diags., and refs. 13 International Cocoa Research Conference. Vol:1, Kota Kinabalu, Sabah, Malaysia 9-14 October 2000.

The inconsistencies in success of budding exercises pose a great problem in the rapid multiplication of desirable genotypes for germplasm, clonal plot and seed garden establishment in cacao (*theobroma cacao L.*). This study was carried out at Cocoa Research Institute of Nigeria, Ibadan to determine the effects of pre-budwood collection treatments of twig on bud take and spout.

CRIDAN 0075

Development of Soil Series Based Fertilizer Recommendation for the New Generation Cocoa Materials in Nigeria. (En). Obatolu, Charles R (Cocoa research Institute of Nigeria, Ibadan, Nigeria).. Encl. 4 tabs., and 10 refs. 13 International Cocoa Research Conference. Vol:1, Kota Kinabalu, Sabah, Malaysia 9-14 October 2000.

Cocoa a major revenue generating commodity in Nigeria has being experiencing in the commercial quantities in the country. However, another major reason for this decline is the unsuitability of the soils carrying cocoa, wrong and wasteful application of fertilizer recommendations.

CRIDAN 0076

Development of the Nigeria Cocoa Industry:Current Issues and Challenges for Research and Production. (En). Fasina, Ayoola B, Badaru kolawole andAikpokpodion Peter O. (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 15 refs., In 13 International Cocoa Research Conference. Vol:1, Kota Kinabalu, sabah, Malaysia 9-14 October 2000.

Cocoa was introduced into Nigeria in the late 19th century. Since then, the Nigeria cocoa industry has witnessed varying fortunes as occasioned by international market forces and Nigeria's domestic socio-economic and political issues. To date research efforts have made a lot of contributions to the development of the cocoa industry. These include development of various production technologies; breeding and selection for cultivars with high pod values, tolerance to and escape from pod rot disease, cocoa swollen shoot virus disease and establishment ability (drought tolerance).

CRIDAN 0077

Towards Cocoa Farmers' Participation in Varietal selection,In- situ Conservation and breeding for Better Adapted Genetic Resources,.Champion Tree: Strategies for the next decade in Nigeria. (En). Esan, E.B (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 2 tabs., and 15 refs. 13 International Cocoa Research Conference. Vol:1, Kota Kinabalu, sabah, Malaysia 9-14 October 2000.,

The genetic improvement of cocoa in Nigeria has been strictly the exclusive preseeves of Cocoa Research Institute of Nigeria. This has been done without farmers' direct participanton in the exercise. New faced with highly tortuous economic and harsher environment realities, cheaper approaches to getting the best

materials for different ecological occasions and the shaving of costs with the farmers and organization, is worth the exercise.

CRIDAN 0078

Adegbola, M.K.O. Determination of the most suitable frequency and time of fungicides sprayings Schedule for adoption in the control of *Phytophthora* black pod (Pod rot) disease of cacao (*Theobroma Cacao, L*). (En). Adegbola, M.K.O. (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 2 tabs., 3 digs. And 6 refs. 11th International Cocoa Research Conference. Yamoussoukro Cote D'Ivoire 18-24/07/1993digs.

Trial were set up in the different ecological zones of cocoa growing areas of Nigeria to determined the effect of the frequency and time of spray applications of fungicides in the control of the phytophthora black pod (pod rot) disease. The experimental design was on a split plot basis involving three fungicides spraying application schedules at once a week, once in two weeks and once in three weeks treatments. Three copper- based fungicides including perenox (i.e. cuprous oxide), B.B.S. procida (stabilized form of Bordeaux mixture) and normal Bordeaux (Lime and copper sulphate at 10:10:100) were used in the experiment which was replicated three times.

CRIDAN 0079

The effect of basamid granular (Dazomet) on nematodea parastic on cacao seedlings in the nursery. (En). Afolami, Olaolu S. (Encl. 4 tabs., and 20 refs. 11th International Cocoa Research Conference. Yamoussoukro Cote D'Ivoire 18-24/ 07/ 1993.

Basamid-granular (Dazomet). was applied at the rate of 0, 2 and 4 per nursery bag of 2 litres capacity at and ½ and 1/4 depth placement . Nematode essay was done prior to nematicides application, at the time of planting, and at the end of the experiment. *Theobroma cacao L.* seeds were planted at the rate of one seed per bag, three weeks after nematicide application and the seedlings were maintained in the nursery for 26 weeks under normal agronomic practices.

CRIDAN 0080

Nursery to field contaminants: the case of nematodes andcCocoa seedlings in Nigeria. (En). Afolami, Olaolu S. (Department of crop production and

crop protection, University of Agriculture, P.M.B 2240, Abeokuta, Nigeria). . In 11th International Cocoa Research Conference. Yamoussoukro Cote D'Ivoire 18-24/07/1993. p 241

Cocoa seedlings in twenty of the 42 nurseries owned by the Ogun State Government in Nigeria were sampled for plant-parasitic nematodes over a three-year period. Sampled seedlings were tagged for follow-up data on seedling growth as revealed by plant height and girth. In the case of one nursery, tagged plants were monitored all the way to the purchasing farmer's field for establishment ability and subsequent plant vigour and seedling survival.

CRIDAN 0081

The effect of gravemorphism on the efficiency of seed-pod Production in cacao seed orchards. (En). Esan, E.B. (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 4 tabs., 6 diags. And 50 refs. 11th International Cocoa Research Conference. Yamoussoukro Cote D'Ivoire 18-24/07/1993. p 637

Cacao hand pollinators in Nigeria, like their counterparts in other cocoa countries of the world, normally pollinate flowers indiscriminately without conscious regard to the possible locational and environmental effect of the flower with respect to light, temperature, gravity, impact of water droplet and run-offs, various micro-organism activities to mention a few.

CRIDAN 0082

Observations on chupons as a tool for cacao rehabilitation. (En). Adenikinju, S.A (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl 6 tabs., 2 diags., and 9 refs. 11th International Cocoa Research Conference. Yamoussoukro Cote D'Ivoire 18-24/07/1993. p 769.

The objectives of the field experiments were to study the growth of cacao chupons and to find out the best time of the year to coppice unproductive cacao trees to produce the most vigorous chupons for rehabilitation. For this purpose two experiments were located in the North Block of the Main Station of the Cacao Research Institute of Nigeria (CRIN). Unproductive F3 Amazon cacao trees established in 1964 were used. Basal chupons were considered to be better materials for replacing unproductive cacao chupons because of their closeness to the soil water and nutrients and due to better anchorage to the cacao stump.

CRIDAN 0083

Economic feasibility for potash production from cacao-pod husk in Nigeria. (En). Oduwole, O.O. and Arueya, G.L. (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 5 tabs., 18 refs. 11th International Cocoa Research Conference. Yamoussoukro Cote D'Ivoire 18-24/07/1993 p 781.

This paper therefore examines, Nigerians potentials in potash production from cocoa-pod husk, a waste product of cocoa (*Theobroma cacao*) that is presently under-utilized. The efficient method of extraction involving crystallisation to obtain a high quality potash is discussed while the economic feasibility of a small scale processing is also examined.

CRIDAN 0084

Use of cocoa-pod husk in poultry feeds: A particular reference to the Nigerian situation (En). Sobamiwa Olayiwola (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 3 tabs., 1 diags., and 14 refs. 11th International Cocoa Research Conference. Yamoussoukro Cote D'Ivoire 18-24/07/1993. p

Cocoa pod husk (CPU) has been proven in series of our experiments, to be optimally suitable at 10% level in poultry (broiler) diets biologically and economically. The high fibre content – notably its components of lignin and pectin – limits the utilization. The toxicity of theobromine (an alkaloid component of cocoa bean) is ruled out with CPH since in the majority of our trials less than 1% total bird mortality was recorded.

CRIDAN 0085

Integrated pests management: Advances in conventional methods. Current outlook of black pod epidemics in Nigeria. (En). Agbeniyi, S.O and Adedeji, A.R). Encl. 2 tabs., and 4 refs. Proceedings of INCOPEP 4TH international Seminar On Cocoa Pests and Diseases. 19-21st October, 2003, Accra, Ghana. ISBN 9988-0-2550-5 : p 16

Studies were conducted on the progress of the black pod epidemics on F3 Amazon cocoa in Nigeria from June to October, 2001. Results from the study indicated that initiation of pod rot disease generally begin at the distal end of the cocoa pod. Similarly, the site of early infection on mature green pods followed the order distal infection > lateral infection > proximal infection.

CRIDAN 0086

The search for phytophthora pod rot resistance and escape at the cocoa Research Institute of Nigeria during the 1960s. (En) Toxopeus, H. Encl. 4 tabs., 2 diags., and 18 refs. proceedings of the International Workshop on the Contribution of disease resistance to cocoa variety improvement. 24th-26th November, 1996. Salvador, Bahia, Brazil :. P(159).

The research effort towards economic control of phytophthora pod rot (Ppr) disease carried out in the 1960s at Cocoa Research Institute of Nigeria CRIN consisted of, apart from efforts at chemical control, an intensive search for genotypes resisting and/or escaping the disease in the field. From among 152 clones carefully observed for natural infection for 3-6 years, 19 were identified as possibly resistant.

CRIDAN 0087

A review of breeding work on disease resistance of cocoa in Nigeria. (En). Badaru, K. Esan, E.B. and Williams, J.A (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 50 refs. proceedings of the International workshop on the contribution of disease resistance to cocoa variety improvement 24th -26th November, 1996. Salvador, Bahia, Brazil. P(167).

Although breeding activities on cacao started in Nigeria in 1912, deliberate genetic manipulation of the crop started in 1931 while breeding for disease resistance was not embarked on until about 27 years later. Since then, disease resistance has featured as an integral part of all the cocoa breeding programme phases to date.

CRIDAN 0088

Towards commercial production of by-products and non-conventional products from cocoa wastes and beans. (En) Adomako, D. Encl. 4 tabs., 2 diags., and 32 refs. Proceedings of the Malaysian International Cocoa Conference. Kuala Lumpur, 1994.

Increased world production of cocoa over the past ten years has resulted in a reduction in the world market price although consumption increased slightly over the same period. Attempts to improve the price by the International cocoa agreement mechanism failed. A strategy adapted to save the industry in producing countries from decline is to diversify the uses of cocoa. Another strategy is to increase consumption worldwide.

CRIDAN 0089

Effective management of cocoa farms in Nigeria for profitability. (En) Adeyemi, A.A. (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 3 tables, 1 dig., and 43 refs. cocoa growers' bulletin No.52, November 2000. Encl. 3 tables, 1 dig and 43 refs. ISSN 0045-7256 p(21-32)

Cocoa (*Theobroma cacao*) has very high yield potential. Yield as high as 200 pods per tree per annum has been recorded from some F3 Amazon selections in Nigeria (Atanda, 1971; Jacob and Olaniran, 1971). This figure, using Are et.al. (1971) conversion ratio of 24 pods to 1 kg dry beans gives about 8 tonnes per hectare of dry beans. In Ghana, Glendinning (1962) also investigating the yield of cocoa reported that a dry bean yield up to about 3.3 tonnes per hectare was realized from some Trinidad introductions. In spite of this good characteristics of cocoa even when the soil is suitable.

CRIDAN 0090

Utilization of alkali-treated cocoa husk in broiler finisher diets. (En). Sobamiwa, O, and Longe, O.G. (Cocoa research Institute of Nigeria, Ibadan, Nigeria).

The effects of dietary inclusion of alkali-treated cocoa husk (ACH) on growth performance, nutrient retention and economics of production of broiler chickens were investigated. It was concluded that

CRIDAN 0091

Partial replacement of maize with cocoa husk meals in layers mash: An on farm experience. (En) Sobamiwa, O. and Akinwale, T.O. (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 2 tables and 11 refs. Proceedings of the 2nd Annual Conference on, livestock products: creating demand in a depressed economy. Lagos, Nigeria, September 16-17, 1997. Encl. 2 tables and 11 refs.

The partial replacement value of cocoa husk meals for maize in laying hen diets were assessed under an on-farm condition. Urea – treated and untreated cocoa husk meals were each incorporated into the farmer's layer mash (FIM) to replace 25% of the maize portion. FIM contained 40% maize. Six groups of 15 laying hens which were in the fifth month of lay were randomly allotted to the 3 dietary treatments including the control (FIM), cocoa husk-based mash (CHM) and urea-treated cocoa husk-based mash (UCHM).

CRIDAN 0092

cocoa and its origin: In a handbook on cocoa marketing, (En). Ogundijo, Encl.1 tabs., and 1diag. A published and printed by Alafas Nigeria Company 2, Ogundipe bye pass off liberty stadium road, Ibadan. Published 1998. ISBN 978-33651 –3 – 4 :p 1-6.

The scientific name of the cocoa tree is theobroma cacao. “cacao” is the name of the plant, while the fruit is called cocoa, it is a source of income and livelihood to the growers, processors and traders engaged in cocoa marketing. Cocoa is used to manufacture chocolate, cocoa bread, butter, creams, cocoa wine and different types of cocoa beverages such as milo, pronto, vitalo, ovaltine, bournvita etc

CRIDAN 0093

Cocoa marketing: a handbook on Cocoa Marketing, (En). Ogundijo, A Published and Printed by alafas Nigeria Company 2, Ogundipe bye Pass off Liberty Stadium Road, Ibadan. Published 1998. :p 7-25..

Cocoa marketing has been transformed and undergone a lot changes. First, from a free enterprise system (primary expartiate firms) to a statutory marketing complex under which the cocoa marketing board had been given exclusive authority to purchase cocoa for export to the “ all comers” market which cocoa trade has turned to since 1986 when the Nigerian Cocoa Board was scrapped.

CRIDAN 0094

Cocoa quality determination: (En). Ogundijo, A a handbook on cocoa marketing ,published and printed by Alafas Nigeria Company 2, Ogundipe bye pass off Liberty Stadium Road, Ibadan. published 1998. Encl. 3 tables and 1 figure.

Authorities within Nigeria have been striving to improve the quality of cocoa, so that it will command World respect and return the highest possible prices in widely distributed export markets. As early as 1889 an ordinance prohibiting adulteration of produce had been enacted for the protectorate of Lagos, its jurisdiction did not extend to the hinterlands and there were no trained personnel to enforce the ordinance.

CRIDAN 0095

Problems of cocoa marketing: (En). Ogundijo, A. handbook on Cocoa Liberty Stadium Road, Ibadan. Published 1998.

Problems of Cocoa Marketing are numerous. Some are hidden while others manifest themselves. However, none of the problems is insurmountable, like the old saying "Every problem has its own solution. Most of the perceived problems are enumerated.

CRIDAN 0096

Economic uses of cocoa: (En). Ogundijo, A. handbook on cocoa marketing, published and printed by Alafas Nigeria Company 2, Ogundipe bye pass off Liberty Stadium Road, Ibadan published 1998.5 tables and 1 figure.

Cocoa dictates pace of Economic activity in the former Western States now Ogun, Oyo, Osun, Ekiti and Ondo States. The Cocoa arc of Nigeria". Cocoa supported and still supports miscellaneous categories of workers such as farmers, panbuyers, storekeepers, License Buying Agents, Cocoa Exporters, Government Workers, transporters and factory workers in Cocoa processing Industries.

CRIDAN 0097

CRIN and the Cocoa revolution: Special report . In quaterly review (En). (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 6 digs and 1 tables. October-December 1998, pg 50-54.

CRIDAN 0098

CRIN, the Institution. In quaterly Review, (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 14 digs. October-December ,1998, p. 55-60.

CRIDAN 0099

Organisation of agricultural research in Nigeria" (Cocoa Research Institute of Nigeria as an example. (En). Obatolu, C.R . (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 3 refs. : Coffee Research Foundation Ruiru, Kenya, Dec. 22, 1994

The paper reviews the history of agricultural research in Nigeria from the pre- independence era when research organization was externally done, to present day. Research especially agricultural research in Nigeria is centralized (under the federal ministries) and funded by federal government. Each research institute has a federal mandate for a group of crops cover different ecological zones of the country. But centrally coordinated at the headquarters of each institute. The extension research liaison services division in some cases together with the Natural Agricultural extension research liaison services institute pass down research information to farmers and relate farmers problem to the research team.

CRIDAN 0100

Cocoa- pod husk in broiler diets. negligible mortality confirms absence of theobromine toxicity. (En). Sobamiwa, O. (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 14 tabs., and 5 refs. Livestock Newsletter Vol.5 .(1) 1994.

A problem that has often been encountered with feeding cocoa by-products to livestock is the toxicity of theobromine- a prominent alkaloid in cocoa bean meal (CBM), cocoa bean shell (CBS), but which occurs only in traces in cocoa-pod husk (CPH) Mortality rate and feed intake, two important factors in theobromine toxicity, were monitored in a series of broiler feeding trials involving dietary inclusion of CPH. The toxic effects of theobromine activity can be ruled out of cocoa husk based diets which is highly related to the negligible amount of theobromine in the husk.

CRIDAN 0101

Pollen studies in some selected accessions of *Kola nitida* (Vent) Schott and endl.(En). Akinwale, S.A.K. & Others (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 2 refs. Plant cell. incompatibility Newsletter No. 26, 1994..

Pollen studies were carried out on eight selected accessions of *ola nitida* staminate and hermaphroditic flowers of the accessions of this species were studied separately. Variations were observed in pollen sizes and shapes within each genotype and there was not any difference in the pattern of variation in pollen from the two types of flowers.

CRIDAN 0102

Effect of soil micronutrient status on the fermentation characteristics and organoleptic quality of Nigeria tea. (En). Ogunmoyela, O.A. (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 6 tables and 12 refs. African Crop Science Journal Vol. 2, No. 1, pp. 87-92, 1994.

The status of micronutrients (Cu^{2+} , Zn^{2+} , Fe^{2+} and Mn^{2+}) in soils and foliage of three commercial tea clones 68, 143 and 35 collected from the Ardo-Gore tea estates of the Mambilla plateau in Gongola state of Nigeria was evaluated. Leaf samples were also batch-processed and examined for fermentation characteristics including average fermentation time and organoleptic cup quality and analytical quality indices, namely total phenol and tannin. Result showed that while Cu and Mn contents are adequate, Fe and Zn are marginal.

CRIDAN 0103

Evaluation of tea clones at nursery and early field establishment stages. (En). Okelana, M.A.O. & Esan, E.B. (Cocoa research Institute of Nigeria, Ibadan, Nigeria). (Encl. 6 tabs., and 11 refs. Café Cocoa The. Vol. xxxviii, (1) 1994.

In Nigeria (Mambilla plateau, Taraba state) twenty clones of tea plant, *Camellia sinensis* L, were raised from single-leaf cuttings and assessed for sprouting and survival throughout the nursery stage. Morphological characteristics just before transplanting to the field were also recorded of the lot of clones, the twelve most outstanding, based on the nursery performance, were further evaluated on the field. The clones exhibited remarkable differences in sprouting and survival abilities. There were marked differences in levels and patterns of green leaf yield realized after a standard pruning of the stands to facilitate early establishment of the plucking table.

CRIDAN 0104

Effects of intercropping on potential yield of cacao in south western Nigeria. (En). Adenikinju, S.A. & Egbe, N.E (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 1 tabs., 3 diags. And 14 refs. Café Cacao The. Vol. xxxiv, No. 4 Oct-Dec. 1990.

Cultivation of cacao by peasant farmers in south western Nigeria along with other tree crops presents a good example of traditional multiple cropping system (a kind of agroforestry). Cacao being a shade tolerant plant, is grown in combination with other tree crops such as oil palm, citrus, kola and plantain or more commonly

along with food crops like cassava and cocoyams. These crops among other provide some shade, help suppress weed growth, supplement income at the early stages of establishment (Adenikinju et al, 1989; Adegeye, 1985 and Oladokun, 1988).

CRIDAN 0105

(Short communication) Determination of some physico-chemical properties of a traditional soap made from cocoa pod husk. (En). Arueya, G.L.). . (Cocoa research Institute of Nigeria, Ibadan, Nigeria) Encl. 5 tabs., and 8 refs. Nig. Journal Tech. Res. (1990) 2, pp. 99- 101.

Traditional (native) soap from cocoa pod husk is an important laundry soap in southwestern Nigeria where large cocoa plantations abound. However, its use is not popular among city dwellers owing in part to the colour, odour and poor appearance. Investigations conducted into the entire spectrum of the local technology of soap making indicated that the underlying reasons are physicochemical-fatty matter 73.11%, total free alkali 0.56%, total free fat 2.4% and 7.8% of matter in water. Consequently improvements in the areas of husk asbing, filtration aids and heating during saponification amongst others are discussed.

CRIDAN 0106

(Note techniques) an economic analysis of soap production from cocoa pod husk. (En). Oduwole, O.O. & Arueya, G.L (Cocoa research Institute of Nigeria, Ibadan, Nigeria) Encl. 5 tables and 8 refs. Café Cacao the. Vol.xxxiv, No. 3, July-Sept. 1990.

Within the last decade, about 12.36million tonnes of fresh cocoa pod husk were allowed to waste in Nigeria (table1). The cocoa pod husks (CPH) were generally left by farmers in heaps near the farm. It is feared that the cocoa waste might serve as a reservoir for the fungus *Phytophthora palmivora*, the causal agent of the black pod disease of cocoa (Okaisabor, 1965, Egunjobi, 1977). It is therefore better to remove these waste and put them into better uses such as soap production.

CRIDAN 0107

Changes in inorganic composition of cocoa cotyledons during germination under different nursery shade condition. (En). Ogunmoyela, O.A. & Esan, E.B. (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 5 tables, and 17 refs.

Turrialba Vol. 40, No.4, 1990. pp. 509- 514.

The dynamics of inorganic constituents of three cocoa (*Theobroma cacao*L.) seed cultivars during germination under eight different nursery shade materials was investigated. Variations were observed in the environments provided by each of these shade materials which appeared to affect the metabolism of these constituents with elephant grass (*pennisetum purpureum*) shade providing the most comparable conditions to oil palm frond shade. Statistical differences among cocoa seed cultivars in the residual contents of all the inorganic constituents in the abscised cotyledons were significant, while shade effects were also significant but only for the micronutrient constituents.

CRIDAN 0108

Inhibition of listeria monocytogenes by cocoa in a broth medium and neutrization of this effect by casein. (En). Laura, J. Rearson & Elmer, H. Marth. (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 21 diags. and 41 refs. Journal of Food Protection. Vol. 53, Jan. 1990.

Dutch- processed cocoa (0.75 to 10.0%, w/v), when added to a broth medium, inhibited/ inactivated *Listeria monocytogenes* strain V7. With agitated incubation at 30⁰C, samples with 5.0, 7.5, and 10.0% cocoa were free of detectable viable cells (<1/ml) 15 to 24 h after inoculation to contain ca. 1 x 10⁰ L. monocytogenes strain V7/ml. Without agitation at 30⁰C, presence of 0.75 to 10.0% cocoa lengthened (1.02 to 1.12h) the generation time of the pathogen when compared to samples without cocoa (0.94 h).

CRIDAN 0109

Allopollen exchange in cashew (*Anacardium occidentale* L). (En). Akinwale, S.A (Co coa Research Institute of Nigeria, Ibadan, Nigeria).. Encl. 1 table.

Studies on method of pollen exchange in cashew (*Anacardium occidentale* L) was carried out on selected accessions of cashew. Results revealed that there was no fruit set in all the bagged panicles even when pollinators were introduced. The study revealed the outcrossing nature of cashew (allopollen exchange)

thus explaining the high level of variation and variability within the species.

CRIDAN 0110

Effective intercropping systems for young cocoa. (En). Adeyemi, A.A. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 7 tables, 4diags., and 18 refs. Trop. Sci. Vol. 3 pg. 1-10, 1999.

In order to maximize land use, the effects of intercropping young cocoa with some popular arable crops were studied. The systems evaluated were cocoa/yam/maize/cowpea, cocoa/cassava/maize melon and cocoa/cocoayam/okra/melon. Growth performance in terms of height, girth, leaf numbers and leaf area of cocoa in the various mixtures was either superior or comparable to that of cocoa alone.

CRIDAN 0111

Calabar's war over cocoa. (En). Chukwumba, Obiora. Tell. Mag., Nov., 15, 1999. Encl. 2 digs.

The first memo underlining the fury and feud currently eating into the cocoa market and public peace in Cross River State was signed and despatched by the deputy governor, John Okpa, August 3, to the State branch of the Cocoa Association of Nigeria (CAN). The Association, a platform for cocoa farmers, merchants, processors and exporters, was by that memo, summoned to meet with the deputy governor the following morning in Calabar, over which issue the memo did not disclose.

CRIDAN 0112

A sensitive and selective method for the quantitative determination of fatty acid tryptamides as shell indicators in cocoa products. (En). Michael Munch, Peter Schieberle. Encl. 9 tables, 8diags, and 12 refs. Z. Lebensm Untersforsch A, 208: pp. 36-46, 1999.

Tetracosanoyl-2-(3-indolyl)ethane amide (lignocerinic acid tryptamide;LAT) and docosanoyl-2-(3-indolyl)ethane amide (behenic acid tryptamide;BAT) were identified as the most prominent tryptamides in cocoa shells based on electrospray ionisation mass spectrometry and ¹H NMR measurements. The structure of LAT, which is reported for the first time in cocoa shells, and also that of BAT were confirmed by synthesis.

CRIDAN 0113

Performance and nutrient utilization of growing rabbit fed urea treated and untreated cocoa pod husks based diets. (En). Oduguwa, O.O., Sobamiwa, O., Sani, D., & Akintunde A.Y. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 2 tables. 12th Inter.Cocoa Res. Conf. Pp. 1055-1058, 1999..

Rabbits (*Oryctolagus cruniculus*) are pseudo-ruminants which have enlarged caeca that harbour microbes. Urea treatment of a high fibre feed stuff like Cocoa pod husk (CPH) for this species of animals may have the advantage of increasing the population and activities of caecal microbes thereby causing a reduction in the content of lignin, hemicellulose and other indigestible polysaccharides, with the resultant enhancement of digestibility.

CRIDAN 0114

Comparative Utilization of Alkali-treated and untreated Cocoa bean in diets of egg-type chickens. (En). Odunsi, A.A, Sobamiwa, O., & Longe, O.G. . Encl. 2 tables, and 14 refs. *trop. J. Anim. Sci.* 2(1): 63-68 (1999). ISSN: 1119-4308.

Fifty, 32 weeks old commercial layers were allocated to 5 groups and fed ad libitum on diet comprising a basal control (without cocoa bean cake) and those based on 10 and 20% untreated cocoa bean cake (UCBC), and 20% alkali-treated cocoa bean cake (ACBC). Experimental duration was 12 weeks. Cocoa-pod ash solution was used as alkali source. Results showed that egg production and feed intake were higher ($p < 0.05$) for control than other dietary treatments.

CRIDAN 0115

Effect of different energy levels of cocoa husk based diets on productive performance of Japanese quails. (En). Olubamiwa, O. Haruna, E.S. etc (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 2 tables, and 13 refs. *Nig. Journ. of Animal prod.* 26: pp.88-92, 1999.

Cocoa husk-based diets were used to assess the effect of different energy levels on the growth performance, economics of production and dressing percentage of Japanese quail (*Coturnix coturnix japonica*) in South Western Nigeria. The assessment period was at 4 to 7 weeks of age. Four isonitrogenous (22% crude protein) diets incorporating graded levels (0, 3.5, 7.0 and 14%) of cocoa husk meal

(CHM) as replacement for maize, were used in the trial which involved 360, 3-week-old quail chicks.

CRIDAN 0116

Evaluation of the optimal biological and economic level of cocoa husk inclusion in production diets for broiler starter. (En). Olubamiwa, O., & Longe, O.G. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 2 tables, and 12 refs. Appl. trop. agric. Vol.2, 149-153, 1999.

Growth response, nutrient utilization composition and calculated gross revenue of broiler chicks during a 3-week feeding experiment were used to evaluate the optimal level of cocoa husk (CH) in broiler starter diets. Seven isonitrogenous diets including the control (mash) diet were used in the trial. The test diets were prepared as mash, crumbled pellets and 2.5% palm-oil supplemented mash, each containing 10 or 15% cocoa husk (CH).

CRIDAN 0117

Replacement value of cocoa husk meal for maize in diets of growing pullets. (En). Olubamiwa, O. & Akinwale, T.O. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 3 tables. J. Anim. Sci. (1) 111-116, 1999.

The effects of incorporating cocoa husk meal (CHM) at the expense of maize in isonitrogenous diets of growing pullets were investigated. The feeding trial lasted 16 weeks and involved 108 10-week-old Nera pullets. They were reared to 20 weeks of age on the control diets (CD) and 100, 150 and 200 g/kg CHM diets (CHMDs) in which CHM replaced maize. From 21 to 26 weeks of age all birds were raised on a common 18% corn-soyabean meal layers mash.

CRIDAN 0118

Comparative effects of three different organic fertilizers on the growth, nutrient uptake and incidences of insect pest infestation of coffee canephora (Pierre ex Fro ehner) on an alfisol in Ibadan- south Western Nigeria. (En). Obatolu, C.R. & Ojelade, K.T.M. . (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 4 tables and 8 refs. Bioscience Research Communications. Oct. 28, 1999.

In Nigeria, like in most Coffee producing countries, the use of inorganic fertilizers is at a very low ebb, because of the cost and logistics of procurement and because of the quest to produce

chemically unpolluted coffee. There was linear growth in height, girth as well as more leaf production of seedlings in soils that received the organic fertilizers. The coffee seedlings that received Chromoleana odorata and Cowdung performed better than those that received pennisetum purpureum.

CRIDAN 0119

Effect of curing and pre-storage dip treatments on the control of storage mould of kolanuts. (En). Agbeniyi, S.O. & Fawole. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 3 tables, and 18 refs. Z Lebensm Unters Forsh A: 208: 47-49, 1999.

The effect of curing kola nuts at 0°C was evaluated at the Cocoa Research Institute of Nigeria, Ibadan, to determine the effect of curing on storage rot. For nuts inoculated 24 h prior to curing, 48-2h curing at 30°C gave optimal disease control. The incidence of rot was higher when the treatment was decayed for 48h after inoculation.

CRIDAN 0120

Effect of plant growth regulation on callus growth of cola nitida. (Malvales: Sterculiaceae). (En). Obembe, O.O., Adebona & Esan E.B. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 12 diags., and 17 refs. Bio-science Res. Communication, Vol. 11, No. 1. March 31, 1999.

The effects of plant growth regulators, naphthl-1-acetic acid (NAA) and 6-benzyl-1-aminopurine (BAP) on callus growth of leaf discs and nodal sections from Cola nitida (Schott and Endlicher) were investigated. The auxin concentrations used for the leaf explants were 1.0, 3.0, 5.0 and 7.0 mg/l NAA, while for the nodal explants, the concentrations employed were 0.5, 1.0, 1.5 and 2.0 mg/l NAA.

CRIDAN 0121

Correction of magnesium deficiency in tea plants through foliar applications. (En). Obatolu, C.R. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria) Encl. 1 table, 3 diags, and 10 refs. communication soil sci. plant. anal. 30 (11&12), 1649-1655, pg. 1999.

Magnesium (Mg) deficiency observed in tea estates of the Nigerian Beverage Production Company on the Mambilla Plateau of Nigeria resulted in a loss of about @% of tea estate including nursery crops

and over 40% reduction in quality of made tea. A trial foliar applications of 0, 5, 10, 20, and 30% of magnesium

conducted on the Mambilla Plateau early in 1989 when frost occurred. Tea plants near the valley areas were found to be the most affected, while matured tea bushes survived frost better than young newly planted tea bushes.

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CRIDAN 0123

Effect of coconut (COCOS NUCIFERA) fabric pot on the growth performance of cocoa (Theobroma cacao) seedlings in the Nursery. (En). Adeyemi, A.A (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 7 tables, and 26 refs. Nig. Journal of Botany. Vol. 11, 35-43, 1998.

Investigations were carried out at the cocoa Research Institute of Nigeria, (7°25'N and 3°52'E) to evaluate the effects of coconut (Cocos nucifera L.) fabric pot in raising cocoa (Theobroma cacao L.) seedlings in the nursery. The attributes of coconut fabric pots and the performance of cocoa seedlings sown in them were assessed and compared with those of black polythene pots. There was significantly higher reduction in the inputs such as top soil, water and land space required when fabric pot (18.75cm high and 6.25/8.75cm diameter) was used than when the normal polythene pot of size 30x12.5cm was used.

CRIDAN 0124

Genetics and Production of Cacao and Cashew in Nigeria: Needs and Potentials for the twenty first century. (En). Esan, E.B. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 2 tables, and 17 refs. Genetics and food security in Nigeria. 1998. p 132- 136.

The main cocoa varieties in Nigeria are the Amelonado (a forestero), Trinitario, a natural hybrid between the criollo and the forestero and the Amazonas. The most successful has been the Amelonado. The west African Amelonado shows a remarkable genetic uniformity. It is obvious that the future of the cocoa industry in Nigeria is bright. Cashew will be best described as the "current and future champion crop" the cashew plant has no agro-ecological limitations or constraints as it is for cocoa, cashew consequently is the only CRIN mandate crop that can be cultivated any where in the country, from the coast to the Sahel savanna. The goal in the overall improvement of cashew should focus at the selection of varieties having high economic worth.

CRIDAN 0125

Performance and egg quality of hens fed cocoa husk based diets. (En).
Sobamiwa, O. Encl. 2 tabs., and 16 refs.
Nig. Journ. Of Animal Production Vol: 25 (1), 1998. p 22-24.

Lowman brown hens, 37-week-old, were used to study the effect of dietary inclusion of 10 and 20% cocoa husk meal (c h m) at the expense of maize on hen performance and egg quality. The trial was conducted for 10 weeks. Egg production (EP), egg weight (EW), eggmass (EM), feed consumption (Fc0, and feed efficiency (FE) were criteria of comparison. Others were feed cost/kg egg, shell weight, percentage shell and yolk colour index.

CRIDAN 0126

Numerical analysis of variations in leaf morphometric characteristics of tea clones (*Camellia sinensis* (L) O. KUNTZE in Nigeria. (En). Esan, E.B., Aikpokpodion, O.P. & Obatolu, C.R. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 7 tabs., 4 diags, and 17 refs. Nigeria Journal of tree crop Res. Vol.2, No.1, 1998.

Numerical analysis of leaf characters were carried out on 29 cultivars of (*Camellia sinensis* L.) O. Kuntze germplasm in Nigeria. Seventeen leaf characters were examined. These included the lengths of midrib, petiole, serrated margins, the maximum breadth and number of serrations. The analysis revealed that the characters most useful for discrimination were the leaf size, extent of serration and the entire margin above serrated margin. Eight definable groups were established and their characteristics presented .

CRIDAN 0127

Characteristics of earth worm casts under SIAM weed and tree crops. (En). Obatolu, C.R., Esan, E.B. & Idowu, T. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 2 tabs., and 7 refs. appl. trop. agric. Vol.3, No 1, 31-33, 1998. Encl. 2 tabs., and 7 refs.

The properties of earthworm casts under siam weed, plantain crop and tree crops (oil palm, cocoa, kola coffee and cashew) were compared. earthworm casts. Siam weed and cocoa trees produced casts with the highest chemical status.

CRIDAN 0128

Micropropagation of cocoa theobroma cacao L.) (En). Esan, E.B. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 3 tabs., 9 diags., and 48 refs. biotechnology in agriculture and forestry. Vol. 18, 1992. Encl. 3 tabs., 9 diags., and 48 refs.

Cocoa has long been an important tree crop because of its various products, particularly those obtained from its seed, commonly referred to as the bean, and from other fruit parts which were long regarded as waste. The Plant was cultivated for at least 3000 years by the Aztecs before it was discovered by Hernandez Cortez in 1519 (Gill and Duffus Group 1987).

CRIDAN 0129

Status of in-vitro regeneration of tropical plantation crops. (En). Esan, E.B. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria) Encl. 70 refs. International Institute of Tropical Agriculture (IITA) 1992.

This paper summarizes the major achievements through the application of plant tissue culture. Particularly rapid clonal propagation (micropropagation). In five economically important, tropical plantation crops-cocoa, oil palm, coconut, cashew, and tea.

CRIDAN 0130

The manifestation, adaptive value and prevalence of pre-bloom water stress among the EUCOFFEA. (En). Williams, J.A. & Olatoye, S.T. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 5 tables, 4 diags., and 14 refs. Nigerian Journal of Botany. Vol. 5, pp. 125-134, 1992.

The results of a 20-year study of flowering in Coffea canephora in two ecologically distinct locations within Nigeria are reported. The main features of flowering at both locations such as requirement of moisture to trigger flowering after a dry spell, a pluviometric threshold for causing flowering are in broad agreement with existing literature on the subject.

CRIDAN 0131

Effects of some selected herbicides on weed control and growth performances of cocoa (Theobroma cacao L.) seedling in the early years of establishment. (En). Adeyemi, A.A. (Cocoa Research Institute of

Nigeria, Ibadan, Nigeria). Encl. 5 tables, and 5 refs. In: Nig. Journal of Weed Science. Vol. 6, 1993. pp. 37-41.

CRIDAN 0132

The nutritive value of alkali treated cocoa husk meal in broiler chicks diets.(En). Sobamiwa, O. & Longe, O.G. (Cocoa research Institute of Nigeria, Ibadan, Nigeria).Encl. 5 tabs., and 15 refs. Animal feed Science and Technology. Vol. 46, pp 321-330, 1994.

CRIDAN 0133

Changes in fatty-acid composition and stearoyl-acyl, carrier protein desaturase expression in developing (*Theobroma cacao* L.) embryos.(En) Vaishalini, K.P. & Others. Encl. 7 figs., and 28 refs. Planta Vol. 193, pp. 83-88, 1994.

CRIDAN 0134

Practical Inclusion of Cocoa Bean shell in poultry feeds: (En). Olubamiwa, O., Odewumi, W.O., Longe, O.G., and Hamzat,R.A. (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 3 tabs.,and 17 refs. 13th International cocoa Research Conference. Shangri-la's, Tanjung Aru Resort Hotel Kota Kinabalu, Sabah Malaysia, 9 –14 October 2000..

CRIDAN 0135

Replacement Value of Kolanut Husk Meal for Maize in Rabbit Diets. (En) Babatunde, B.B., Hamzat, R.A, and Adejinmi, O.O. (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 3 tabs., and 15 refs Trop. J. Anim. Sci. 4 (2): 127 – 133 (2001), ISSN: 1119-4308.

CRIDAN 0136

Performance characteristics of broiler finishers-fed kola (*Cola Nitida*) ventenat (Schott Et. Endl) Pod husk- based diets. (En). Hamzat, R.A. and Babatunde, B.B. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 3 tables, and 28 refs. Moor Journal of Agricultural Research 2: 153-158, 2001.

Ninety-six 4- -week-old Anak 2000, broiler chicks were used to

Determined the effect of feeding kola pod husk (kph)-based diet on metabolized energy, crude fibre digestibility and mortality of finisher broilers. It was concluded that KPH could be included in broiler finisher diet up to 20% level without significant reduction in the performance of broilers determined

CRIDAN 0137

Utilization and evaluation of fresh kola testa in feeding giant land snail (*Archatina archatina*) under kola plantation. (En). Hamzat, R.A., Sanusi, R.A. and Olubamiwa, O (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). First Biennial Conference of the Nigerian Society for Experimental Biology Ilorin, Nigeria September 6-9, 2000.

Seven- five grower giant land snails were used to study the evaluation of fresh kola testa in growing snail diets in which snails used for the experiment were randomly allotted to five dietary treatments A(100% fresh water leaf). 80% FWL + 20% fresh kola testa [FKT), C(50%FKT + 50% FWL), D(20% FWL+ 80% FKY) and E(1000% FKT). The experiment spanned for a period of twelve (12) weeks. The shell length, shell mouth radius, weight gain, costs and returns profile, cost benefit-ratio, gross margin and profitability ratios were assessed. The performance parameters viz weight gain, shell mouth radius and shell length were significantly different.,(p<0.05) among treatment. Parameters studied were best on the snails fed with diets B and D. The gross margin (GM), Profitability ratio (PR) and cost benefit Ratio (CBR) were N314.40K, 12 respectively.

The study therefore indicated that the feeding of snail with fresh kola testa under kola plantation would be of benefit to the farmers by way of higher income, improved standard of living and adequate use of kola by- product (kola testa) and shade.

CRIDAN 0138

Incidence of bryophytes and lichens on rehabilitated cocoa trees.(En) Olaiya, A.O, Agbeniyi, S.O. and Adenikinju, S.A.(. Cocoa Research Institute of Nigeria, Ibadan, Nigeria)

The experiment was carried out between 1998 and 1999 at the Cocoa Research Institute of Nigeria, Ibadan to investigate the incidence of epiphytes on the rehabilitated cocoa plots .The plot N2/3 was rehabilitated by coppicing and chupon regeneration in 1996 and started producing fruits in 1998. The incidence of

Bryophytes and Lichens were monitored both on stumps and stems of regenerated chupons at two weeks interval over a period of five months. The result showed that Lichen exhibited higher percentage infestation in both cases, which ranged between 39- 54 % [stumps] and 64 – 69% [chupons] while Bryophytes infestation ranges between 10 – 28% [stumps] and 1-13% [chupons] respectively. The relationship between the Bryophyte and Liches generally showed low inverse correlation except for Bryophyte stumps /lichen chupons and lichen stumps/ Bryophyte chupons which showed low positive correlation. In all there was no significant difference.

CRIDAN 0139

Nutritional Qualities of Snails (*ARCHACHATINA MARGINATA*) Fed Solely with Fresh Kola Testa Under Kola Plantation. (En). Hamzat, R.A., Jaiyeola, C.O., and Longe, O.G (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 3 tabs., and 12 refs. Proc. 27th Ann. Conf., nig. Soc. For Anim. Prod. (NSAP), March 17 –21, 2002, Fed. Univ. of Tech., Akure, Nigeria. Pp 295-297.

This experiment was set up to assess the potential of fresh kola testa in feeding African giant land snail (*Archachatina marginata*) raised under kola plantation. The nutritional qualities of the snail meat was then assessed after the trial. Sixty (60) snails which were randomly distributed into four (4) dietary treatments were used for this study and each of the treatments was replicated three times with five (5) snails per replicate. The treatments were: FPL (100% fresh pawpaw leaf), FKT (100% fresh kola testa), FWL (100% fresh water leaf) and FMC (100% fresh maize chaffs).

CRIDAN 0140

.Utilization of Various Treated Cocoa Bean Shells in Layers Mash. (En). Olubamiwa, O., Soetan, O.A., Olamijulo, A.O., Hamzat, R.A., and Longe, O.O. (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 2 tabs., and 11 refs. Proc. 27th Ann. Conf. Nig. Soc. For Anim. Prod. (NSAP), March 17-21, 2002, Fed. Univ. of Tech., Akure, Nigeria. p 267-269.

The Utilization of variously treated, (boiled, sun-dried, leached, alkali and urea treated) cocoa bean shells (CBS) in laying hen diets, was investigated. A total of 8 dietary treatments which

included the control (0% CBS) diet and a commercial diet were used in the trial. The other diets contained untreated CBS, sun-dried CBS, urea-treated CBS, alkali-treated CBS, boiled CBS and leached CBS. Eighty individually caged, six-month-in-lay pullets, were allocated among the diets in a completely randomized design. Each bird, representing a replicate, had unrestricted access to feed and water throughout the 12-week experiment. Parameters evaluated included egg weight, percentage egg production, feed intake, egg mass, feed efficiency and feed cost/kg egg.

CRIDAN 0141

Use of Fresh Kola Testa in Feeding Giant Land Snail (*Archatina archatina*) under Kola Plantation. (En) Hamzat, R.A. (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Encl. 3 tabs., and 4 refs. Re-Inventing Animal Production in the 21st Century, Proceedings of 5th Annual Conference of Animal Science Association of Nigeria September 19-22, 2000. Port Harcourt, Nigeria.

CRIDAN 0142

Performance characteristics of immature African giant land snail (*Archachatina marginata*) fed dried kola testa / palm kernel cake mixture. (En). Hamzat, R.A., Omole, A.J., and Oredein, A.O. (Cocoa research Institute of Nigeria, Ibadan, Nigeria). . 5th Biennial Conference of the African Crop Science Society. Theme: Agricultural Policy, Sustainable Crop Production and Poverty Alleviation in Africa. Le Meridien Eko Hotel Victoria Island, Lagos, Nigeria October 21-26, 2001.

This experiment was set up to assess the performance of African giant land snails (*Archachatina marginata*) fed dried kola testa (DKT) and palm kernel cake (PKC) mixture. A total of 72 snails were randomly distributed into four (4) dietary treatments and replicated 3 times with 6 snails in each of the replicates in a completely randomized design. The treatments were: A (100% pawpaw leaf); B (75% DKT : 25% PKC); C (50% DKT: 50% PKC) and D (25% DKT: 75% PKC). The result revealed significant differences ($P < 0.05$) in aperture radius; weight gain, shell length and carcass values but there were no significant differences ($P > 0.05$) in shell breadth and feed intake. The values recorded for aperture radius and weight gain were: 2.14, 2.62, 2.43, 2.53 cm and 20.00, 39.96, 30.15 and 21.56 g respectively for diets

A,B, C and D. The values for the shell length were 8.91, 10.48, 9.83. and 9.82cm respectively for diets A,B,C and D. As for the carcass analysis, the dressing (%), shell/live weight (%), and visceral/ live weight (%), values obtained were: 37.07, 37.89, 36.91, 22.31, 31.80, 29.67 and 28.45, and 13.46, 26.42, 27.20 and 20.02 for snails fed diets A,B, C and D, respectively. The performance characteristics and carcass values obtained showed that diet B was the best while diet 0 was the least. This experiment thus shows that it is possible and practicable to feed dried kola testa-based diets to snails, most importantly by way of providing an effective way of utilizing the kola testa, regarded as wastes in kola plantation in Nigeria and also to provide information on self-formulated diet for snails hi kola farmers. This will go a long way to alleviate poverty among kola farmers and provide employment opportunities for the entire rural dwellers

CRIDAN143

Utilization of Kola Testa (KOT) for Livestock Nutrition. (En). Hamzat, Rasheed Adedayo (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Awareness creation for Economic Empowerment of Rural communities of Lagos State, Organised by Lagos State centre for Rural Development (CERUD). Held on 20th July, 2005 at the Ikorodu town hall Ikorodu, Lagos.

The scarcity and high cost of cereal grains in many developing countries have led to renewed interest in the use of crop residue in livestock feeding due to the fact that farm wastes and crop residues are relatively cheaper and in several cases available in large quantities. These have been found suitable in several livestock feeds though to a limited extent which has to be established by scientific search. Large quantities of agricultural by – products, which are regarded as non- conventional feed sources are produced in Nigeria.

CRIDAN144

Potentials of kola podhusk (KPH) as a feed ingredient for livestock feeding” (En). Hamzat, Rasheed Adedayo (Cocoa research Institute of Nigeria, Ibadan, Nigeria). Awareness creation for economic empowerment of rural communities of Lagos state, organized by Lagos state center for rural development (CERUD) Held on 20th July, 2005 at the Ikorodu town Hall Ikorodu, Lagos.

CRIDAN 145

Effects of processing techniques on the utilization of cocoa beans shell
By laying hens (En). Olubamiwa, O. and Hamzat, R.A. (Cocoa Research
Institute of Nigeria, Ibadan, Nigeria). Enc. 2 tabs and 13 refs. MICCO,
05, 18-19 2005, Kuala Lumpur . pg 118-119.

A major problem of poultry production in the underdeveloped
countries today, apart from the incidence of disease is the high cost
of feeds, arising from high cost of feed ingredients. This problem
has tended to reduce the rate of expansion of the poultry and has
added to the low level of animal protein intake of the

p

CRIDAN 146

Assessment of genetic diversity of cacao L. collections in Nigeria using
simple sequence repeat markers. (En) Aikpokpodion, P.O., Adetimirin,
V.O., Ingelbrecht, I., Schnell, R.J. and Kolesnikova-Allen, M.A. MICC 05,
Encl. 2 digts., and 4 refs. Kuala Lumpur. 18-19 July 2005. p 83-85.

Although the bulk of the world's cocoa (more than 70%) is
produced in West Africa. The non-native cacao tree species was
introduced to the region in the 19th century. Initial base material was
of the Amelonado population, but since the 1920s there have been
several subsequent introductions of materials from other
populations. As a result of efforts to control the attack of cocoa
swollen shoot virus disease (CSSVD) in the region, a large-scale
variety replacement with introduced upper Amazon materials took
place in the early 1940s.

CRIDAN 147

Analysis of cocoa yield dynamics on an experimental plot.(En).
Sanusi,R.A & A.A.Oloyede. R.A. (Cocoa Research Institute of Nigeria,
Ibadan, Nigeria). MICC;05 18-19 July, 2005.kuala Lumpur. Pg 98.

Prediction\ forecasts of crop yield from agro-climatological variables is not well appreciated in Nigeria despite the fact that rain-fed husbandry has remained the most established practiced of Nigerian farmers. This study, therefore, attempted an estimation of cocoa pod yields under varying weather conditions. Parvin and Minzer- Zarnovitz methods as well as non –parametric tests were used to analyse data obtained from CRIN's W11/2 (cocoa experimental) plot covering 1985-1995 sessions. The result indicated that if the weather was (consistently) ideal, pod yield would have been 199.24% higher than was realised during the period of study.If the weather was (consistently) un-ideal, pod yield could have been 75.5% lower than was realize during the period.

CRIDAN 148

Biological control potentials of mycoflora associated with cocoa pod, leaf, root and rhizosphere soil in Nigeria (En). Adedeji, A.R.Agbeniyi, S.O.& Odebode, A.C. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). MICC; 05, 18-19 July 2005. kuala Lumpur. Pg 104.

Three trichoderma species commonly encountered with cocoa pod leaf and rhizosphere soil were screened in vitro for their potential biological control activities against phytophthora megakarya, the causal organism of pod rot disease of cocoa (theobroma cacao L) in Nigeria. Their frequency of occurrence was determined along other fungi.

CRIDAN 00149

Field evaluation of five brands of copper sulphate on the control of phytophthora pod rot disease of cocoa in Nigeria. (En). Iremiren, G.O., Agbeniyi,S.O. Ibiremo,O.S. and Ogunlade, M.O. R.A. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). MICC 05,18-19-2005.Kuala lumpar. p. 105.

The control of *Phytophthora* pod rot disease in Nigeria is largely through the use of copper-based fungicides. Majority of Nigeria cocoa farmers still use copper sulphate for *Phytophthora* pod control despite the introduction of more efficacious fungicides that have metalaxyl in the past decade. This calls for the continuous evaluation of the various brands of copper sulphate in the Nigeria market. The field study in 2003 and 2004 reports on the efficacy of Nispra1, Tismac2 Kopesra3, Mistai4, and Mag5, which are brands of copper sulphate on the control of *Phytophthora* pod rot disease of cocoa. Mistai 4 gave the lowest pod rot control (49.84%). While the highest control (70.27%) was achieved with Tismac 2 compared with the unsprayed cocoa plots. Thus the efficacy of Tismac 2 recommended its continued use by the peasant cocoa farmers in Nigeria who can not afford the recently introduced fungicides.

CRIDAN 150

Influence of cocoa pod husks as soil amendment on meloidogyne incognita in cocoa. (En). R.A. Fademi, O.A, Orisajo, S.B and Afolami, S.O. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). MICC 05, 18-19 July 2005, Kuala Lumpur. p. 30.

An experiment was carried out to assess the effect of different levels of cocoa pod husks (CPH) as soil amendment against the root-knot nematode, meloidogyne incognita on cocoa (*Theobroma cacao* L. cv. F3 Amazon) seedlings. Partially decayed and dry CPH incorporated at the rate of 13,900Kg/ha, 27,800Kg/ha and 55,600Kg/ha were shown to reduce root galling of cocoa seedlings by 88%, 92% and 93% respectively. Percentage reduction in eggs/juveniles with respects to control was 97% by any of the treatment. There were considerable varying increases in plant height, stem girth, leaf area, and shoot weights due to the soil amendments.

Key word: root-knot nematode, cocoa seedlings, soil amendment.

CRIDAN 151

Incidence of *Phytophthora* pod rot in different cocoa agro-ecological zones of Nigeria. (En). Agbeniyi, S.O., Adedeji, R.A. and Otuonye, H.A. . (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). MICC05, 18-19 July 2005, Kuala Lumpur, p.106.

Cocoa *Theobroma cacao* L. ranked first amongst the exportable crop commodities and second after oil in the foreign exchange earnings of Nigeria. The incidence of *Phytophthora* pod rot caused by *Phytophthora megakarya* and *P. palmivora* poses a serious threat to

cocoa production in Nigeria. The work reported here established the presence of the two causal organisms in the different agro ecological zones where cocoa is grown. The peak period of black pod incidence was found to be remarkably different in the various locations. A highly significant positive correlation ($r = 0.8844$) existed between incidence of pod rot and amount of rainfall in all the locations. Higher incidence of pod rot (85%) was recorded at Ikom while the lowest incidence of 55% was obtained at Ibadan. This study confirmed the yearly outbreaks of *Phytophthora* pod in Nigeria. Thus an holistic control strategy which must include release of resistant cocoa varieties is highlighted in this paper.

CRIDAN 152

Effects of feeding graded levels of kolanut husk meal on the performance of cockerels. (En). Babatunde, B.B., and Hamzat, R.A. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 4 tabs., and 13 refs. Nig. J. Anim. Prod. Nigerian society for Animal production. 2005, 32(1): 61 –66 @2005

Eighty black Nera cockerel chicks were randomly allotted to four dietary treatments containing 0, 10, 20 and 30% kolanut husk meal (KHM) for twelve weeks. Significant difference ($p < 0.05$) in feed intake, weight gain and conversion ratio were observed. Dietary inclusion of KHM depressed ($p < 0.05$) growth rate, feed conversion ratio and nutrient utilization of cockerel birds.

CRIDAN 153

The feeding value of full-fat cashew nut (*Anacardium Occidentale* Linn) rejects and low cereal diets for broiler chickens. (En). Sogunle, O.M., Fanimu, A.O., Biobaku, W.O. and Bamgbose, A.M. Encl. 6 tabs., and 19 refs. Nig. J. Anim. Prod. 2005, 32(1) 46-53.

A study was conducted to examine the economic benefits of using full-fat cashew nut (FFCN) rejects and low cereal diets on 195 Anak 2000 strains of broilers. The five diets used contained: 0%, 25%, 50%, 75% and 100% FFCN for diets 1 to 5, respectively, as a replacement for full-fat soyabean (FFSB). Cost of feed per weight gain reduced from N38.41 in diet 1 to N24.43 in diet 5 and the total cost of feed consumed per bird reduced from N116.17 in diet 1 to N86.24 in diet 5. Weight gain also decreased while feed/gain increased with inclusion level of FFCN in the diets.

CRIDAN 154

Nutrients balance sheet after coffee and maize cropping on an alfisol supplied with organic fertilizer in Ibadan – Nigeria.(En). Obatolu, C.R (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 9 tabs. and 7 refs. Organization de l Unite africaine. Soil Africains (African soils). Vol,28.pg219-224.

Four different organic materials were used as fertilizer for coffee *canephora* (Pierre ex forehner) and maize (*zea maize*) production on the residual nutrients. These materials were cowpea tops, cowdurg, *chromolaena odorate*, *pennisetum pyrpurem* applied at 20 tons per hectare.

CRIDAN 155

Interspecific hybridization between *cola acuminata* and *cola nitida*; I.A Backcross to the *C.Nitida* maternal parent.(En). Adebola, P.O. x Ibadan Nigeria). Encl 1 tabl and 10 refs. Nigeria .J. genetic vol.16(2001)p. 44-47.

In the cocoa research institute of Nigeria (CRIN). The F₁ interspecific hybrid trees of *cola acuminata* x *cola nitida* have remained unproductive despite their profuse annual flowering since they were planted about 33 years ago. Several worker have studies this plant and it was concluded that they were completely sterile.

CRIDAN 156

Pollen fertility and viability studies in *coffea canephora*, Pierre ex Froehner. (En). Omolaja,S.S. and Fawole,I. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl . 6 tabs, 2 diags and 11 refs.Nigeria J. Genetics.17(2002);43-50.

Pollen fertility and viability of seven clones of coffee *canephora* were investigated by pollen staining and in vitro pollen germination methods. The experiment was replicated three times. Six pollen shapes observed in *C. canephora* were monosulcate, bisulcate, tricolpate, spherical, rectangular and polycolpate.

CRIDAN 157

Response of cacao *L.* to soil copper levels 2. upper amazon seedling performance at varied soil copper concentration. (En). Obatolu,C.R. and Sanwo, J.O. (Cocoa

Research Institute of Nigeria, Ibadan, Nigeria). Encl; 4 tabs and 14 refs. The Ogun journal of agricultural sciences.

An investigation was conducted in the nursery at cocoa research institute of Nigeria , Idi-ayunre, to asses cocoa strain responses to soil copper concentration. Five strain entries were subjected to `13 copper concentrations. Responses were measured in 13 seedlings traits over a 13-week period.

CRIDAN 158

Seasonal variations in soluble carbohydrates, starch and phosphorus contents of CRIN elite cocoa clones rooting potential. (En). Odegbaro, O.A., and Adedipe, N.O. Encl. 6 tabs., and 2 diags. Horticultural Society of Nigeria. Proceedings of the 18th Annual conference, May 28-June 1, 2000. Held at: Institute for Agricultural Research, Samaru Ahmadu Bello University, Zaria, Nigeria.

Anaiyses of the cocoa cuttings were made to determine seasonal changes in the carbohydrates and phosphorus levels in relation to the seasonal variations in cutting productivity and rooting response. The cutting productivity, the rooting response, the carbohydrate and phosphorus levels, all showed significant seasonal variations ($P=0.01$). The vigorous clones which produced more cuttings did not always possess high rooting response. It was also found that the most productive clones had significant higher carbohydrates and phosphorus levels than the least productive ones.

CRIDAN 159

The effect of different shade intensities on berry yield of coffee.(En). Famaye, A.O., Agboola, A.A., and Obatolu, C.R. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 2 tabs., and 4 refs. Horticultural Society of Nigeria. Proceedings of the 18th Annual Held at: Institute for Agricultural Research, Samaru Ahmadu Bello University, Zaria, Nigeria. Conference May 28- June 1, 2000.

Two factorial field experiments involving three shade intensities and four periods were conducted between 1995 and 1998 at the Cocoa Research Institute of Nigeria, Ibadan, Oyo state, to determine the effect of different intensities of shade on the berry yield of coffee. Four shade periods namely, 0, 3, 6 and 12 months were imposed on three intensities of shade; 0, 50 and 100 per cents. The 12 treatments were laid out using a randomized complete block design with four replications. On the overall , the yield of the three shade regimes is in the follwing order $50\% > 0\% > 00\%$. It is suggested that 50% shade will result in optimum yield of coffee.

CRIDAN 0160

The comparative study of five tea clones under plantain shade in Ibadan, south-western Nigeria. (En). Obatolu, C.R. and Ipinmoroti, R.R. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 2 tabs., 3 diags., and 10 refs. Proceedings of the 18th annual conference of the Horticultural Society of Nigeria. Held at the Institute for Agricultural Research, Samaru Ahmadu Bello University, Zaria Nigeria. May 28 – June 01, 2000.

Tea (*Camellia sinensis* L.) has recently been introduced into the Nigerian agriculture, about three decades ago and is well adapted to the highland areas of Mambilla Plateau in Taraba State, where the needed sub-tropical climatic conditions are prevailing. It was found that clay, organic matter and pH levels were the most critical soil factors for selecting suitable sites for tea. Leaf scorching on tea seedlings was more pronounced due to high environmental temperature of the study centers. To reduce this effect and to complement the above findings, a uniform shade regime experiment was conducted at Ibadan, to compare the performance of different tea clones under shade. It was observed that tea clones differ greatly in their performance under shade.

CRIDAN 0161

Quantitative Variability in Floral Characteristics of selected Clones of *Coffea canephora* (Pierre) in Nigeria. (En). Omolaja, S.S. and Fawole, I. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 7 tabs., 3 diags. And 19 refs. Nigerian Journal of Genetics Vols. 16 (2001) and 17 (2002).

Floral characteristics of eighteen clones of *Coffea canephora*, (Pierre) were investigated with respect to variation in flowering behaviour. Among these only ten clones were studied for anther, filament and style lengths. The candle stage period of the flower, prior to anthesis, varied among the clones and this influenced their flowering synchrony.

CRIDAN 0162

Trait association, path analysis and pluck quality value in tea (*Camellia sinensis* (L) O.Kuntze) (En). Esan, E.B., Omolaja, S.A. and Obatolu, C.R. Encl; 2 diags and 4 tabs. Nigeria Journal of Science vol.34 No.4(2000) 337-343.

Twenty-four clones of tea (*Camellia sinensis* (L) O. Kuntze) were investigated for the genotypic association of six yield components,

their effect on yield and pluck quality value. The experiment was of completely randomized design with three replicates. Two yield components ; weights of terminal bud and the first leaf positively associated with yield.

CRIDAN 0163

Nutrient release and fertilizer needs of soils of old cocoa plots. (En). Ndubuaku,U.M. and Lucas, E.O. Encl. 10 diags ,3 tabs and 10 refs. In Nigeria journal of science. Vol. 34. no 4 (2000) P: 381-387 .

The amount of nutrient released with time by soils of old cocoa plots and the fertilizer needs of such soils for optimum growth of cocoa seedlings were monitored for twelve months. The amounts of major nutrients such as P,K,Mg and Ca release with time were lower in soils of old cocoa plots than in natural forest soils but there were no significant differences in the levels of these nutrients in the two soils.

CRIDAN 0164

Preliminary effect of sawdust/ topsoil mixtures on germination, root volume and other growth parameters of F3 Amazon cocoa seedlings in the nursery. (En). Ndubuaku,U.M. and Oyekanmi,E.O. Encl 4 tabs , 5 diags and 3 refs. Nigeria journal of science. Vol 34, no 4 (2000) P: 389-394.

This investigation was carried out to design a suitable topsoil and growth of cocoa seedlings in the nursery for a period of six months. A control (topsoil alone) and four mixture of topsoil and sawdust in different ratios of 50%;50%;67%;75%;25% and 80%;20% were used.

CRIDAN 0165

Dialled analysis of self and cross- compatibility in selected clones of coffee canephora Pierre. (En). Omolaja,S.S. and Fawole,E.A. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria) Encl 1 diag, 6 tabs and 18 refs. Nigerian journal of science. Vol .34, no. 4 (2000). Pg 417-425.

Seven coffee canephora Pierre, clones established on experimental plot S8/1, Cocoa research institute of Nigeria, headquarters, ibadan were intermated using a full dialled systems. Two characters namely pollen tube penetration of the style and seed set were subjected to dialled analysis. Genetic variation for the characters studied was due to genes with additive and dominance effects.

CRIDAN 0166

Studies on kola tissue culture 1; protocols for establishing kola tissue in vitro. (En). Obembe,O.O Encl. 3 tabs and 10 refs. Nigerian journal of science. Vol.34.no.4 (2000) P: 271-276.

The micropropagation of cola nitida (vent) schott and endlicher by means of tissue culture was investigated to provide baseline information on the survival of kola tissue and organs in vitro. Investigation were conducted on the development of sterilization protocols, and medium selection and modifications.

CRIDAN 0167

Studies on kola tissue culture 11; effects of plants growth regulators on callus induction. (En Obembe,O.O.) Encl 1 diag, 3 tabs and 20 refs. Nigerian journal of science. Vol .34,no.4(2000) 277-281.

Callus induction was studied on leaf and single node cutting explants from cola nitida (vent.) schott and endlicher seedlings. Callus was induced successfully from cut surfaces (periphery) of young leaves in vitro on the medium supplemented with 0.5-5.0mg^l-1 naphtheneacetic acid (NAA), Combined with 0.23mg^l-1 6-benzyl-aminopurine (BAP) and on medium supplemented with 0.2-0.6 mg^l-1 BAP, combined with 1.0 mg^l-1 NAA.

CRIDAN 0168

Cocoa IPM research and implementation in Nigeria. (En). Idowu,O.L.,Ojelade,K.T.M.,and Adebola,P.O.. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria) west Africa regional cocoa IPM Workshop, cotonou, Benin November 13-15,2001. pg 67-72.

For almost two decades (1970-1990) research efforts on pests and diseases of cocoa were concentrated on bioecology and control of cocoa disease and cocoa swollen shoot virus disease. By late 80' it had

oreign exchange earnings in Nigeria. In the early 1960s, agriculture production contributed about 60% of the GDP and about 80% of all export earnings. However, as a result of various reasons over the years, the agricultural sector experienced severe decline until it recorded a negative growth rate of 2.8 per annum between 1974 and 1984.

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CRIDAN 0170

Adoption of modern agronomic practices by cocoa farmers in Nigeria a multivariate tobit analysis. (En). Oduwole, O.O. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria) Encl. 52 tabs., 5 figs., and 65 refs.

This study was directed towards analyzing the factors affecting the adoption of modern agronomic practices on cocoa agriculture in Nigeria. The study looked at the farmer's socio economic factors,

knowledge, constraint and perception of modern agronomic practices as it affects future sustainability of cocoa in Nigeria. It became necessary to examine the factors because of the slow growth in the national cocoa output despite numerous efforts by government to promote agriculture and in particular cocoa cultivation.

CRIDAN 0171

Organoleptic assessment of chocolate made partly from cashew- kernel meal. (En). Ojeh, O.A and Falowo, D.O (Cocoa Research Institute of Nigeria, Ibadan, Nigeria) Encl. 3 tabs., and 10 refs. Cashew Causerie Vol 1 No 1 1983. p: 17-19,

Camcho- a cholate product made partly from cashew-kernel meal was organoleptically assessed for consumer acceptability with reference to two other chocolate products.' 'KOCHO'' made partly from kola powder andCACHO from cocoa powder which have earlier been found acceptable by previous consumer test.

CRIDAN 0172

The importance of plantain to cacao production and the peasant farmers. (En) Adenikinju, S.A (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 3 tabs., and 11 refs. Vol 38 (4) 1983 P: 348 – 350

The plantain or cooking banana (Musa paradisiaca L.) is a common feature of cocoa farms. On the basis of the recommendations from the Cocoa Research institute, it is planted in a new plot ahead of the cacao seedlings (PLATE 1). The plantain commences fruiting about two years later, long before the cacao starts production.

CRIDAN 0173

Current Outlook of Black pod Epidemics in Nigeria. (En). Agbeniyi, S.O and Adedeji, A.R (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 2 tabs., and 4 refs. proceedings of incoped 4th international seminar on cocoa pests and diseases , 19th – 21st October, 2003, Accra, Ghana.

Studies were conducted on the progress of the black pod epidemics on f3 Amazon cocoa in Nigeria from june to October,

2001. Results from the study indicated that initiation of pod rot disease generally begin at the distal end cocoa pod. Similarly, the site of early infection on mature green pods followed the order distal infection> lateral infection> proximal infection. It was, thus, suggested that in the black pod season, pods should be sprayed to run-off with fungicides to protect green pods from infection of *P. megakarya*. It was also recommended that black and mummified pods on trunks and within the plantation should be removed at regular interval.

CRIDAN 0174

Use of cocoa pod husk as fertilizer for maize production. (En). Oladokun, A.O. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl. 8 tabs and 11 refs. Nigerian jour. of agronomy. Vol.,1, (3), 1986.p. 103-109.

Cocoa (*Theobroma cacao*) pod husk prepared in four different ways (burnt cocoa pod husk (BCPH); Old cocoa pod husk (OCPH); Fresh cocoa pod husk (FCPH); and Rotten cocoa pod husk (RCPH) was compared with commercial fertilizer (NPK) in raising crops of maize in 1977 and 1978.

CRIDAN 0175

Effect of shade regimes on growth and nutrient uptake of seedling and matured tree of coffee species in Nigeria. (En). Famaye,A.O. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl.69 tabs,10 diags and 71 refs. Thesis August, 2000..

Nigeria, coffee is an important crop of high economic value. Growing coffee under the shade of other plant reduces yield. Understanding the performance of coffee under such condition will enhance yield.

CRIDAN 0176

Characterization of Nigerian robusta coffee (*Coffea canephora* Pierre ex. Froehner) germplasm and determination of factors controlling compatibility. (En). OMOLAJA,S.S. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encl., 24 tabs,16 figs,and 9 refs. In a thesis,2004,.

A study was carried out to characterize thirty-seven coffee canephora using forty-eight agro-botanical and three biochemical characteristics, determine the number of self-incompatibility alleles (SIA), and the role of pollen-stylar protein in the expression of self-incompatibility. The biochemical characters were phenol, caffeine and protein contents. The phenol and caffeine contents were determined following extraction while protein was studied by polyacrylamide gel electrophoresis (PAGE).

CRIDAN 0177

Post harvest incidence and control of fungi associated with kolanuts *Cola nitida* (vent)schott and endl. And *Cola acuminata* (brenan) schott and endl.). (En) Agbeniyi, S. O. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria). Encls; 21 tabs, 9 diags and 5 maps. Thesis Nov. 2004.

A study was conducted to determine the frequency of occurrence of fungi associated with kolanut at processing and storage. Samples of healthy and infected kolanuts were collected from fourteen randomly selected locations across the kola-growing belt. (southwest and southeast) of Nigeria.

CRIDAN 0178

Daniel, A.M.

Effects of three organic fertilizers on the growth and nutrient uptake of *Coffea canephora* (Pierre ex. Froehner L.) seedling. In thesis, 2005. incl., 9 tabs, 1 fig., and 114 refs.

This study was carried out to evaluate the effect of addition of three organic fertilizers on the growth response of coffee seedlings, estimate the optimum rate of addition of the organic fertilizers and determined the effects of their application on the soil chemical properties and nutrient status of *Coffea canephora* plants.

CRIDAN 0179

Anonymous

Cocoa/cacao (*Theobroma cacao*). in a guide to insects pests of Nigerian crops, (identification, biology, and control) pg 158-162. incl. 7 diags., and 1 tabl.

Abstracts;

A minor pest, usually kept below economic damage levels by natural control. Widespread throughout Nigeria. Also attacks mango, guava, avocado, kola and cashew.

CRIDAN 0180

Anonymous.

Cashew (*Anacardium occidentale*). In a guide to insect pests of Nigerian crops. (identification, biology and control. Pg 152-155. inc 3 diags and 1 tabl.

Abstract

This is a serious foliage pest of cashew which causes severe damages to young plantations particularly in the dry season.

CRIDAN 0181

Anonymous

Coffee (*Coffea arabica*) (*Coffea robusta*) coffee leaf roller (*epicampoptera glauca*). In a guide to insect pests of Nigeria crops (identification, biology and control).pg 166-172. incl., 14 diags and 1 tabl.

Abstract

The most important shoot feeding pest of coffee. Found throughout Nigeria. The larvae feed inside the leaf margins by scraping at the surface of the underside surface of the leaf. Older larvae feed actively from the edge of the leaf and may leave only the midrib. Bushes can be defoliated. Larvae will also feed on green bark and berries.

CRIDAN 0182

Anonymous

KOLA (*Cola nitida* and *cola acuminata*) Sterculiaceae. In a guide to insects pests of Nigerian crops. (identification, biology and control). Pg 174-178. incl 4 diags and 1 tabl.

Abstract

Nymphs and adults feed by piercing tissue and sucking plant sap. Feeding causes yellowing of the leaves and die-back of new growth. Damage to pods includes stunting of growth and malformation

CRIDAN 0182

Mc Akinwale, S.A

Palynology of Cashew (*Anacardium Occdentale* L.) in Relation to Fruit Set. In: Journal of Agriculture, Science and Technology. Vol. 2, No. 2 (101 194) June 1992. A publication of the university of Agriculture, Makurdi, Nigeria.

Abstract

Pollen studies (size, shape and stainability) were carried out on 25 genotypes of cashew (*Anacardium occidentale* L.). In all the studied genotypes, stamens were dimorphic with the longer stamen having higher percentage pollen stainability (fertility) than the shorter ones.

Mc Sobamiwa, O & Longe, O.G.

The nutritive value of alkali treated cocoa husk meal in broiler chicks diets
In; *Animal feed science and technology*. Vol.46, pp 321-330, 1994.
Encl 5 tabs and 15 refs

Sani, D.I and Akintunde A.Y

Performance and Nutrient Utilization of Growing Rabbits Fed Urea-Treated and Untreated Cocoa Husk Based Diets. In 12 International Cocoa Research Conference. Salvador, Bahia Brasil. 17-23 November 1996.
encl.2 tabs. And 9 refs.

Biological control potentials of mycoflora associated with cocoa pod, leaf, root and rhizosphere soil in Nigeria. (En). Adedeji, A.R., Agbeniyi, S.O. and Odebode, A.C. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria.). MICC'05, 18-19 July 2005, Kuala Lumpur.

Three trichoderma species commonly encountered with cocoa pod, leaf and rhizosphere soil were screened in vitro for their potential biological control activities against *Phytophthora megakarya*, the causal organism of pod rot disease of cocoa (*Theobroma cacao* L) in Nigeria. Their frequency of occurrence was determined along other fungi. *Trichoderma harzianum* and *T. viride* were more frequently isolated than *T. atroviride* from all the major cocoa growing zones. The frequency of occurrence of *T. harzianum* (0.22) was more than that of *T. viride* (0.16). Owena zone had least frequency of occurrence (0.04) of *Trichoderma* spp. None of the three species of trichoderma screened produce rot or any other disease symptoms on the cocoa pod, however they were readily re-isolated from the pod tissues around the point of inoculation.

CRIDAN 0183

Current status of nematode problems on cocoa in Nigeria, and perspectives for future researchers. (En). Fademi, O.A. and S.B. Orisajo (Cocoa Research Institute of Nigeria).. MICC'05, 18-19 July 2005, Kuala Lumpur. p105

We review the situation of plant parasitic on cocoa in Nigeria since the establishment of the Cocoa Research Institute of Nigeria (CRIN) some forty

years ago. Although the effective number of plant nematologists who have worked, and still working on cocoa is very few compared to the total of number of plant nematologists in the country, yet some achievements have been made. A total of 35 nematodes in 21 genera have been associated with the roots and soil of cocoa. Of these, four genera (Meloidogyne, Helicotylenchus, Scutellonema and Xiphinema) were outstanding, having more than species representation per genus. However, Meloidogyne spp. is considered the most important on account of its wide host range. Preliminary studies on varieties resistance and pathogenicity studies to this "assumed" most important genus (the root knot nematode, Meloidogyne spp.) showed that seedling development and vigour is impaired by increasing populations of the nematode, while all the selected clones exposed to the nematode were susceptible. Given the importance of plant parasitic nematodes in general on cocoa growth and yield, and consequently on national cocoa beans output, this paper presents the need to scale up development of nematology studies on cocoa, and pursuance of international collaboration between nematologists in cocoa-growing countries as well as technical assistance of international agencies for nematology studies on cocoa.

Key word: Cocoa, plant-parasitic nematodes, Meloidogyne spp., seedling decline, cocoa output, international cooperation.

CRIDAN 0184

Analysis of cocoa yield dynamics on experimental plot. (En). R.A. Sanusi and A.A. Oloyede (Cocoa Research Institute of Nigeria). MICC'05, 18-19 July 2005, Kuala Lumpur. p98

Prediction/forecast of crop yield from agro-climatological variables is not well appreciated in Nigeria despite the fact that rain-fed husbandry has remained the most established practice of Nigerian farmers. This study, therefore, attempted an estimation of cocoa pod yield under varying weather conditions. Towards this end, Parvin and Minzer-Zarnovitz methods as well as non-parametric tests viz: serial correlation and Kruskal-Wallis tests were used to analyse data obtained from CRIN W11/2 (cocoa experimental) plot covering 1985-1995 seasons. The result indicated that if the weather was (consistently) ideal, pod yield would have been 199.24% higher than was realized during the period under study. If the weather was (consistently) un-ideal, pod yield could have been 75.5% lower than was realized during the period. Black pod infection during a particular period had no influence on infection in another period ($P > 0.1$). The pod bearing capacity of the trees was found to be a significant factor of the incidence of black pod in the plot under investigation ($P > 0.01$). In view of these findings, it was strongly that for the realization of the policy objective of a resuscitated agro-allied driven economy, policy makers and scientists need to pay more attention to the influence of weather variables on agricultural production.

Key word: cocoa pod, weather, season and agricultural production.

CRIDAN 0185

Tree performance is regulated by hydraulic conductance and water relations: Implication for increased cocoa productivity. (En). Agele Samuel (Federal University of Technology, Akure, Nigeria). MICC'05, 18-19 July 2005, Kuala Lumpur. p98

The humid tropics where the world's cocoa is produced is characterized by wet and dry season transitions, biotic and abiotic stresses and rainfed agriculture. In circumstance of these constraints/characteristics is the huge task and increased productivity with limited resources. Soil-plant-atmosphere coupling (SPAC) explains the control exercised by the soil and atmospheric conditions (environment) on plant processes. Also, whole plant hydraulic conductance can limit whole tree performance measured in terms water use (transpiration). Carbon gain and growth. There, if transport sufficiency is linked to performance in trees, there is need to confirm the necessity of high whole plant hydraulic conductance for high productivity in cacao. Water ecophysiological research present relevant options to overcome constraints associated with cacao production from the perspectives of plant-soil interaction and crop-soil manipulation. This is indispensable to the development of accelerated technological development for sustainable rainfed agriculture, and therefore to crops and production technology for tomorrow. It is necessary to explore the application of key research achievements in water ecophysiological and soil-plant-atmosphere in the strategies for increase cacao production in the different growing seasons in a humid tropical environment

CRIDAN 0186

Building a future for cocoa in Nigeria. (En) Agbeniyi, S and Adeogun, O (Cocoa Research Institute of Nigeria, Ibadan, Nigeria.)

A cocoa industry is founded on its farmers. Cocoa is a fundamental component of rural livelihoods in West Africa, but young people are leaving owing to low profitability. In February this year, the Nigerian federal government launched a programme aimed at revitalizing the cocoa rehabilitation programmes. It recognizes that retaining the young generation in cocoa farming is key to the sector's future. For this to happen, cocoa needs to be perceived as providing an economically viable and sustainable livelihood.

CRIDAN 0187

.Chromosome numbers of four Nigerian species of cola schott. &endlicher (sterculiaceae).(En). Adebola, P.O and Morakinyo, J.A. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria.) Encl. 4 figs. And 10 refs.

This paper reports the results of chromosome countings in four wild cola species (*lateritia*, *C. ballayi*, *C. verticillanta* and *C. gigantea*). Cytological investigation of these species gave a constant mitotic chromosome counts of $2n = 4x = 40$ for the first time. The karyotypes were found to consist mostly of metacentric and sub-metacentric chromosomes. In addition to confirming the chromosome numbers and ploidy levels in these species, the results also reveals high symmetry and homogeneity of the karyotypes with those of the cultivated species (*C. nitida* and *C. acuminata*) already reported. The similarity in chromosome morphology between the cultivated and wild species indicate their common origin and suggests the possibility of using these wild species as bridges for gene transfer in cola breeding programmes involving interspecific hybridization.

CRIDAN 00188

Arabical coffee – soil relationship at sites on the mambilla plateau, Nigeria. (En). Owaiye, A.R and Fagbami, A. (Agronomy department, University of Ibadan, Ibadan.). ISBN 978-24535-30-7 Ibadan(Nigeria) Organization of African unity scientific technical and research commission (1995). p.571-578. 8 tables: summary (En). proceedings of third African soil science society conference on rehabilitation and management of African soils for sustainable productivity and environmental protection. Ilorin (Nigeria).vol 28,1995.

Three-year Arabica coffee (*coffea arabica* L.) yield and 27 soil variables, measured at 0-20cm (topsoil) and 20-50cm (subsoil), respectively, from five farmers field, were used for this evaluation. The farmers field had previously been classified at the sub-group level of Soil Taxonomy. Significant ($P < 0.05$) differences were found between the soil taxa (5) and their coffee yield potential. Multiple, Linear, stepwise regression showed that the taxa yield differences were due to inverse iron-manganese relationship in the topsoil ($R^2 = 0.89$) while soil acidity ($R^2 = 0.82$) and clay content ($R^2 = 0.17$) were important in the subsoil. All regression were significant at $P < 0.05$. Coffee yield declined with topsoil manganese toxicity, however, subsoil hydrogen ion toxicity and

, Adeoti, A.A, Agbeniyi, S.O., Aikpokpodion, P.O. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria.).

, Adeoti, A.A, Agbeniyi, S.O., Aikpokpodion, P.O. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria.).

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, Adeoti, A.A, Agbeniyi, S.O., Aikpokpodion, P.O. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria.).
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The phytophthora pod rot disease constitutes a major threat to cocoa cultivation in all cocoa-growing regions worldwide. It is one of the most important diseases limiting the attainment of genetic yield potential of this tree crop. Though available, chemical control methods are often expensive and beyond the reach of peasant farmers that produce more than 95% of Nigeria crop. Also, the limited knowledge of rational chemical application among rural farmers and the adverse effect on the environment makes it an unfriendly approach.

Breeding commercially viable resistant cacao genotypes have been advocated to be the durable control approach against the *phytophthora* pod rot. Towards achieving this objectives, promising cacao materials were selected from the gene pool in Cocoa Research Institute of Nigeria,(CRIN) Headquarters,Ibadan.Screening of these eighth selected cocoa clones with four(4) isolates of *phytophthora megakarya* of known aggressiveness in combination-NGRI4 ,using the leaf discs inoculation method at standard inoculum concentration of zoospore of 3×10^5 /ml was carried out.Result showed that T12/5 is resistant,while clones T17/11 and T86/2, are moderately resistant.The other clones T85/5,T85/45,T20/11, were moderately susceptible.It is therefore,suggested that clone T12/5 be integrated into the resistant breeding effort against *phytophthora* pod rot.

CRIDAN 190

Evaluation of the susceptibility of local cocoa germplasms in Nigeria to phytophthora pod rot disease using the leaf discs technique. (En) Otuonye, A.H., Adeoti, A.A, Agbeniyi, S.O., Aikpokpodion, P.O. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria.).

CRIDAN 191

Cashew apple juice: its use in fortifying the nutritional quality of some tropical fruits

(En). Akinwale, T.O. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria.)

Encl.2 tables, and 8 refs.

11.01. 2000- g:/ springer- zeischriften/ European-Food-A-217/Neusatz/00000140-217.3d -3B2-Umbruch, seite 1-3

The physico-chemical properties of some tropical fruits (pineapple, orange, grape, mango and lemon) were analyzed and compared with those of cashew apple. Cashew apple juice was found to contain the highest amount of vitamin C (203.5mg/100ml) of edible portion. Orange, grape,

pineapple, mango and lemon contained average values of 54.7mg, 45.0mg, 14.70mg, 30.9 mg and 33.7 mg vitamin C per 100 ml of juice respectively. Obviously, cashew apple juice contains almost four times the amount of vitamin C in the popular citrus fruits and more than four times as much vitamin C as in other fruits. Hence, when cashew apple was blended with other tropical fruits it boosted their nutritional quality. On the other hand, these fruits improved the acceptability of cashew juice in terms of taste and flavour. The blends, even though significantly different ($p > 0.05$) in taste, colour and mouthfeel, were all acceptable to consumers with no significant difference ($p > 0.05$) in overall acceptability.

CRIDAN 192

Production constraints in the management of large scale tree crop plantations. (En) Adenikinju S.A & Oduwole O.O (Cocoa Research Institute of Nigeria, Ibadan, Nigeria.). Encl. 7 refs.
AERLS National Workshop on Tree Crops Production held at CRIN, Ibadan October 24, 28, 1988 in collaboration with CRIN, Nifor, NIHORT & RRI.

The importance of large scale plantations of tree crops lies in their being a source of wealth to the owners as to the country at large . This is in addition to the role of such plantations in land conservation by preventing erosion and soil denudation and ultimately preventing desertification. Specifically, tree crops like cocoa, kola and cashew, three of the five schedule crops under the Cocoa Research Institute of Nigeria (CRIN) are also earners of foreign exchange.

This presentation deals generally with production constraints in the management of large tree crop plantations. As most of these constraints are already known to the policy makers, they will only be listed and elaborated upon briefly.

CRIDAN 193

Diseases and pests of cocoa , kola, coffee and cashew and their control. (En) Okelana, F.A, Odebode, A.C, Ndubuaku, T.C.N, Akinfenwa, F.O, Adeyemo, Y.A, Fawole, E.A, Olunloyo, O.A, and Filani, G.A. (Cocoa Research Institute of Nigeria, Ibadan, Nigeria.) Encl. 3 tables, and 3 refs.
AERLS National Workshop on Tree Crops Production held at CRIN, Ibadan October 24, 28, 1988 in Collaboration with CRIN, NIFOR, NIHORT & RRI.

Cocoa (*Theobroma Cacao*), kola (*cola nitida* and *cola acuminata*), coffee (*coffea arabica*, *coffea canephora* and *coffea liberica*) and cashew (*Anacardium occidentale*) are four of the five crops on the mandate of the Cocoa Research Institute Of Nigeria (CRIN). THE Institute which was

formally established in 1964 now conducts research into all aspects of production and utilization of these crops including Tea (*Camelia Sinensis*) Cocoa is still the foremost agricultural crop earning substantial foreign exchange for Nigeria in spite of the decline in its production. While kola, coffee and cashew are minor cash crops, their potencial as major foreign exchange earner for the country in the last two years future cannot be under estimated. In the last two years there has been a tremendous upsurge in the export prices of the crops.

Like many other crops, infection by various diseases and pest infection are among the various factors limiting their production. In order to minimize losses attributable to the diseases and pests, various control measures-chemical, cultural, physical, biological, use of resistant varieties have been evolved and are being adopted to varying extents.

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