ANNUAL REPORT

OF THE

COCOA RESEARCH INSTITUTE OF NIGERIA, IBADAN

2003

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PRINCIPAL ADMINISTRATION AND RESEARCH STAFF LIST AS AT 31ST DECEMBER, 2003 ADMINISTRATION

1.	Director/Chief Executive	-	Prof. G. O. Iremiren	B.Sc., M.Sc., Ph.D
2.	Admin. Secretary	-	J.O. Babafemi -	B.Sc, M.B.A, MNIM

FINANCE AND ACCOUNTS

1.	Chief Accountant	-	O. S. Adefaka -	BSc. Acct.

RESEARCH

Entomologists

1.	F.A. Okelana (Mrs.)	-	B.Sc, M. Phil, Ph.D
2.	T.C.N. Ndubuaku	-	B.Sc, M.Sc.
3.	K.T.M. Ojelade	-	B.Sc, M.Sc.
4.	E.U Asogwa	-	B.Sc, M.Sc.
5.	J.C. Anikwe	-	B.Sc, M.Sc.

Soils & Plant Nutrition Scientists

1.	O.S. Ibiremo	-	B.Sc, M.Sc.
2.	R.R. Ipinmoroti	-	B.Sc, M.Sc.
3.	C.I. Iloyanomoh (Mrs.)	-	B.Sc, M.Sc.
4.	M.O.Ogunlade	-	B.Sc, M.Sc.
5.	M.A. Daniel	-	B.Sc.
6.	A. Alhaji Yabagi	-	B. Agric.
7.	L.O.Adebowale	-	BSc.

Crop Processing And Utilisation Scientists

1.	O.Olubamiwa	-	B.Sc; M.Sc; Ph.D
2.	R.A. Hamzat	-	B.Sc, M.Sc.
3.	C.O. Jayeola (Mrs.)	-	B.Sc, M.Sc.

4.	L.E. Yahaya	-	B.Sc, M.Sc.
5.	S.O. Aroyeun	-	B.Sc, M.Sc.
6.	S.O. Ogunwolu	-	B.Sc, M.Sc.
7.	A.A. Ajao	-	B.Sc, M.Sc.
8.	M.A. Ogunjobi	-	B.Sc, M.Sc.
9.	R.O. Igbinadolor	-	B.Sc
10	F.C. Mokwunye	-	B.Sc
11.	J.O.Ogunbayo	-	B.Sc

Economists And Statisticians

1.	E.O.Aigbekaen	-	B.Sc; M.Sc; Ph.D
2.	O.O. Oduwole	-	B.Sc, M.Sc.
3.	T.R. Shittu	-	B.Sc, M.Sc.
4.	R.A. Sanusi	-	B. Agric., M.Sc.
5.	K.A. Oluyole	-	B. Agric
6.	B.O. Obatolu	-	B.Sc, M.Sc.
7.	J.O. Lawal (Mrs.)	-	B.Sc, M.Sc.
8	M. Adejumo (Mrs.)	-	B.Sc.

Extensionists

1.	S.O. Adeogun	-	B.Sc, M.Sc.
2.	E.O. Uwagboe	-	B.Sc
3.	S. Adebiyi	-	B.Sc
4.	E.A. Agbongiarhuoyi	-	B.Sc
5.	N. Idris	-	B.Sc.

Plant Pathologists

1.	O.A.Fademi	-	B.Sc., M.Sc., Ph.D.
2.	Dr. (Mrs.) L.N., Dongo	-	B.Sc., M.Sc., Ph.D.
3.	S.O. Agbeniyi	-	B.Sc., M.Sc., M.Phil
4.	A.R.Adedeji	-	B.Sc., M.Sc.
5.	S. Orisajo	-	B.Sc., M.Sc.
6.	A.H. Otuonye	-	B.Sc
7.	M.O. Okeniyi	-	B.Sc

Plant Breeder

1.	K. Badaru	-	B.Sc., M.Phil
2.	S.S. Omolaja	-	B.Sc., M.Sc., M.Phil
3.	P.O. Adebola	-	B.Sc., M.Sc., M.Phil., Ph.D.
4.	O.M. Aliyu	-	B.Sc., M.Sc.
5.	P.O. Aikpokpodion	-	B.Sc., M.Sc.
6.	A.A. Muyiwa (Mrs.)	-	B.Sc.
7.	K.E. Dada	-	B.Sc.

Agronomists

1.	A.O. Famaye	-	B.Sc., M.Sc., Ph.D.
2.	E.A. Adeyemi (Mrs.)	-	B.Sc., M.Sc.
3.	A.O. Olaiya	-	B.Sc., M.Sc.
4.	L.A. Hammed	-	B.Sc., M.Sc
5.	A. Oloyede	-	B.Sc., M.Sc
6.	K.O. Ayegboyin	-	B.Sc.

Internal Audit: - A.S.B. Akanni

Engineering Works: - G.E. Ubani

Plantation Manager: - G.A. Layode

Health Centre

1. Dr. B.Oluyole - MBBS (Part-time Medical Officer)
2. F.J. Oloyede - S.R.N., S.C.M.

Officers In-Charge of Substations

G.Z. Anuforo - Ikom

S.E. Akinrowo (Mrs.) - Owena

R.A. Madehin - Mambilla

Adebayo O. - Ibeku

Ajani A. - Ochaja

S.D.Oladoyinbo - Uhonmora

SENIOR STAFF FRESH APPOINTMENTS FOR THE YEAR 2003

NO.	NAMES	DESIGNATION/SALARY GRADE	DATE OF BIRTH	DATE OF FIRST APPT.	DATE OF PRESENT APPT.	LOCATION
1	Prof. G. O. Iremiren	Director/CE, HATISS 15	15/6/49	1/10/72	2/1/03	Headquarters
2	Dr. E. O. Aigbekaen	Assistant Director, HATISS 14	26/4/49	10/10/78	3/3/03	Headquarters
3	Dr. A. O. Fademi	Assistant Director, HATISS 14	16/12/56	30/2/82	1/4/03	Headquarters
4	Dr.(Mrs.) L. Dongo	Chief Research Officer, HATISS 13	27/10/64	17/2/03	17/2/03	Plant Pathology
5	A.Pelemo	Higher Statis. Officer, HATISS 07	1/7/75	10/2/03	10/2/03	Econs. & Statisticts
6	S. Ebulu	Lab. Technologist II HATISS 07	28/3/75	13/2/03	13/2/03	SPN
7	J. Okaisabor	Higher Agric. Supt., HATISS 07	23/4/58	31/3/03	31/3/03	Uhonmora
8	S. Akhidime	Admin. Officer II, HATISS 07	13/9/70	31/3/03	31/3/03	Administration
9	S. Ukpeoyibo(Miss)	Admin. Officer II, HATISS 07	28/11/71	2/4/03	2/4/03	Administration
10	J. O. Ogunbayo	Research Officer II, HATISS 07	17/4/78	1/7/03	1/7/03	CPU
11	O.B. Ibiremo(Mrs.)	Higher Executive O. HATISS 07	19/11/70	2/9/03	2/9/03	Finance & Accounts
12	Sote Adesola(Mrs.)	Staff Nurse/Midwife, HATISS 07	22/7/74	17/9/03	17/9/03	Health Centre
13	Oduola A.P.(Mrs.)	Staff Nurse/Midwife, HATISS 07	18/12/71	17/9/03	17/9/03	Health Centre
14	Olatunji(Mrs.)	Staff Nurse/Midwife, HATISS 07	22/12/67	18/9/03	18/9/03	Health Centre
15	B. A. Uloko	Higher Agric. Supt., HATISS 07	13/3/70	18/9/03	18/9/03	Ochaja substation
16	H. Baoku(Mrs.)	Staff Nurse/Midwife, HATISS 07	18/6/66	23/9/03	23/9/03	Health Centre
17	F.Evbuomwan(Mrs.)	Staff Nurse/Midwife. HATISS 07	28/9/74	6/10/03	6/10/03	Health Centre

JUNIOR STAFF FRESH APPOINTMENT FOR YEAR 2003

	DESIGNATION/SALARY GRADE	DATE OF BIRTH	DATE OF FIRST APPT.	PRESENT APPT.	LOCATION	REMARKS
1. S. E. Edokpa	Asst. Draughtsman, HATISS 02	16/3/75	25/2/03	25/2/03	Engineering	
2.. Huseini Usman	Health Assistant, HATISS 03	17/4/75	25/2/03	25/2/03	Mambilla	
3.. Miss E. Iruobe	Agric. F.A II HATISS 01	20/4/61	1/4/03	1/4/03	Uhonmora	
4. M Dagana	Motor Driver, HATISS 02	10/1/73	6/5/03	6/5/03	Ochaja	
5. M. Onipe(Miss)	Messenger, HATISS 01	25/9/75	2/6/03	2/6/03	D/Office	
6. Samuel Adeyemo	Head Watchman HATISS 01	20/4/67	2/6/03	2/6/03	Security	
7. F. Lukman(Mrs)	Agric. F.A II, HATISS 01	25/12/67	2/6/03	2/6/03	Field	Deceased
8. Miss. O. Taiwo	Agric. F.A II, HATISS 01	1/7/74	2/6/03	2/6/03	Field	22/12/03
9. Miss F. Fowosere	Agric. F.A. II, HATISS 01	12/10/68	2/6/03	2/6/03	Field	
10. R. Oghenegueke (Mrs)	Messenger HATISS 01	27/8/68	2/6/03	2/6/03	GMESS	
11. Mrs. E. Ariyibi	Agric. Field Attd. II,	4/4/65	2/6/03	2/6/03	Field	
12 Mrs. O. Adepoju	Agric. Field Attd. II, HATISS 01	2/2/66	2/6/03	2/6/03	Field	
13 Mrs. B. Ogunleye	Agric. Field Attd. II, HATISS 01	10/7/64	2/6/03	2/6/03	SPN	
14. Mrs. T. Ijadunola	Messenger, HATISS 01	15/5/66	2/6/03	2/6/03	Field	
15. S. Adeyanju	Agric. Field Attd. II, HATISS 01	23/11/78	2/6/03	2/6/03	AD(R&S)'s	
16. S. Abass	Messenger, HATISS 01	19/7/76	2/6/03	2/6/03	Office	
17.S. Omitade	Head Watchman HATISS 01	1/2/67	2/6/03	2/6/03	Security	
18. A. Olayiwola	Agric. Field Attd. II HATISS	15/5/65	2/6/03	2/6/03	Field	
19.A. Ganiyu	Agric. Field Attd. II, HATISS 01	5/5/65	2/6/03	2/6/03	Field	

S/No.	NAME	DESIGNATION/ SALARY GRADE	DATE OF BIRTH	DATE OF FIRST APPT.	PRESENT APPT.	LOCATION	REMARK
20.	Mrs. F. Okere	Agric. Field Attd. II, HATISS 01	11/2/68	2/6/03	2/6/03	Field	
21.	Miss T. Bakare	Agric. Field Attd. II, HATISS 01	26/2/75	2/6/03	2/6/03	Field	
22.	Mrs. B. Makinde	Agric. Field Attd. II, HATISS 01	10/5/73	2/6/03	2/6/03	Field	
23.	.A. Jayeade	Agric. Field Attd II, HATISS 01	28/6/68	2/6/03	2/6/03	Field	
24.	Mrs. O. Adeyemi	Agric. Field Attd II. HATISS 01	14/11/68	2/6/03	2/6/03	Field	
25.	Mrs. B. Ogbechie	Messenger, HATISS 01	1/12/74	2/6/03	2/6/03	Agronomy	
26.	Mrs. A. Olaoye	Agric. Field Attd. II. HATISS 01	8/1/75	2/6/03	2/6/03	Field	
27.	Mrs. S. Rabiu	Health Attd. HATISS 01	1/3/71	2/6/03	2/6/03	Health Centre	
28.	Mrs. J. Ganiyu	Agric. Field Attd. II, HATISS 01	8/7/69	2/6/03	2/6/03	Field	
29.	Miss B. Adeyemi	Agric. Field Attd. II, HATISS 01	22/11/69	2/6/03	2/6/03	Field	
30	Mrs. B. Lawal	Agric. Field Attd. II, HATISS 01	12/1/67	2/6/03	2/6/03	Field	
31.	Mrs. E.Emaku	Agric. Field Attd. II, HATISS 01	17/7/69	2/6/03	2/6/03	Field	
32.	Ugwoke Joseph	Agric. Field Attd. II, HATISS 01	13/12/75	2/6/03	2/6/03	CPU	
33.	Kola Komolafe	Agric. Field Attd. II, HATISS 01	14/9/76	2/6/03	2/6/03	Field	
34.	Alao Ganiyu	Agric. Field Attd II HATISS 01	15/4/64	2/6/03	2/6/03	Field	
35.	Miss R. Imafidon	Agric. Field Attd II HATISS 01	24/3/69	2/6/03	2/6/03	CPU	
36.	Gbadamosi Mufu	Agric. Field Attd.II HATISS 01	1/1/65	2/6/03	2/6/03	Field	
37.	K. Akinrelere	Agric. Field Attd. II HATISS 01	27/4/75	2/6/03	2/6/03	Field	
38.	Miss O. Otitoloju	Agric. Field Attd.II HATISS 01	1/8/77	2/6/03	2/6/03	AD(EUR)'s	
39	Mrs. Y. Ajayi	Agric. Field Attd, II HATISS 01	5/10/69	2/6/03	2/6/03	Field	

40. .Miss B. Oladunmoye	Agric. Field Attd. II, HATISS 01	28/4/78	2/6/03	2/6/03	Field
41. .Mrs. F. Eseghe	Agric. Field Attd. II,HATISS 01	15/1/65	2/6/03	2/6/03	Field
42. Mrs. B. Kuforiji	Messenger, HATISS 01	14/6/76	2/6/03	2/6/03	CPU
43. Mrs. K. Alalade	Agric. Field Attd., II HATISS 01	14/9/68	2/6/03	2/6/03	CPU
44. B. Akinyode	HATISS 01 Messenger,	20/4/68	2/6/03	2/6/03	Admin.
45..Mrs. E. Ojo	HATISS 01 Agric. Field Attd., II	2/2/68	2/6/03	2/6/03	Field
46 ..B. Saka	HATISS 01 Head Watchman,	28/9/	2/6/03	2/6/03	Security
47. K. Oloyede	HATISS 01 Agric. Field Attd. II,	3/3/69	2/6/03	2/6/03	Field
48. Mrs. B. Taiwo	HATISS 01 Agric. Field Attd. II,	5/5/73	2/6/03	2/6/03	Field
49. I. Garba	HATISS 01 Agric. Field Attd. II,	17/6/81	2/6/03	2/6/03	Library
50. Mrs. E. Adetunji	HATISS 01 Agric. Field Attd. II,	10/12/77	2/6/03	2/6/03	Fiel
51. Mrs. E. Gbiye	HATISS 01 Agric. Field Attd.II	10/1/57	2/6/03	2/6/03	Field
52. Moshood Ojo	HATISS 01 Agric. Field Attd.II	19/6/60	2/6/03	2/6/03	Field
53. Alabi Mukaila	HATISS 01 Agric. Field Attd.II	2/3/71	2/6/03	2/6/03	Field
54. Y. Adebisi	HATISS 01 Agric. Field Attd.II	4/12/59	2/6/03	2/6/03	Field
55. Mukaila Ojo	HATISS 01 Agric. Field Attd.II	1/11/63	2/6/03	2/6/03	Field
56. M. Aribido (Mrs.)	HATISS 01 Agric. Field Attd.II	1/10/69	2/6/03	2/6/03	Field
57.Mrs. A. Adewumi	HATISS 01 Agric. Field Attd.II	15/2/64	2/6/03	2/6/03	Field
58.Mrs. F. Anikudi	HATISS 01 Agric. Field Attd.II	12/7/76	2/6/03	2/6/03	Field
59. V. Olubisaiye	HATISS 01 Agric. Field Attd.II	14/9/70	2/6/03	2/6/03	Field
60. Miss K. Adeleye	HATISS 01 Head Watchman,	3/10/68	2/6/03	2/6/03	Security
61. Mrs. C. Olatunji	HATISS 01 Agric. Field Attd.II	7/10/77	2/6/03	2/6/03	Field
62. J. Oladokun	HATISS 01 Agric. Field Attd.II	2/10/73	2/6/03	2/6/03	Field
63T. A. Adetunji	HATISS 01 Agric. Field Attd.II	6/12/75	2/6/03	2/6/03	Field
64. Mrs. O. Rafiu	HATISS 01 Agric. Field Attd.II	15/9/59	2/6/03	2/6/03	P/Pathology
65. John Oladipo	HATISS 01 Messenger	8/3/73	2/6/03	2/6/03	Field
66. Mrs. B. Ejenobor	HATISS 01 Agric. Field Attd.II	23/9/74	2/6/03	2/6/03	Admin.
67. Miss E. Ojo	HATISS 01 Agric. Field Attd.II	27/5/70	2/6/03	2/6/03	P/Breeding
68. Akanji Azeez	HATISS 01 Head Watchman,	26/11/77	2/6/03	2/6/03	Security
69. Oni Akele	HATISS 01 Agric. Field Attd.II	8/3/78	2/6/03	2/6/03	Field
70. Abioye Peter	HATISS 01 Agric. Field Attd.II	13/10/74	2/6/03	2/6/03	Field
71. Mrs. R. Tijani	HATISS 01 Agric. Field Attd.II	27/7/76	2/6/03	2/6/03	Field
72. T. Modebei	HATISS 01 Messenger	27/7/76	2/6/03	2/6/03	AD(PBM&T) Offi
73. Mrs.B. Olawore	HATISS 01 Agric. Field Attd.II	29/9/75	2/6/03	2/6/03	Field

74. S. Njaogwali	Head Watchman HATISS 01	24/4/68	2/6/03	2/6/03	Security
75. N. Olagunju	Agric. Field Attd. II HATISS 01	10/11/68	2/6/03	2/6/03	Field
76. Moses Ojo	Agric. Field Attd. II HATISS 01	20/12/59	2/6/03	2/6/03	Field
77. O. Akinyomide	Agric. Field Attd. II HATISS 01	28/9/70	2/6/03	2/6/03	Field
78. A. Adekanbi	Works Attendant HATISS 01	9/5/75	2/6/03	2/6/03	Engineering
79. A. Adesida	Works Attendant HATISS 01	29/12/75	2/6/03	2/6/03	Engineering
80.Osagbemi Oladipo	Agric. Field Attd. II HATISS 01	5/12/67	2/6/03	2/6/03	Printing
81.Sola Adepoju	Senior Steward HATISS 01	11/2/72	2/6/03	2/6/03	SS Club
82. Usman Tijani	Works Attendant HATISS 01	11/6/73	2/6/03	2/6/03	Engineering
83.Lateef Amusa	Agric. Field Attd. II HATISS 01	22/9/75	2/6/03	2/6/03	Field
84. Olaolu Oladoja	Agric. Field Attd. II HATISS 01	22/11/66	2/6/03	2/6/03	Field
85. T. Oluwayomi	Messenger, HATISS 01	2/5/75	2/6/03	2/6/03	Finance & Accounts
86. K. Makinde	Agric. Field Attd. II HATISS 01	17/10/77	2/6/03	2/6/03	Field
87. O. Oladunmoye	Agric. Field Attd. II HATISS 01	30/10/75	2/6/03	2/6/03	Poultry
88. John Okonchie	Head Watchman HATISS 01	17/2/69	2/6/03	2/6/03	Security
89. Mrs. B. Ganiyu	Messenger, HATISS 01	21/5/75	2/6/03	2/6/03	Admin.
90. F. Igwe	Agric. Field Attd. II HATISS 01	20/1/64	2/6/03	2/6/03	Field

91. A. Akinrinola	Messenger HATISS 01	28/9/80	2/6/03	2/6/03	AD (EUR)'s Office
92. Mrs. A. Akionla	Agric. Field Attd. II HATISS 01	15/8/62	2/6/03	2/6/03	Field
93. Abiodun Taiwo	Head Watchman HATISS 01	25/12/77	2/6/03	2/6/03	Security
94. A. Ikpefua	Head Watchman HATISS 01	22/6/79	2/6/03	2/6/03	Security
95. Onwunbiko Micheal	Head Watchman HATISS 01	17/8/64	2/6/03	2/6/03	Ibeku
96. Okeke Eyeribe	Agric. Field Attd. II HATISS 01	7/4/58	2/6/03	2/6/03	Ibeku
97. Owashi Onyema	Head Watchman HATISS 01	16/5/57	2/6/03	2/6/03	Ibeku
98. Joseph Nuki	Head Watchman HATISS 01	7/6/65	2/6/03	2/6/03	Mambilla
99. Augustine Davies	Agric. Field Attd. II HATISS 01	16/6/80	2/6/03	2/6/03	Mambilla
100.A.J. Lawal (Mrs)	Agric. Field Attd. II HATISS 01	18/2/73	2/6/03	2/6/03	Mambilla
101. Ojo Toiki	Agric. Field Attd. II HATISS 01	1/1/70	2/6/03	2/6/03	Owena
102. A.A. Ajayi	Agric. Field Attd. II HATISS 01	25/12/68	2/6/03	2/6/03	Owena
103. Thomas James	Agric. Field Attd. II HATISS 01	15/12/77	2/6/03	2/6/03	Owena
104. Edet R. Akpan	Agric. Field Attd. II HATISS 01	15/12/68	2/6/03	2/6/03	Ajassor
105. Ignatius Ajito	Head Watchman HATISS 01	16/2/62	2/6/03	2/6/03	Ajassor

106 James Okoi	Works Attendant HATISS 01	12/2/62	2/6/03	2/6/03	Ajassor	
07. Nathaniel Oguche	Agric. Field Attd. II,HATISS 01	11/12/68	2/6/03	2/6/03	Ochaja	
108. Musa Abdullahi	Agric. Field Attd. II, HATISS 01	15/11/70	2/6/03	2/6/03	Ochaja	
109. Mrs. L.E.D. Samuel	Health Attendant HATISS 01	24/4/74	2/6/03	2/6/03	Ochaja	
110. Nubi Attah	Agric. Field Attd. II, HATISS 01	15/1/73	2/6/03	2/6/03	Ochaja	
111 Pius Opalua	Agric. Field Attd. II, HATISS 01	5/1/70	2/6/03	2/6/03	Ochaja	
112.. James Ehisonomen	Head Watchman HATISS 01	7/7/55	2/6/03	2/6/03	Uhonmora	
113. Idowu Umahion	Agric. Field Attd. II, HATISS 01	24/3/64	2/6/03	2/6/03	Uhonmora	Deceased 28/9/03
114. Alaba Umahion	Agric. Field Attd. II, HATISS 01	4/9/66	2/6/03	2/6/03	Uhonmora	
115. K. Aransi	Head Watchman HATISS 01	4/9/61	2/6/03	2/6/03	Security	
116. O. Akinwale	Agric. Field Attd. II, HATISS 01	3/1/63	2/6/03	2/6/03	Field	
117. O. Ilori	Agric. Field Attd. II, HATISS 01	16/6/66	2/6/03	6/6/03	Fermentary	
118. S. Oladunmoye (Miss)	Agric. Field Attd. II, HATISS 01	4/2/72	2/6/03	2/6/03	Financ & Accounts	
119 O. Adeleke	Agric. Field Attd. II, HATISS 01	6/8/59	2/6/03	2/6/03	Field	
120. K. Adeboye	Works Attendant HATISS 01	22/2/74	2/6/03	2/6/03	Engineering	
121. M. Oyawale	Works Attendant HATISS 01	25/4/76	2/6/03	2/6/03	Engineering	

122. O.A.Kuforiji((Mrs)	Messenger, HATISS 01	16/9/74	4/6/03	4/6/03	Ikom
123. Mrs. M. Bakare	Messenger, HATISS 01	4/4/69	4/6/03	4/6/03	PEM
124. A. Akinyemi	Messenger, HATISS 01	28/2/82	9/6/03	9/6/03	Extension
125. Alli Saidi	Messenger, HATISS 01	3/3/78	9/6/03	9/6/03	Econs. & Statis.
126. S.O. Musa	Motor Driver,HATISS 02	15/3/65	30/6/03	30/6/03	Uhonmora
127. Friday Alu	Motor Driver,HATISS 02	15/1/73	27/6/03	27/6/03	Uhonmora
128. O. Olajumoke	Messenger, HATISS 01	30/4/82	24/7/03	24/7/03	Engineering
129. Shina Atanda	Clerical Assistant, HATISS 02	29/3/79	3/9/03	3/9/03	Administration
130.Domi Mary S.	Agric. Field Attd. II HATISS 01	17/7/56	5/9/03	5/9/03	Field
131. Kayiwedo E. A.	Agric. Field Attd. II HATISS 01	5/12/56	9/9/03	9/9/03	Field
132. Olutade Ann	Clerical Assistant HATISS 02	28/6/56	10/9/03	10/9/03	Finance & Accts.
133. Efunniyi Muyiwa	Photographic Asst. HATISS 02	9/6/77	8/10/03	8/10/03	Photographic
134. Bolanle Ogunmoyela	Asst. Ex. Officer HATISS 05	25/2/65	30/10/03	30/12/03	SSWA
135. Enno Innocent Eno	Stores Assistant HATISS 02	9/9/73	28/10/03	28/10/03	Ajassor

YEAR 2003 LEFT THE SERVICE

NO.	NAME	DESIGNATION	LOCATION	DATE JOINED	DATE OF EXIT	MODE OF EXIT
1	A. Akinrelere	Chief Draughtsman, HATISS 06	Engineering Services	13/6/69	11/1/2003	Compul. Retirement
2	Y. Emiola	Chief Agric. Supt., HATISS 13	P/EM	1/3/68	1/3/03	“
3	J. Egbadon	Snr. Lab. Tech., HATISS 09	ICL	9/2/68	9/2/03	“
4	S. Odunewu	Agric. Field Attend.II HATISS 01	GMESS	19/6/01	7/4/03	Deceased
5	G. Adesuyi	Asst. Chief Nur. Officer, HATISS 12	H/Centre	21/2/77	21/2/03	“
6	P. Akinola	Agric. Field Attend. I, HATISS 02	Pland Breeding	2/1/96	18/4/03	”
7	Mrs. G. O. Okoh	Snr. Lab. Tech., HATISS 09	“	1/6/94	19/4/03	”
8	F. Adesokan	Asst. Chief Lab. Tech., HATISS 12	Entomology	1/7/68	1/7/03	Compul. Retirement
9	R. O. Akintola	Asst. Chief Agric. Supt., HATISS 12	Pland Breeding	13/5/68	13/5/03	“
10	Mrs. A. M. Idowu	Asst. Chief Nur. Officer, HATISS 12	H/Centre	29/9/75	14/5/03	”
11	Miss F. Nwanosike	Higher Agric. Supt., HATISS 07	Ibeku Substation	30/5/02	13/6/03	Decease
12	C. N. Ntui	Asst. Chief Agric. Field O’seer, HATISS 05	Ajassor Substation	8/4/68	8/4/03	Compul.Retirement
13	J. Monkio	Snr. Agric. Field O’seer, HATISS 04	P/EM	5/6/68	5/6/03	Compul Retirement
14	A. Aremu	“	“	17/4/70	12/5/03	”
15	K. Aransi	Head Watchman, HATISS 01	Security	2/6/03	28/9/03	Compul. Retirement
16	M. Dagana	Motor Driver, HATISS 02	Ochaja Substation	6/5/03	22/12/03	Compul. Returement“
17	Mrs. O. Ogunsowo	Chief Agric. Supt., HATISS 13	P/EM	2/9/68	2/9/03	Compul. Retirement
18	F. Wahabi	Asst. Chief Agric. Field O’seer, HATISS 05	“	2/9/68	2/9/03	Compul. Retirement
19	H. Boboye	Snr. Works Supt., HATISS 08	Engineering Services	1/9/68	1/9/03	Voluntary Retirement
20	W. Balogun	Head Messenger, HATISS 03	Administration	7/2/79	16/12/03	

YEAR 2003 TRAINING PROGRAMME

NO.	NAME	INSTITUTION	TYPE OF COURSE	COMMENCEMENT DATE	DATE COURSE ENDED	REMARKS
1	Miss E. Iruobe	Health Centre	Six Weeks Training	3/9/03	15/10/03	6 Weeks
2	A. D. Oyawale	Federal College of Forestry, Ibadan	Six Months Training course on Silvi-cultural and Nursery Assistant	12/5/03		Six Months
3	J. A. Orobiyi	"	"	"		"
4	F. Ejakpovi	"	"	"		"
5	W. P. Kunnuola	"	"	"		"
6	M. J. Okere	"	"	"		"

Executive Summary

COCOA PROGRAMME (Leader: K. Badaru)

Title: **Survey and Identification of Natural Enemies and Alternate Host Plants of the Brown Cocoa Mirid**, *Sahlbergella singularis* (Okelana F.A. and J.C. Anikwe)

Introduction: The cocoa agro-ecology has been subjected to loads of synthetic pesticides pumped into it over the years. In view of these enormous problems often associated with the use of synthetic insecticides, it becomes necessary to identify and rear natural enemies of the brown cocoa mirid, which may subsequently lead to harnessing of such biological control agents for a sustainable biological control measure.

Also, the identification of alternate host plants of the cocoa mirids will further enhance the development of such cultural control measures in which these plants could be use as trap plants for the pest.

Objectives: (1) To carry out survey, identification and rearing of the natural enemies of the brown cocoa mirid, *S. singularis*

(2) To embark on the identification and monitoring of the alternate host plants of the brown cocoa mired, *S. singularis*

Materials and Methods: Twenty field collected adult and nymphal mirids were placed into a kilner jar in the laboratory. The mirids were observed daily after their mortality for a period of thirty days for possible emergence of parasites/parasitoids. This experiment was repeated two other times. Stands of seven potential alternate host plants of the brown cocoa mirids were identified and monitored on a regular basis on three locations, viz; CRIN Headquarters, FRIN Headquarters and CRIN Owena Substation.

The plants, their locations and number of stands identified on each location are presented in Table 1.

Table 1: Locations of some Potential Alternate Host Plants of *S. singularis*

Host Plant	Vernacular name	Location	Number of stands
Ceiba pentandra *Linn.*	*Araba*	*Zones 5 & 8*	*5*
Citrus species	Osan-mimu	Zones 1 & 5	5
Cola acuminata	Obi abata	Zone 7	10
Cola millenii K.Schum	Atewo-edun	Zones 1 & 7	10
Adansonia digitata Linn.	Ose	FRIN	1
Bombax buonopozense	Olokododo	FRIN	2
Desplatsia dewevrei	Ila-erin	Owena	3

Plants within the estate were monitored on a fortnight basis while those located at FRIN were monitored on a monthly basis. Fruits of *D. dewevrei* were collected from Owena sub-station on three different occasions for the laboratory culture of *S. singularis.*

Results and Discussion: There was no visible emergence of parasites/parasitoids from dead mirids in the laboratory in the course of the experiment. This is in consonance with the result of Booker (1966) who discovered that parasitism of cocoa mirids was extremely low under field conditions at Idi-Ayunre, Ibadan. This study will however be expanded next season to include the isolation and identification of pathogenic organisms from mirids and observations on potential predators in the field.

The monitoring exercise on identified potential alternate host plants of the brown cocoa mirid did not show any presence of the pest on these plants. There was a generally very low population of the mirids on the cocoa agro-ecology this season. The fallen fruits of *D.dewevrei* De Wild and Th. Dur. (Tiliales: Tiliaceae) collected from Owena used for the laboratory rearing of mirids showed that the plant could be found suitable as host. This is however dependent on improved rearing methodology of mirids on fruits of *D. dewevrei*. The longevity of mirids on fruits of *D. dewevrei* is presented in Table

2.

Table 2: Longevity of *S. singularis* on fruits of *D. dewevrei* in the Laboratory

Longevity(days) on fruits	Date of mirid introduction	Number of mirids introduced	Date last insect found dead	No. survived till last day
0	19/09/2003	20	20/09/2003	0
0	26/09/2003	10	27/09/2003	0
3	21/10/2003	10	24/10/2003	2
3	10/12/2003	10	13/12/2003	3

Mirids are known to be very feeble and die within few hours outside their food source. Also, improper handling of insects during collection from the field can lead to early mortality. The result above showed that with a condusive-rearing environment and improved rearing methodology; *D. dewevrei* could be found as a suitable alternate host plant to the brown cocoa mirid in Nigeria.

Summary and Conclusion: The search for a suitable host plants and natural enemies of the cocoa mirid will be intensified next season as non-chemical control methods could help in the formulation of an integrated pest management (IPM) programme.

Reference:

Booker, R.H. (1966). Natural Control Agents. Ann. Rep. Cocoa Research Institute of Nigeria. 1966 – 67: pp.27 –28.

COCOA PROGRAMME (Leader: K. Badaru)

Experimental Title: Evaluation of higher density planting in cacao plantation in Nigeria.
(Famaye, A.O. and Olaiya, A.O.)

Introduction:

The optimum spacing between cocoa trees is the distance, which will give the greatest economic return of yield per unit area. In West Africa, spacing of 3.1 x 3.1m and 2.5 x 2.5m have been recommended given 1040 and 1600 stands per hectare respectively. This population per hectare was adjudged too low compare with Guinea and Samoa which have around 5000 stands per hectare thereby returning 3 tons of cocoa beans/hectare against 1 ton/hectare. Moreover, competition for agrarian land by other developmental projects in Nigeria have left scientist with no other option than efficiency of resource use, which can be defined as the ability to derive maximum output per unit of source.

Objectives:

This experiment was therefore designed to determine the highest density in which cocoa tree could give the greatest economic returns.

Methodology:

Four different spacing of 3.1 x 3.1m, 2.5 x 2.5m, 2.0 x 2.0m and 1.0 x 1.0m were used to establish the experiment. It was laid out in a randomized complete block with three replications. Data were collected on survival rate and morphological parameters while supplying of missing stands as well as routine maintenance practices like weeding and protection against pests and diseases is on going. All data shall be subjected to analysis of variance and means separated using Duncan's multiple range tests.

Result and Discussion:

The experiment is on-going at the headquarters while Owena and Ikom is yet to be established.

Summary and Conclusion:

Data collection is going on at the headquarters while efforts to establish replications at other geo-

political zones are being intensified.

COCOA PROGRAMME (Leader: K. Badaru)

Title: Yield evaluation of Cocoa rehabilitation through coppicing .
(Olaiya, A.O. Famaye, A.O. and Hammed, L.A.)

Introduction:
The vast majority of cocoa farms in Nigeria are now over 60 years old, the age at which decline sets in. Reports have shown that the highest cocoa yields are achieved between 15 and 25 years. Depressed yield is also associated with poor management or total neglect of cocoa farms. Rehabilitation through coppicing and allowing the most vigorous chupon to take over was reported as successful by Are and Jacob (1968) and Adenikinju (1993) published effect of time of coppicing based on agronomic parameters.

Objective:
To evaluate the bean yield record collected from rehabilitation trials over a period of five years.

Materials and Methods:
The experiment was laid out in randomized complete block design. Coppiced trees during each month and the control constituted the 13 treatments and 10 trees replicate for each treatment. Yield data from 1996 to 2000 were collected and analyzed based on 1111 plants/ha. The data was subjected to analysis of variance and means was separated using least significant difference.

Results and Discussion:
The result showed that coppicing in the month of November performed best on the average. All the treatments except the control had significant increase in pod yields, this shows inverse relationship in that during the period under review. There are increases in yield of the coppiced treatments while decrease is obtained from the control.

Summary and Conclusion:
Rehabilitation through coppicing of old and unproductive cacao stems has been proved to improve yield of cocoa.

COCOA PROGRAMME (Leader: K. Badaru)

Project: Sustainable Cocoa Commodity System (SCCS) (K. Badaru and Olaiya, A.O.)
Experiment: On farm experimentation on cocoa rehabilitation options.

Introduction:
This project was initiated by FUTA with collaboration from CRIN and Ondo State ADP. Two scientist(s) from CRIN are part of the field project (Mr. K. Badaru, Mr. A.O. Olaiya) and an Agricultural Superintendent, Mr. L. Raji. The project is out to evaluate various rehabilitation options so as to recommend to farmers across the cocoa growing regions in West Africa. The project is sponsored by CIRAD.

Objective:
To examine various rehabilitation methods with a view to recommend to farmers.

Materials and Methods:
Five farms sites were selected at five different locations within Ondo and Osun States for field experimentation. The rehabilitation options includes coppicing and chupon regenerations, cutting the old trees and leaving he volunteer chupons; replanting of seedlings, coppicing and budding of super tree on regenerate chupons and coppicing and grafting on regenerated chupon.

Results and Discussion:
Coppicing and selection of super trees were carried out at farmers plot while two clones from CFC project was made available as part of super tree treatment. The regenerated chupons are still young while some volunteer chupons have been grafted. The project is on going.

Summary and Conclusion:
The work is on-going.

COCOA PROGRAMME (Leader: K. Badaru)

Title: Management of epiphytes and mistletoes infesting cocoa plantation in Nigeria.
(Olaiya, A.O. and Agbeniyi, S.O.)

Introduction:
Apart from the black pod disease which includes crop losses estimated at 30% world production, several other factors are contributing to the dwindling production figures. Amongst others, epiphytes and mistletoes have been identified as major actors as they affected flowering and pod production in cacao.

Objective:
This experiment was carried out to determine the effects of these degradation agents on pod production, cherelle wilt and yield of cacao, and also to evaluate both cultural and chemical control measures.

Materials and Methods:
Experiment 1 and 2 involved four treatment each laid out in a completely randomized block design with five replicate trees while experiment 3 was out in randomized compete block design with ten treatments and three replicated both for Bryophytes and lichens. Data were collected on flowering cushion, total fruit set, cherelle wilted pod, damaged pods and fermentable pods. All data collected were subjected to analysis of variance and comparison of treatment means was made using the least significant difference. Descriptive statistics was used for observational records.

Results and Discussion:
The result of experiment 1 showed that lichens at 60% above stem coverage was responsible for depressinon in floweing and fruit setting while Bryophytes infested trees recorded high incidence of cherelle wilt and diseased pods. Reduction in fruit setting, fruit size and weight was recorded for mistletoes infested trees. In experiment 2, cultural method of scrapping off the bryophyte did not show any significant effect on pod yield whereas cutting off of mistletoes significantly improved the yield ($P<0.05$). Experiment 3 on herbicide application showed that folar at 1.21/ha, followed by Glyphosate at 1.51/ha and Paraquat at 1.51/ha respectively significantly reduced the effect of Bryophyte infestion ($P<0.05$)

Summary and Conclusion:
Pruning and cutting of Mistletoes has been found as the only solution to the menace of parasitic plants on cocoa. Spray application of Folar 525 performed better than other treatments.

COCOA PROGRAMME

Project Title: The CFC/ICCO/IPGRI Project on Cocoa germplasm Utilization and Conservation: A Global Approach

Scientists: Kolawole Badaru (Cocoa Breeder & Technical Coordinator)

P. O. Aikpokpodion (Cocoa Breeder)

S. O. Agbeniyi (Plant Pathologist)

During the reporting year, the five-year old project (1998 – 2003) was effectively concluded. There were two major components of activities:

1. **Clone Trials**
   a. International Clone Trial
   b. Local Clone Trial
   c. Local Clone Observation Trial
   d. Ex-Uhonmora Clones Conservation Plot

2. Hybrid Trials

a. Hybrid Trial 1
b. Hybrid Trial 2
c. High Density Trial

International Clone trial

24 clones were successfully introduced and established on the field on a land area of 1.0 ha. Each clone is represented in each of three blocks. Resistance screening with early screening test using leaf discs showed the usefulness of 10 new selections for use in further breeding programme.

IMC 47,SPEC 54-1, POUND 7,AMAZ 5-2,ICS1, PA150, PA120, T85/799,EET 59, LCTEEN 46, PA 107, SCA 6, CATIE 1000, LCTEEN 37-1, WA 40, T79/501, PLAYA ALTA 2, IFC 5, MOCORONGO, MAN 15-2, VENC 4, BE 10, UF 676, AMAZ 15-15, MXC 67 and APA 4. These were obtained from Montpellier, France and Intermediate Quarantine Centre, Reading in The United Kingdom.

Local Clone Trial

Thirteen clones selected in previous breeding programmes used as parents of Hybrid Trial 1 progenies were established on a 0.6 ha land area. These were T22/28, T57/22, T30/10, T101/15, T86/2, T9/15, N38, T65/35, T65/7, T12/5, T12/11, T16/17, T82/27.

Hybrid Trial 1

Twenty-three progeny families were successfully established on a land area of 2.0 ha planted out at a spacing of 3.0m x 3.0m. Each genotype was planted in 6 blocks of 10 plants each. Observations were made on yield, precocity, growth performance and resistance screening using leaf disc test. Results obtained are presented in Table 1 . Observations made showed that heterosis was expressed for early yield, indicating that this phenomenon holds great promise for yield in cacao hybrid development. On the other hand, inbreeding depression was also evidently expressed in the worst performing hybrid families, indicating caution in using individuals belonging to the same population for hybrid development in cacao.

Table 1. Mean Yield[#] and growth performance of Hybrid Trial 1 progenies for three years (2001 – 2003)

Genotype	Cumulative mean yield (3 years)	Mean Tree Yield	Jorqt. height (cm)	Trunk Circum. (cm)	Tree size (1 – 5)
T53/5 X N38	117.5 a	13.72 ab	115.0 bcd	12.5 a	2.3 ab
T65/7 XT101/15	90.25 ab	15.7 a	104.6 def	10.5 bcd	2.3 ab
T101/15 X N38	85.75 ab	12.25 ab	95.8 efg	9.7 cd	2.3 ab
T65/7 X T57/22	73.5 ab	13.52 ab	128.6 b	11.3 abc	2.3 ab
P7 X T60/887	69.75 ab	9.48 ab	114.7 bcde	11.5 ab	2.4 ab
T65/7 X N38	67.75 ab	8.48 ab	148.4 a	11.8 ab	2.4 ab
T53/5 X T12/11	60.5 ab	10.12 ab	102.8 def	10.25 bcd	2.6 a
T86/2 X T9/15	60.0 ab	9.82 ab	109.8 cdef	10.7 bcd	2.5 ab
T65/7 X T9/15	41.25 ab	8.22 ab	124.6 bc	10.4 bcd	2.4 ab
T86/2 X T22/28	41.0 ab	6.8 ab	123.9 bc	10.2 bcd	2.4 ab
T86/2 X T16/17	40.5 ab	9.28 ab	108.5 cdef	9.8 cd	2.1 bc
T82/27 X T12/11	36.0 ab	6.38 ab	114.3 bcde	10.4 bcd	2.6 a
T65/7 X T22/28	34.75 ab	12.45 ab	91.8 fg	8.1 e	2.5 ab
T86/2 X T57/22	27.25 ab	8.65 ab	107.8 cdef	9.3 de	2.5 ab
T9/15 X T57/22	20.5 ab	5.25 ab	98.7 def	9.5 de	2.6 a
F3 Amazon	19.5 ab	5.2 ab	102.0 def	9.3 de	2.4 ab
T12/11 X N38	18.25 ab	5.25 ab	114.5 bcde	10.7 bcd	2.4 ab
T82/27 X T16/17	18.0 ab	5.45 ab	99.4 def	10.4 bcd	2.6 a
Pa150 X T60/887	17.75 ab	5.58 ab	99.2 def	9.2 de	2.6 ab
P7 X Pa150	11.25 ab	3.68 ab	117.1 bcd	9.8 cd	2.5 ab
T65/35 X T30/13	10.0 b	4.65 ab	109.4 cdef	9.7 cd	2.5 ab

T86/2 XT53/8	8.25 b	3.92 ab	64.2 i	6.3 f	1.9 c
T65/7 X T53/8	5.25 b	2.45 b	83.0 gh	8.1 e	2.2 abc
T86/2 x T65/35	3.0 b	2.5 b	73.4 hi	6.8 f	2.1 abc

[#]Mean separation by Student-Newman-Keuls Test. Means not followed by same letters are different.

Hybrid Trial 2

About 32 crosses derived from a 7 x 7 diallel mating design planned in 1999 (Aikpokpodion, 2000) wasestablished on a 0.6ha land area. About 65% survival was recorded. They are in the first year of field establishment. F_2 Upper Amazon individuals showing good yield and low pod rot incidence on the field were used as parents in the crosses.

High Density Trial

The performance of three progeny crosses was observed along with one F3 Amazon control. These were planted out in a 3.0m x 1.5m inter-row and intra-row spacing respectively with a periodical pruning of branches to encourage spread into the alley between row rather that intra-row. The yield and growth performance is presented in Table 2. The management constraints of this type of arrangement however suggest its impracticability by farmers.

Table 2. Yield and growth performance of Hybrid Density Trial progenies for three years (2001 – 2003)

Genotype*	Mean Tree Yield	Jorqt. height (cm)	Trunk Circum. (cm)	Tree size (1 – 5)
P7 X Pa150	4.2 a	122.6 a	10.5 a	2.2 bc
T12/11 X N38	0.8 b	103.1 b	9.4 b	2.6 a
T65/7 X T22/28	1.1 b	71.2 c	6.2 c	2.0 c
F3 Amazon	2.6ab	113.8a	10.3a	2.4b

Local Clone Observation

1. Ex-Uhonmora Conservation Plot.
   24 selected Na x Na and Pa x Pa single crosses individuals were successfully established clonally on a 0.25 ha land area at Ibadan. Observations are being taken on yield and resistance. Preliminary observations showed that some clones combine good early yield with resistance.

2. CRIN Selected Clones Collection

About 50 interesting local clones selected in previous breeding programmes were intended for field establishment on a prepared 0.6ha land area. This was not successfully established. However, resistance screening is being carried out on the nursery plants. From preliminary results seem to confirm the usefulness of SCA 6 as a good source of resistance genes.

COCOA PROGRAMME

Project title: The CRIN/IITA Cocoa Genetic Diversity Project (July 2002 – June 2005)

Scientists: P. O. Aikpokpodion (Cocoa Breeder)
Kolawole Badaru (Cocoa Breeder)
Maria Kolesnikova-Allen (Molecular Geneticist, IITA)
Ranjana Bhattarcharjee (Consultant, IITA)

Objective

The main aim of the project is to determine the extent of genetic diversity in cocoa populations grown in Nigeria. This is within the framework of a project covering the whole West Africa cocoa growing countries of Cote d'Ivoire, Ghana, Nigeria and Cameroon. The outcome of this project would provide basis for the effective utilisation of germplasm in cocoa breeding programme, dissemination of improved cultivars and further introduction of less used populations.

During the reporting year, 756 accessions of cocoa had so far been collected and more than 300 accessions successfully established in the nursery. These were collected from Cross River, Abia, Edo, Ondo and Ekiti states.

Molecular studies is on-going at Central Biotechnology Laboratory of International Institute of Tropical Agriculture (IITA).

Research Publications during the Year 2003.

Aikpokpodion, P. O., Badaru, K. & Eskes, A. B., 2003. Improving brown budding efficiency in cacao, *Theobroma cacao* L.: effects of twig manipulation and some control treatments of fungal infection on new sprouts. *Crop Protection* 22: 1-6

Aikpokpodion, P. O., 2003. Genetic variability and heritability of flowering time in cacao, *Theobroma cacao* L. and its related species. *Journal of Genetics & Breeding* 57:1-4

Aikpokpodion P. O., Badaru K., Kolesnikova-Allen M., Ingelbrecht I. & Adetimirin V.O., 2003. Farmer-researcher participatory on-farm selection of improved cocoa carieties: the Nigerian experience. In *: INGENIC Workshop on Cocoa* Breeding For Improved Production Systems held 19-21 October 2003, Accra, Ghana.

COCOA PROGRAMME (Leader: K. Badaru)

Title: Identification and characterisation of cocoa swollen shoot virus (CSSV) isolates. (Dongo, L.N. ,Otuonye, H.A., Okeniyi, M.O)

Introduction: CSSV in Nigeria has not been well studie.
The swollen shoot disease caused by this virus has been and still is a major problem for the ocoa industries of Ghana and Nigeria (woods, 1987). In Nigeria, swollen shoot outbreaks were discovered in 1944 two areas, the larger being to the east of Ibadan. There are many of CSSV, which differ in the symptoms they produce, the vectors that transmit them and range of their alternative hosts. The virulent starins predominate and cause various types of leaf cchlorosis, root necrosis, root and stem swellings and die back in Amelonado trees in Ghana. These trees would usually be killed in two or three years. Going by the economic implecation of CSSV in Neighbouring countries like Ghana, more virus in Nigeria.

Objectives:

(1) To re-establish the presence and distribution of the virus.

(2) To characterise the virus isolates.

Materilas and Methods:

Leaves of cocoa plants showing cons[icuous symptoms were collected from zone 9 (CRIN) and Offa-Igbo, an area of mass infection. The samples collected were each tested from CSSV at IITA by Enzyme-linked immunosorbent assay (ELISA) of extracted sap. Polyclonal antisera raised against two strains of CSSV were kindly supplied by Dr. A.A. Ollennu of CRIG. Two ELISA techniques (Protein A sandwich ELISA and Antigen coated plate ELISA) were employed. Based on the mean optical density (OD) values obtained after reading then wells, each sample was scored positive or negative for CSSV.

Results and Discussion

The results of the experiment is presented in the table below:

Table 1: The mean optical density (OD) values obtained after reading the wells at A405.

Samples	Sources	Antisera raised against two strains of CSSV	ACP-ELISA	PAS-ELISA
1	Zone 9	1A	0.151	0.112
		NA	0.177	0.116
2	Zone 9	1A	0.171	0.128
		NA	0.218*	0.123
3	Zone 9	1A	0.180	0.130
		NA	0.337**	0.167
4	Offa-Igbo	1A	0.188	0.140
		NA	0.243**	0.166
5	Offa-Igbo	1A	0.151	0.117
		NA	0.195	0.132
6	Offa-Igbo	1A	0.227*	0.137
		NA	0.322**	128
7	Offa-Igbo	1A	0.135	0.128
		NA	0.166	0.141
8	Offa-Igbo	1A	0.176	0.131
		NA	0.209*	0.128
9	Offa-Igbo	1A	0.148	0.119
		NA	0.291*	0.126
10	Symptom less (CRIN)	1A	0.124	0.115
		NA	0.112	0.113

Note: * weekly positive

** strong positive.

Summary and Conclusion:

In this preliminary study, CSSV was found was found to infect two out of the thre samples assayed in zone 9, and four out of six samples from Offa-Igbo. The result has confirmed the natural occurrence of CSSV on cocoa in Nigeria. The two starins of CSSV were detected in mixed infection in samples having virus like symptoms. This could mean that the viruses within them are of different strains to the tested or the symptoms may have been caused by physical, chemical or other biological agents. There is need for funding for this research as the findings will elucidate the distribution, the different starins and of course the economic importance of the virus in Nigeria.

Referrence:

Woods, G.A.R. (1987). Cocoa. Fourth edition

Longman Scientific & Technical, 619pp.

Title of Programme: KOLA PROGRAMME (Leader: T.C.N. Ndubuaku)

Experimental Title: Field establishment, yield and yield component of Kola as affected by planting density in Nigeria (L.A. Hammed, A.O. Olaiya).
Objective: (i) To study field establishment of Kola as affected by planting density in Nigeria.

(ii) To study the effect of planting density on yields and yield component of Kola in Nigeria.

Methodology: The experiment laid out in randomized complete block with three replications, was established at Zone 5 in the Headquarters of CRIN, Ibadan. Six hundred seedlings of *Cola nitida* collected from the main nursery of the Institute were used for the planting operations. The planting density which constitute the treatments include 177 plants/ha, 354 plants/ha, 531 plants/ha, 708 plants/ha and 1600 plants/ha, and it all occupied 143.5m x 100m of land.

Results: The work failed due to logistic problem.

Title of Programme: KOLA PROGRAMME (Leader: T.C.N. Ndubuaku)

Experimental Title: Kola rehabilitation through coppicing and chuppon regeneration (K. Badaru and A.O. Olaiya).

INTRODUCTION: This project was started in 2002 with coppicing of 40 old and unproductive kola trees in zone7. The problems of unproductivity in kola have been traced to incompatibility and old age. Therefore the project is out to solve these two problems in one and single experiment.

MATERIALS AND METHODS: Forty trees were coppiced and chupons allowed to regenerate. The regenerated chupons were later pruned to retain four most vigorous ones for budding and grafting operations. Six different high yielding clones (AC 58,AD44 ,AF112, L48, AA23 and AA86) were slected for grafting and budding exercise.

RESULTS: Three out of forty trees coppiced trees died after a year (7.5%) while budding success is put at 38.8%. Almost all the grafted trees did not take giving 7.14% success. The experiment is still on going.The budded materials died later.2003 Annual Report

Investigators: L.A. Hammed, A.O. Olaiya

Annual Report 2003
Title of Programme: KOLA PROGRAMME (Leader: T.C.N. Ndubuaku)
Experimental Title: The effect of burying fresh kola nuts in different media on the control of kola weevil *B. kolae* in storage (T.C.N. Ndubuaku)

Introduction: The kola weevils, *Balanogastris kolae* (Desbr.) and *Sophrorhinus spp* are the most destructive pests of kola nuts in West Africa. The weevils are field-to-store pests of kola nuts and without any form of control, infestation of 100% will usually occur during storage. The use toxic of toxic chemicals to control kola weevils has persisted among kola farmers because no alternative safe and efficient methods of control of weevils in storage have been developed.

Objective: To evaluate the effectiveness of burying fresh kola nuts in media on the control of kola weevil *B. kolae* in storage.

Materials and Methods: Fifty freshly harvested kola nuts per treatment replicate were buried in thin film polythene bags containing 10, 000 cm^3 each of either dry or moist media of sawdust, river sand or topsoil. Each of the moist media contained additional 1 litre of water. The nuts were buried for 12 weeks and each treatment was replicated four times. The control were nuts in black polythene bags. The experiment was laid out in a completely randomized design under laboratory. The number of adults that emerged from the nuts during storage was recorded at biweekly intervals. Data collected were subjected to analysis of variance and least significant difference (LSD) was used to compare the means of variation.

Results and Discussion: The effect of burying of fresh kola nuts in different media on the control of kola weevil. *B.kolae* in storage is presented in Table I. At 2 weeks and 4 weeks of storage, there were no significant differences in adult emergence between the control and each of the treatments at 6 weeks, 8 weeks, 10 weeks and 12 weeks after treatment.

Summary and Conclusion: The drastic reduction in adult emergence and infestation in kola nuts stored in the various media compared with the control is an indication that the media successfully acted as physical barrier, which disallowed egg laying and feeding by the first generation of adult weevils, which emerged in storage. Storage of unskinned kola nuts in sawdust, river sand or top soil can therefore be recommended as a safe, cheap, easy–to–apply and effective method of control of weevils in storage. Further research is recommended to determine how this finding can be adopted in packaging of kola nuts for transportation and exportation.

Table 1: Effect of burying unskinned kola nuts in different media on infestation by *B. kolae*

Burying Medium	Adult emergence Duration of burying					
	2 wks	4 wks	6 wks	8 wks	10 wks	12 wks
Top soil (wet)	0.5	1.5	15.3	11.5	4.25	5
Top soil (dry)	1.25	0.5	14.5	17.3	6.25	8.25
River sand (wet)	0.75	1.5	1.25	5.5	3.25	0.75
River sand (dry)	0.25	0	4	6.25	0	2.25
Sawdust (wet)	1	3	6.25	7.75	0.25	2.75
Sawdust (dry)	1	2	8	10.8	0.5	4.25
Control	2.5	7	76.5	84.5	42.75	23.3
LSD (P=0.05)	NS	NS	18.3	16.2	11.1	6.92

Coffee Research Programme

SUMMARY

The execution of the 2003 research theme was between January and December 2003. At the end of the year, the achievements recorded were: (i) grafting technique was successfully carried out on coffee, (ii) coffee varieties that exhibited some level of tolerance to attack by coffee berry borer were identified, (iii) clones that were suitable for synthetic and hybrid productions were identified and used to establish a new seed garden in Zone 1 (iv) the Ikereku Model Coffee farmer, which had been abandoned for some years was re-established. The major constraints were: (a) inadequate funding of research tasks (b) obsolete and non-functional equipment, (c) unavailability of essential facilities: no water supply, no vehicle to reach experimental locations outside the headquarters and electricity was absolutely not available. It was indeed a very bad year for research. Therefore, it was with a lot of sacrifice that the programme scientists were able to record the few achievements stated above.

The future focus are: (a) to encourage the replanting of old varieties with new, improved, high yielding clones, (b) establishment of an effective marketing system for Nigerian coffee by encouraging direct linkage between coffee farmers' associations and overseas importers, as well as, promote local consumption, (c) development of appropriate Integrated Pest Management techniques for pest control in coffee and (d) development of appropriate soil and agronomic practices for sustained high yield. Research and development, costly though they may be, guarantee sustained strength for a nation. The commitment of Nigerian leaders to the onerous task of the nation's technological advancement would be desirable; in terms of adequate and prompt funding for research or else the country's drive towards development would be a mirage.

PROGRAMME TASKS

TASK	TITLE
1.1	Rapid clonal propagation of high yielding coffee genotypes to the Nigerian farmers
1.2	Seed garden establishment for coffee
1.3	Evaluation of natural enemies alternate host plants, some botanicals and cultural methods for the control of insect pests of coffee in Nigeria.
1.4	Development of in-situ demonstration units for harvesting, primary processing and storage of coffee in Nigeria.

COCOA RESEARCH INSTITUTE OF NIGERIA
LIST OF PARTICIPATING SCIENTISTS

S/N	NAME	DISCIPLINE	QUALIFICATION	STATUS
1	Dr (Mrs.) F. A Okelana	Entomology	B.Sc; M.Sc; M.Phil; PhD	A.D(R&S)
2	Mr. E. U. Asogua	Entomology	B.Sc; M.Sc;	S.R.O.
3	Mr. J.C. Anikwe	Entomology	B.Sc;MSc;	R.O.I
4	Dr. S. S. Omolaja	Plant Breeding	B.Sc;M.Sc;PhD	AC.R.O
5	Mr. Dada, K. E.	Plant Breeding	B.Sc;	R.O.II
6	Dr. A. O. Famaye	Agronomy	B.Sc;M.Sc;PhD	AC.R.O
7	Mr. A. A. Oloyede	Agronomy	B.Sc; M.Sc;	SR.O.
8	Mrs E.A. Adeyemi	Agronomy	B.Sc; M.Sc;	S.R.O.
9	Rev. O. O. Oduwole	Agric.Economics	B.Sc; M.Sc;	CRO
10	Mr. R. A. Sanusi	Agric.Economics	B.Sc; M.Sc;	SR.O.
11	Dr. O.A. Fademi	Plant Pathology	B.Sc;M.Sc;PhD	AD,PBMT
12	Dr (Mrs). L.N.Dongo	Plant Pathology	B.Sc;M.Sc;PhD	CRO
13	Mr R. .A Adedeji	Plant Pathology	B.Sc; M.Sc;	S.R.O.
14	Mr. M. O. Okeniyi	Plant Pathology	B.Sc	R.O.II
15	Mr. S. B. Orisajo	Plant Pathology	B.Sc; M.Sc;	R.O.I
16	Mr. O. S. Ibiremo	Soil Science	B.Sc; M.Sc;	S.R.O.
17	Mr. M. A. Daniel	Soil Science	B.Sc; M.Sc;	R.O.I

18	Mrs. C. I. Iloyanomo	Soil Science	B.Sc; M.Sc;	R.O.I
19	Mr. M. Ogunlade	Soil Science	B.Sc; M.Sc;	R.O.I
20	Mrs. C.O. Jaiyeola	Food Technology	B.Sc; M.Sc;	S.R.O.
21	Mr. O. O. Ogunwolu	Food Technology	B.Sc; M.Sc;	SR.O.
22	Dr. E.O Aigbekaen	Extension	B.Sc; M.Sc; PhD	AD(EAE)
23	Mrs. J. O. Lawal	Agric. Econ.	B.Sc; M.Sc;	R.O.I
24	Mr. A. E. Agbongiarhuoyi	Extension	B.Sc	R.O.II

EXPERIMENTAL TITLE: Progress report on seed garden establishment.

SCIENTISTS: Dr. S. S. Omolaja, Mrs E.A. Adeyemi, Mr. O. S. Ibiremo and Dada, K. E.

INTRODUCTION:
Five hybrid clones were selected from the Coffee germplasm plot in zone 5, CRIN Headquater. The selection was based on earlier evaluation of all the materials over the years for high yield and good combining ability.

OBJECTIVE
To under-study the establishment of different rooted cuttings of the selected clones on field.

MATERIAL AND METHODS:

Two hundred and twenty five trees of the selected clones were proposed for the establishment on the selected plot. The selected varieties are Quillou (C111, C90 and C36), Java (T1049) and Niaoulli (M10). The cuttings were planted at a spacing of 3.0m x 3.0m;intercropped with plantain sucker. The planting arrangement was designed to enhance efficient cross-pollination among the selected clones. Hence, the 1-hectare is divided into nine blocks. Two out of the total nine blocks was established last year. Each block would contain the five selected clones, but as at the time of the establishment, three out of the selected clones were available for establishment. The remaining two was to raised and supplied later. Ball-to-earth method of transplanting was employed to transplant the clones. After which agronomic practices as per row weeding, pesticide's application against termites were carried out on the plot. Survival count was carried out at nine months after transplanting. The result of which is contained in the Tables below.

RESULTS AND DISCUSSION

Table 1.Survival percentage of clones in Block 1

Clones	Total planted	Total survived	Percentage
C36	25	23	92%
C111	25	20	80%
T1049	25	18	70%

Table 2: Variance reading for Block 1

Groups	Count	Sum	Average	Variance
C36	5	23	4.6	0.3
C111	5	20	4.0	0.5
T1049	5	18	3.6	0.8

Table 3: ANOVA For Block 1

Source of variation	SS	df	MS	f	P value	Fcrit	
Between group	2.533333	2	1.266667	2.375	0.135207	3.88529	N.S
Within group	6.4	12	0.533333				
Total	8.933333	14					

Table 4: Survival Percentage for Clones in Block 2

Clones	Total planted	Total survived	Percentage survived
C36	25	20	80%
C111	25	22	88%
T1049	25	15	60%

TABLE 5: Variance reading for Block II

Groups	Count	Sum	Average	Variance
C36	5	20	4.0	0.5
C111	5	22	4.4	0.3
C90	5	15	3.0	1.5

TABLE 6: ANOVA Table for Block II

Source of variation	SS	df	MS	F	P-value	F-crit
Between group	5.2	2	2.6	4.333333	0.038323	3.88529
Within group	7.2	12	0.6			
Total	12.4	14				

The Tables showed that there was no significant difference in survival count of the clones in Block I; but C36 recorded the highest survival count while T1049 is the lowest. The survival count percentages in ascending orders are T1049<C111<C36. There is a significant difference in the survival count of clones in Block II. The pathologist, entomologist and soil scientist in the institute are understudying the reason for this. Also C36 recorded the highest survival percentage, while T1049 recorded the lowest survival percent. The survival percent in descending orders are C36>C111>T1049.

EXPERIMENTAL TITLE: Screening of selected robusta coffee varieties for resistance to the economic insect pests of *Coffea canephora*.

SCIENTISTS: Anikwe J. C. and F. A. Okelana

INTRODUCTION:
C. canephora, which accounts for 94% of coffee exported from Nigeria (Williams, 1989) is plagued by a myriad of insect pests. The economic pests of robusta coffee cause substantial loss in the yield and quality of coffee beans produced. The economic pests of robusta coffee include the Coffee Berry Borer (CBB), *Hypothenemus hampei* Ferrari (Coleoptera: Scolytidae) and three foliar pests viz. *Epicampoptera* species (Lepidoptera: Drepanidae), *Cephonodes hylas* L. (Lepidoptera: Sphingidae) and *Leucoplema dohertyi* Warren (Lepidoptera: Epiplemidae) (Okelana, 1989).

OBJECTIVES:
(1) To identify lines of robusta coffee varieties resistant to the CBB and major defoliator pests of robusta coffee.

(2) To investigate the chemical composition of the resistant lines of robusta coffee varieties

MATERIALS AND METHOD

Five robusta coffee varieties were considered for this experiment and these include; Gold Coast (A), Quillou (C), Java (E), Java ex. Gambari (T) and Niaoulli (A).40 ripened berries were randomly collected from each variety at the Germplasm plot on a weekly basis during the coffee-harvesting season from March to June 2003. These field-collected berries were later teased in the Laboratory to investigate the presence and infestation levels of the developmental stages of the CBB, *H. hampei* found in each berry variety. 10 stands of each of the robusta coffee varieties were tagged and observed for the incidence of the foliar pests at the Institute's Germplasm plot. Monitoring was carried out on a weekly basis between the hours of 8.00hrs and 11.00hrs GMT from January to December 2003. Records were taken of the destructive stage (caterpillars) of insect species found on each coffee variety.

RESULTS AND DISCUSSION:

The results of the experiments are as follows:

Table 1: Presence of the Developmental Stages of CBB, *H. hampei* on Five Varieties of Robusta Coffee:

Mean weekly values per 40 berries

Period	Gold Coast (A)				Quillou (C)				Java (E)				Java ex.Gam.(T)				Niaoulli (M)			
	L	P	A	*	L	P	A	*	L	P	A	*	L	P	A	*	L	P	A	*
March	3.5	0.3	11.3	9.5	0.5	0.0	4.0	4.8	5.5	0.3	4.8	4.5	2.8	0.0	3.8	1.0	3.0	0.0	3.5	6.8
April	0.3	0.0	4.0	5.3	0.8	0.0	19.3	7.8	0.8	0.0	0.8	8.0	0.5	0.0	8.0	9.8	0.5	0.0	0.0	11.3
May	0.0	0.0	3.5	7.5	0.3	0.0	0.8	7.5	0.0	0.0	0.1	7.0	0.3	0.0	0.0	7.3	0.0	0.0	0.0	8.3
June	0.0	0.0	1.0	12.0	0.7	0.0	0.7	7.7	0.3	0.0	0.3	7.0	1.0	0.0	1.0	10.3	0.3	0.0	0.0	8.0

Note: L = larva, P = pupa, A = adult, * = characteristic pin-hole symptom on berries

Table 2: Occurrence of Caterpillars of two major Defoliator Pests on Five Varieties of Robusta Coffee:

(A) *Epicampoptera* species

Mean weekly values per 10 stands

Varieties	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Gold Coast(A)	0.0	0.0	0.0	0.0	0.4	1.9	6.4	7.0	7.8	1.9	0.2	0.0
Quillou (C)	0.0	0.0	0.0	0.0	1.2	2.5	8.6	6.5	6.0	0.8	0.1	0.0
Java (E)	0.0	0.0	0.0	0.0	0.2	1.0	4.0	5.3	2.5	0.4	0.0	0.0
Java ex.Gam.(T)	0.0	0.0	0.0	0.0	0.0	0.8	0.4	1.0	1.4	0.3	0.1	0.0
Niaoulli (M)	0.0	0.0	0.0	0.0	0.2	0.1	1.7	2.2	2.0	1.0	0.0	0.0

(B) ***Cephonodes hylas***

Mean weekly values per 10 stands

Varieties	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Gold Coast(A)	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Quillou (C)	0.0	0.0	0.2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Java (E)	0.0	0.0	0.4	0.2	0.0	2.0	0.3	0.0	0.0	0.0	0.0	0.0
Java ex.Gam.(T)	0.0	0.0	0.0	0.6	1.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Niaoulli (M)	0.0	0.0	0.0	0.4	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0

SUMMARY AND CONCLUSION:

CBB was present inside all the berry varieties used with a mean peak population of 48.25% adult found in the Quillou variety (Table 1). Niaoulli had the least mean adult beetle infestation of 8.75% however; a higher proportion of the characteristic pinhole damage symptom was recorded on Niaoulli.

Epicampoptera species inflicted much damage on Quillou and Gold Coast varieties during the third quarter of the year than on the other varieties (Table 2). *Cephonodes hylas* arrived the coffee plot much earlier than *Epicampoptera* species. Its population was not high enough to cause any significant damage on the robusta coffee varieties. *Leucoplema dohertyi* was not encountered on any variety on the germplasm plot.

The next stage of the work will involve further monitoring of the pests, laboratory culturing of insect pests on the various varieties of robusta coffee and studies on resistance mechanism.

REFERENCES:

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WILLIAMS, J.A. (1989). Coffee Breeding in Nigeria. In: Progress in Tree Crop Research, 2nd edition.CRIN, Ibadan, Nigeria. Pp127-140.

TITLE: Establishment of rooted cuttings and high yielding coffee genotypes in Ikereku (On – Farm Adaptive Research – OFAR)

SCIENTISTS: Dr (Mrs.) F. A Okelana, Dr. S. S. Omolaja, Rev. O. O. Oduwole Dr. A. O. Famaye, Mr. A. A. Oloyede, Mrs E.A. Adeyemi, Mr. O. S. Ibiremo, Dr. E.O Aigbekaen, Mr. Agbongiarhuoyi, E. A.

INTRODUCTION:
In an effort towards promoting coffee development and research, a model coffee farm was established in Ikereku village in Akinyele Local Government Area of Oyo State. This was made possible by the combine team of Coffee Programme.

OBJECTIVES:
To extend CRIN's improved coffee rooted cuttings to farmers and encourage participation on their farms.

METHODOLOGY:
The coffee farm was established at Ikereku village in Akinyele Local Government Area of Oyo State. Preliminary visits were made to the village. Farmers' plots were randomly selected for the project. The farm size is half an acre with a plant population of 234 stands of coffee and equivalent number of plantain suckers as shade crops.

Extension contact – some contacts were made to the farm after planting for monitoring.

RESULTS AND DISCUSSION (Feedback)
It was observed that the coffee plants are growing well and the farmer involved is maintaining the plots by clearing round the crops.

SUMMARY AND CONCLUSION

With the cultivation of coffee in farmers' farm, it is expected that many farmers will be opportune to adopt the improved coffee rooted cuttings and in turn plant them on their farms. The establishment of coffee on – farm will encourage cooperation between research, extension and the farmers. The project is still on going in Ikereku village.

TITLE: Multiplication of selected clones of *Coffea canephora* through grafting and budding.

SCIENTISTS: Adeyemi, E.A., Omolaja, S.S and Keji, K.E

INTRODUCTION:

Rooting of *Coffea canephora* stem cuttings, using full or half-node cuttings has been a successful means of vegetative propagation in CRIN. There is however the need to explore other means of vegetative propagation, hence the justification for this study.

OBJECTIVES: To determine success-take in propagating coffee by grafting and budding.

To determine clonal and varietal effects on grafting and budding success.

MATERIALS AND METHODS:

Grafting: One hundred scions each of five improved clones (M10, C111, C36, C90 and T1049) of three varieties (Niaolli (M10), Quillou (C111, C36, C90) and Java (T1049) of *Coffea canephora* were grafted on 6 months old seedling root stocks using top-left method. The grafting was done in October 2003 at CRIN central nursery. Success-take was monitored from 3 weeks after set (WAS) until 18 WAS when stability was attained.

Budding: At the same period and venue, the five selected clones as in grafting above were budded on seedling stocks. Observations were made on success-take over a period of time.

RESULTS AND DISCUSSION:

Table 1: Grafting success-take at 3 and 18 WAS

	Means success-take	
	3WAS	18WAS
M10	21.25	15.75
C111	20.50	15.25
C36	13.00	8.50
C90	12.75	8.25

T1049	13.25	1.25
LSD (0.05)	2.72	1.90

Table 2: Budding success-take at 2WAS

Clones	Mean Success-take
M10	0.00 5
C111	0.25 2
C36	0.25 2
C90	0.25 2
T1049	3.25
LSD	0.67

Grafting:
Initial success-take at 3WAS was highly significant (P<0.01) been highest (21.25) in M10 and lowest (12.75) in C90. A reduction in success-take was observed with time until 18 WAS when stability was attained. Success-take at 18WAS was still highest (15.75) in M10 but lowest (1.25) in T1049 while C90 ranked fourth position with 8.25 mean value (table 1). Ranking in grafting success from varietal perspective follow the order: Niaolli (M10) > Quillou (C111, C36, C90) > java (1049). Success take for M10 and C111 were however not different (P, 0.05) at 3 and 18WAS.

Budding:
In budding initial success-take is usually observed at 2WAS (table 2). Clone T1049 recorded highest initial mean budding – success (3.25). C111, C36, and C90 responded equally to budding implying that there is no difference in budding success among Quillou variety. M10 did not respond to budding (0.00). Ranking of initial budding success on varietal basis follow the order Java > Quillou > Niaolli. It was observed that all the clones that recorded initial budding – success eventually dieback.

SUMMARY AND CONCLUSION:
Clone M10 is better propagated through grafting rather than budding so also the other clones since all those that recorded initial budding-success eventually dieback. The study will be repeated in year 2004.

EXPERIMENTAL TITLE: Effects of synthetic and natural rooting hormones on the rooting success of half-node and one-node stem cuttings of selected clones of *Coffea canephora*.

SCIENTISTS: Adeyemi, A.E. and Omolaja, S.S.

OBJECTIVES: To assess the effect of rooting hormones on rooting success of half-node coffea stem cuttings

To compare the effect of rooting hormones on rooting success of half-node and one-node *Coffea* stem cuttings

To assess clonal and varietal effects on rooting success.

INTRODUCTION:
Seventy percent rooting success was obtained with half-node coffea stem cuttings in the absence of rooting hormone (Adeyemi *et al,* 2003). Omolaja and Obatolu (1999) reported higher rooting success of full node(s) coffea stem cuttings treated with synthetic hormones. It is therefore imperative to evaluate the effect of synthetic and natural rooting hormones on the rooting success of half-node and one-node stem cuttings of
C. canephora.

MATERIALS AND METHODS:

Five clones of C. canephora, which belong to three varieties namely C36, C111, C90 (quillou) T1049 (Java) and M10 (naolli) were selected for the study. Orthotropic shoots of the choice clones were obtained at coffea germplasm plot in zone 5 at CRIN headquarters, Ibadan. With the use of secateur, one node and half-node cuttings were prepared from the orthotropic shoots. The cuttings were subjected to 5secs dip in:

(i) 8,000 ppm in acetic acid (IAA)

(ii) coconut milk (CNM) obtained from coconut fruit

(iii) water (control)

Before potting in black polythene pots containing 1.5kg forest topsoil.

The soil was watered to full capacity before covering in white polythene sheet weighed down soil to provide a humidified condition. Watering was done from the sides of the set up as necessary.

At five weeks after set (WAS) initial survival record was taken as the hardening process commenced and continued till 7 WAS (Omolaja and Obatolu, 1999). From 12 WAS till 24 WAS the record was taken at weekly interval. Data generated were subjected to description analyses.

RESULTS AND DISCUSSION.

Table 1: Effect of rooting solutions on percent rooting success of half-node stem cuttings selected clones of *C. canephora* at 20 WAS.

	Clonal Percent Rooting Success			
Rooting solutions	C111	C90	M10	T1049
IAA	63	4.8	20	-
CNM	29	-	-	16
H20(Control)	33	-	-	13

Table 2: Percent rooting success of half and full-node coffea stem cuttings treated with IAA at 20WAS

	Percent clonal rooting success			
Nodal cuttings	**C111**	**C90**	**C36**	**M10**
½ node	**63**	**48**	**20**	**-**
Full-node	**-**	**23**	**42**	**80**

Table 3: Initial (5WAS) and final (20WAS) percent rooting success of half-node *Coffea* stem cuttings treated with rooting solutions

	Clonally percent rooting success and die back within 15 weeks											
Rooting solutions	**C111**			**C90**			**M10**			**T1049**		
	5 WAS	**20 WAS**	**Die back**	**5WAS**	**20 WAS**	**Die back**	**5WAS**	**20 WAS**	**Die back**	**5WAS**	**20 WAS**	**Die back**
1AA	**95**	**63**	**33.7**	**81**	**4.8**	**94.1**	**91**	**20**	**72.0**	**-**	**-**	**-**
CNM	**83**	**29**	**65.1**	**-**	**-**		**-**	**-**	**-**	**57**	**16**	**71.9**
H_2O (Control)	**87**	**33**	**62.1**	**-**	**-**		**-**	**-**	**-**	**73**	**13**	**1382.2**

Table 4: Initial (5WAS) and final (24WAS) rooting success of one node stem cuttings of *C canephora* treated with 1AA

Clonally percent rooting success and die back within 15 weeks			
Clones	**Initial**	**Final**	**Die back**
C36	**98**	**78**	**20**
C90	**83**	**22**	**73.5**
M10	**96**	**40**	**58.3**

Indole acetic acid (1AA) produced the highest rooting success both among and within the clones (table 1) Similarly, clone C111 gave the highest success in all the rooting solutions
Among the three clones: C111, C90 and M10 treated with IAA, the percentage success-take were 63, 4.8 and 20 respectively. While C111 responded favourably to 1AA treated, C90 belonging to the same variety responded poorly. This is buttress by the high percent die back (Table3). Treatment with CNM and H_2O **(contract)** followed the same trend with responding better than T1049 (16%) and 13% respectively) within the clone CIII did not respond favourable to caring as the central treatment gave a higher success-take (33%) than CMN (29%). The reverse was observed in of success-take of T1049 to CNM and H^2O (13%). Among the clones full-node stem cutting gave a higher rooting success than half-node when treated with 1AA (table 2).

In table 4 full node cutting of C36 responded best to 1AA by producing highest initial success-take (98%) and least die back (20%). Although M10 also gave a higher initial success-take but the final success-take was low (40%) cutting from a high die back (58.3%). C90 gave the least rooting-success, which reflected in the highest percent die back.

SUMMARY AND CONCLUSION:
The rooting solutions investigated IAA gave the best performance. In the same vein, clone CIII gave the best success-take. Full node stem cuttings produced a better success-take than half-node cuttings
There were missing data due to inadequate shoots for cutting preparation. The work shall be repeated in year 2004 to make up for this shortcoming.

TITLE 3: Establishment of seed garden using half-node rooted stem cuttings of Robusta Coffee (*Coffea canephora*)

SCIENTISTS: Adeyemi, E.A., Omolaja, S.S and Keji, K.E

INTRODUCTION:
In year 2002, the possibility of propagating Coffea through rooting of half-node stem cutting was explored and 70 percent success was attained (Adeyemi et al, 2003). There is the need to evaluate the field performance of these cuttings in the establishment of seed garden which will serve as a source of supplying improved planting materials to farmers; hence the justification of the study.

OBJECTIVES: (1) to evaluate the field survival of five clones of robusta coffee

(2) to assess yield output of the clones

MATERIALS AND METHODS:
Half-node rooted stem cuttings of three clones of robusta coffee namely: C36, C111 and T1049 belonging to two varieties viz: Quillou (C36 and C111) and java (T1049) were transplanted at 3.0x3.0 plant spacing into 0.25ha of land located directly opposite the office complex in Zone 1 at CRIN headquarters. Fifty stands of each of the clones were transplanted into two blocks of twenty-five *Coffea* stands per block using augmented design in five replications. Transplanting in the field was done with a ball of earth in July 2003. Plantain suckers planted simultaneously with *Coffea* 3.0x3.0 spacing served as nurse / shade plant.

Each *Coffee* stand was mulched with dry grass. Watering, using watery can was done thrice weekly in the dry season in order to maintain conducive soil moisture and temperature. At 9 months after transplanting (May) data on survival was taken and subjected to analysis of variance. Means were separated using least significant difference.

RESULTS AND DISCUSSION:

Table 1: Survival count of *Coffea* clones in block 1 at 9 MAT

Clones	Mean Survival Count
C 36	4.6^{ns}
C 111	4.0^{ns}
T 1049	3.6^{ns}

Table 2: Survival count of *Coffea* clones in block 2 at 9 MAT

Clones	Mean Survival Count
C 36	4.0^{ns}
C 111	4.4^{ns}
T 1049	3.0^{x}
LSD (0.05)	1.1

Mean survival count for block 1 was 4.6, 4.0 and 3.6 for clones C36, C111 and T 1049 respectively (table 1). The order of survival is C36 > C111 > T1049 though they are not different from each other. The same trend was obtained in block 2 (table 2). However, the survival count differs between varieties (p=0.05) with Quillou better than java. There is no different in survival within the Quillou variety though C36 had higher survival count than C111. The difference observed in block 2 could have been due to differences in soil nutrient between blocks 1 and 2.
Summary and conclusion: Quillou variety of *C canephora* established better than java in the field. Establishment gapping up, data collection and collation will continue in year 2004.

EXPERIMENTAL TITLE: Screening of coffee seedlings for resistance to root-knot nematode, *Meloidogyne incognita*

SCIENTISTS: S.B. Orisajo, O.A. Fademi & S. S. Omolaja

INTRODUCTION:
Root-knot nematodes are very destructive to Coffee Plantations (Huang et al;
1984) and may be found in the major coffee-producing regions of Central and south America and Africa (Whitehead, 1959; Aruda & Reis, 1962; Lordello, 1984). Meloidogyne species produces small-elongated galls that are located primarily at the root tips; in addition, roots may show cracks, necrosis, and sloughing of cortical tissue (Lehman & Lordello, 1982). The aboveground parts of the plant may show chlorosis, premature leaf drop, and symptoms typical of mineral deficiencies (particularly nitrogen and

zinc), and general signs of decline (Chitwood & Berger, 1960). The use of resistant varieties or rootstocks is the most economical and effective methods of limiting losses due to nematodes (Lordello, 1984), hence the need for screening coffee species for resistance to *Meloidogyne incognita.*

OBJECTIVE:
To determine the degree of resistance or susceptibility of selected coffee seedlings to infection by *Meloidogyne incognita.*

MATERIALS AND METHODS:
Topsoil used in the experimental was obtained from CRIN Headquarters. Approximately 2kg of the soil was weighed into each of the 2 litre-size polythene bags used as pots for the experiment. One seedling of the Coffee species was then transplanted and laid in a completely randomized design with six replications. Two weeks after transplanting, the pots were inoculated into 5,000 M. incognita eggs obtained from the culture maintained on the roots of *Celosea argentea* using Huskey and Barker (1973) Sodium Hypochlorite (NaOcl) method. Uninoculated units served as control. Normal watering of seedlings as obtains in coffee nurseries was carried out.

RESULTS AND DISCUSSIONS:
Preliminary investigations showed that coffee seedlings were susceptible to root-knot nematodes. Typical gall formations were seen on the roots with necrosis. The nematode actually reproduced on the crops (Table 1).

Table1: Influence of *Meloidogyne incognita* on Coffee seedlings

Parameter	Inoculated	Control
Galls	11	-
Number of juveniles	5,761	-
Reproduction factor ®	1.15	-

SUMMARY AND CONCLUSION:
More research will be carried out to ascertain the Coffee species resistant to this pathogenic nematode.

EXPERIMENTAL TITLE: Response of Coffee seedlings to organic manure amended with phosphate fertilizers in an Ultisol.
(Ibiremo, O.S, M. O. Ogunlade, and C.I Iloyanomon

INTRODUCTION:
Coffee production had declined over the years due to inconsistent Government policies especially marketing, poor soils. Pests and diseases resulting in farm abandonment or shift to other crops. However, one of the means to restore coffee production is through the used of organic mineral fertilizers. Organic-mineral fertilizer combines the attributes of organic fertilizers which include enhancing cation exchange capacity, improving soil structure and supporting microbial activities (Dada & Deckers, 1991), and that of inorganic fertilizers that take care of the immediate needs of the crop with higher efficiency.

OBJECTIVE:
To evaluate the effect of integrating phosphate fertilizers with organic manure on the growth coffee seedlings.

MATERIALS AND METHODS: Two organic manures (Ground cocoa pod husk, GCPH and ground Cowdung, GCD) were integrated with two phosphate fertilizers (single super phosphate, SSP and Sokoto rock phosphate, SRP). The manures were applied to supply 60kg N/ha while The phosphate fertilizers were applied to supply

30kg P205/ha the nine treatments were tested in a completely randomised design with three replications in a green house.

RESULTS AND DISCUSSION

The results indicated that SRP gave superior seedling performance in height leaf a And dry matter yield. The SSP when both applied at the same rate. The effect of GCD significantly improved the plant height and leaf area of coffee seedlings than GCPH ($P < 0.05$). The growth of coffee seedlings (height and leaf area) was improved as a result of GCD fertilisation with either SCP or SRP was generally better than GCPH fortification with SRP.

SUMMARY AND CONCLUSION:

Fortification of GCD and GCPH with phosphate fertilizers greatly improved coffee seedling growth. However in Ultisol SRP can be suitably substituted for SSP in coffee production.

Table 1: Influence of P-fortified organic fertilizers on some selected growth

	Treatment	Plant Height	Leaf area	Dry matter yield g/pot
1	SSP at 30kg P205/ha	43.20b	89.902	7.73ab
2.	SRP at 30kg P205/ha	55.80a	88.40a	12.082
3.	GCD fortified with SS P30kg, P205ha	54.50a	98.70a	12.03a
4	GCPH fortified with SS P 30kg P205/ha			
	GCD fortified with SRP 30kg P205/ha	42.90ab	79.50a	11.12ab
5.	GCPH fortified with SRP 30kg,205/ha	38.40b	81.60a	8.70ab
6	GCD	29.90bc	62.50ab	10.90a
7	GCPH	40.20ab	65.80ab	6.82b
8	Control (No fertilizer)	29.90c	62.10ab	15.72a
9	Mean	31.70bc	68.50ab	7.47b
	S.E.	41.48	77.41	9.58
		17.82	32.92	5.58

Values with the same letter in the column do not differ significantly at P =0.05 (DMRT)

CASHEW PROGRAMME (Leader: Dr. P.O. Adebola)

Experimental Title: Further selection of cashew germplasm with desirable qualities (High yielding jumbo nuts with consistent yield). O. M Aliyu

Introduction:

Cashew genotypes grown in the research plots of Cocoa Research Institute of Nigeria (CRIN), Ibadan both in the Headquarters and substations largely produced small to medium sized nuts which in the first instance attracts less premium when compared to the Brazilian jumbo nuts and also found to be less suitable for the processing plants. However, during the nationwide cashew survey jointly carried out by the Bio-Hybrids Agriculture System Limited, U.K and the Institute under they auspices of the STCP in 2001, cashew trees with desirable characteristics such as jumbo-sized nuts and high yield were identified in Kosoni-ola Farms, Oro, Kwara State, Innocent Audu Farms,Otukpo, Benue State, and TY Acres Farm, Takum, Taraba State. Selection of these valuable materials as germplasm stock is a prerequisite to their utilization in cashew breeding programme to achieve meaningful improvement in the crop species.

Objective: To broaden the genetic base of cashew germplasm in the Institute with Brazilian accessions for future use in selection and breeding of cashew varieties with desirable qualities for farmers.

Result: Out of the farms selected for the acquisition of nuts, only Kosoni-Ola Farm Ltd, **Oro, Kwara State was visited during the year under reference due to scarcity of fund. Open pollinated nuts were collected from these identified with proven qualities and bulk before it** was distributed to scientists and Officer-In-Charges (OICs) for planting in the headquarters and substations. However, about 3 tons of bulk harvest of the open pollinated nuts was also acquired and subsequently supplied to the National Tree Nursery Development Committee, for distribution to cashew farmers in Nigeria. Cashew germplasm plot in Zone 6 were also gapped with nuts from this collection. During the study visit to the farm (Kosoni-Ola Farm, Ltd), It was observed that 18 out of 25 trees identified with jumbo nuts and high yield in the 2001/2002 production season had consistent yearly fruiting habit, while the remaining 7 trees exhibited biennial fruiting characteristic.

Conclusion: It is suggested that more trees be selected in addition to those identified with consistent proven qualities for further observation and effort should be made to clonally acquired those already identified with good quality characteristics.

Experimental Title : Clonal propagation of improved cashew by budding and grafting.

(O.M. Aliyu)

Introduction: Cashew being an out-breeding crop tends to display high heterogeneity i.e. plants raised through open pollinated nuts would display high level of phenotypic and genotypic variability. Beside the fact that vegetative propagation is a fast, reliable and easy method of producing plants with desirable characters, it is a means of perpetuating genetic integrity of the desired plant characters in the offspring. In order to produce true-to-type improved planting material for farmers, there is need to improve on the level of success of these propagation techniques (grafting and budding).

Objective: To improve on clonal propagation techniques of budding and grafting in cashew.

Materials and Methods: 10 cashew trees (accessions) with medium-sized nut characteristic were selected and 40 open pollinated nuts were collected from each of the trees. The nuts were sown in polypots filled with topsoil to raise the rootstocks for the grafting trial and the experiment was laid out using randomized complete block design (RCBD) with three replications. Grafting operation was carried out on 2.5 months old cashew rootstocks (Aliyu, 2001) and 4 grafters were employed in the operation and their skill was also considered as factor. Budding tape was removed 21 days after grafting operation and data were collected on number of successful grafts (take and survival).

Results and Discussions: The data obtained from this study was statistically analyzed and presented in Tables 1, 2, 3 and 4 below.

Table 1: Analysis of variance of number of successful grafts 21DAG.

Source of variation	Degree of Freedom	Sum of squares	Mean squares	F value	Probability level
Replication	2	8.60	4.30	4.74	.0114*
Grafters	3	16.30	5.43	5.99	.0010***
Accessions	9	44.47	4.94	5.45	.0000***
Grafters x Accessions	27	13.20	0.49	0.54	$.96^{ns}$
Error	78	70.73	0.91		
Total	119	153.3			

DAG: Day after grafting. ns: Not significant, *: Significant at <0.05, **: Significant at <0.001 and ***: Significant at <0.0001.

Table 2: Analysis of variance of number of surviving grafts 90DAG

Source of variation	Degree of Freedom	Sum of squares	Mean squares	F value	Probability level
Replication	2	2.85	1.43	2.62	.795^{ns}
Grafters	3	17.60	5.87	10.77	.0000***
Accessions	9	39.63	4.40	8.09	.0000***
Grafters x Accessions	27	18.23	0.68	1.24	.2297^{ns}
Error	78	42.48	0.55		
Total	119	120.80			

DAG: Day after grafting. ns: Not significant, *: Significant at <0.05, **: Significant at <0.001 and ***: Significant at <0.0001.

Table 3: Mean performance of accessions used as rootstocks in the trials

Accession No.	Number of take	Number of surviving grafts
1	1.75bcd	0.92b
2	1.67cd	0.83b
3	1.0d	0.5b
4	2.42abc	1.83a
5	2.42abc	1.75a
6	2.58abc	1.83a
7	1.75bcd	0.83b
8	1.0d	0.33b
9	2.67a	1.67a
10.	1.25d	0.5b

Table 4: Mean performance of Grafters in the trials

Grafters No.	Number of take	Number of surviving grafts
1	2.47a	1.70a
2	1.50b	0.63c
3	1.77b	1.03b
4	1.67b	1.03b

The results however showed that there was significant difference attributed to both accessions and skill of the grafters, in other words the suitability and compatibility of rootstocks is genotype specific in addition to the skill of grafters. It means that the two components play significant role in the success of grafting operation in cashew. Interaction of these two factors was however not significant for both number of take and number of surviving grafts 90 days after grafting (Tables 1 and 2). From the mean performance of the accessions, accessions tagged 4, 6, 5 and 9 could be regarded as been more suitable as rootstocks than the other six with mean number of take and survival ranging from 2.42 to 2.67 and 1.67 to 1.83 respectively. Asadullah and Khan (1960) reported similar result on mango. This performance found to be relatively consistent from number of take to the number of surviving grafts suggestive that the attribute is inherent and it can be selected for.

Skill of grafters was also found to be very important as shown by the result of this study. It was observed that grafter number one (G1) was more skillful than the three others as shown in Tables 3 and 4. Garg (1954) and Litz (2000) also reported significant effect of grafters' skill on vegetative propagation of mango by grafting technique.

However, the result obtained in the budding trial was very poor in the year under review and lack of resources (human and materials) hindered the repeat of the study. The experiment continues in Year 2005.

CASHEW PROGRAMME (Leader: Dr. P.O. Adebola)

Experimental Title: Ecology of the cashew leaf miner, *Acrocercops synagramma* Meyricki (Lepidoptera: Lithocolletidae). (Okelana, F.A. and J.C. Anikwe).

Objective: To monitor the occurrence of the cashew leaf miner, *Acrocercops synagramma* on cashew at CRIN Headquarters.

Methodology: Twenty stands of cashew at each of two locations viz; around the office complex and nearby North plot at CRIN Headquarters were selected randomly, every week, making a total of 40 stands. Four branches at hand height were chosen per tree and the number of leaves with active (fresh) mines of the pest were counted and recorded. Total and mean weekly values of mines per month were computed.

Results: The cashew leaf miner, *Acrocercops synagramma* occurred in eleven out of twelve months of the year at both locations. The leaf miner was absent in April at both sites with very low incidence in March, especially on the North plot (Table 1). A peak population of the pest was recorded in August around the Office Complex and in October on the North plot stands. There was a generally higher incidence of the pest on the office complex stands than those at the north plot as presented in Table 1. Tender cashew leaves were more susceptible to the miner's attack than the old leaves.

Constraint: Lack of funds to conduct other aspects of studies on the pest.

Table 1: 2003 Incidence of the cashew leaf miner *A. synagramma* on cashew at two **locations at CRIN Headquarters, Ibadan.**

Mean weekly number of leaves with fresh mines

Month	Office Complex	North Plot
January	12.7	7.3
February	3.3	5.3
March	4.0	2.0
April	0.0	0.0
May	8.3	4.8
June	16.0	10.5
July	24.4	9.6

August	57.3	9.0
September	23.2	9.6
October	17.3	12.5
November	11.8	5.5
December	20.0	11.2

Cashew Programme (Leader: Dr. P.O. Adebola)

Experimental Title: Control of an outbreak of insect pests on newly establishe plantation. (Asogwa E.U. and J.C. Anikwe)

Introduction: Cashew (*Anacardium occidentale)* belongs to the genus *Anacardium*. It is a member of the family *Anacardiaceae*, the family to which also the Mango (*Mangifera indica*) belongs. The family comprises of about 60 genera and 400 species of trees and shrubs. There was an observed case of serious foliage defoliation, girdling of young stems and die back of seedlings at the established cashew plot at Zone 5, CRIN headquarters by a team of Entomologists and Agronomists. This therefore necessitated the immediate initiation of a chemical control measure to quell their attack and bring down their population to far below the economic threshold level.

Objective: To bring under control a sudden outbreak of cashew seedling pests at CRIN plantation.

Methodology: The incidence of the foliage defoliation, girdled stems and die back of the seedlings were taken before spraying the plot. The pre-spray numbers of the insect pest complex were also recorded. All the girdled stems were collected outside the plots where they were allowed to dry before burning them. The plot was then sprayed at the recommended rate of 0.25% a.i. with an insecticide containing 600EC diazinon as the active ingredient. Post spray records on the number of insect pests found on the plot were taken 24hrs, 2 weeks and 1 month after insecticide application. The plot was subsequently monitored for the presence of insect pests of cashew seedlings.

Result: The result of the experiment is presented in Table 1.

Table 1: Control of insect pests of cashew seedling at CRIN Hq, Ibadan

Insect pest type	Pre-spray count	Post-spray-count		
		24hrs	14days	30days
1. *Analeptes trifasciata*	4	-	-	-
2. *Euprotis fasciata Wlk*	22	-	-	-
3. *Acrocercops synagramma*	13	-	-	2

4. *Pachnoda cordata*	4	-	-	-
5. *Parapoderous fuscicernia*	42	-	-	-
6. *Anoplecnomis corvipes*	2	-	-	-

Conclusion: The burning of the collected girdled stem from the plots was to kill the eggs and the developmental stages of *A. trifaciata* present inside the cut stems. Insect pests inflicting damage on cashew seedlings will further be monitored on the three-cashew seedling plots within the estate.

Title of Programme: Cashew programme (Leader: Dr. Adebola)

Experimental title: Pathogenicity of *Colletotrichum gloeosporioides* on cashew seedlings

(Dongo, L.N., Orisajo, S.B. and Otuonye, A.H.)

Introduction: Cashew has been described as the most variable agricultural plant that can produce 40kg (881bs) of nuts in one year and then decrease to zero production the following year largely because of disease (Hilton, 1998). One of such diseases is the anthrocnose caused by *C. gloesporioides.* The fungus thrives under wet conditions and can cause almost total crop failure. It also affects other tropical fruit trees such as mango, guava, avocado, papaya and citrus. (Tricita *et al,* 1975). Serious damage to the inflorescence of cashew by *C. gloesporioides* has been reported from Tanzania. (Intini & Sijaona, 1983).

There is no available report of the disease on cashew in Nigeria, and this necessitated this study.

Objectives: (1) To isolate and identify the organism from infected plant parts.

(2) To determine its pathogenicity on cashew seedlings

Materials and Methods

Isolation of Cultures: Isolate of *C. gloesporioides* was obtained from small pieces of tissue cut from the leaves (showing dark brown necrotic spots on the leaves) of an infected cashew plant by surface sterilizing in 1% Sodium hypochlorite solution for five minutes and plating out on potato-dextrose agar (PDA) containing 100 PPM streptomycin. After 205 days at about 22^{o}C, colonies with characteristics of C. *gloesporioides* were transferred to fresh plates of PDA and sub-cultured to obtain pure isolates. Microscopic examination of the isolated organism was undertaken for confirmatory purposes.

Growth of Pure cultures: 9.0 cm petri dishes containing 15-20ml of PDA were inoculated centrally with 5mm diameter disks cut from the margins of active colonies on PDA. They were incubated at 22^{o}C for 5 days. The cultures were maintained in test tubes over paraffin oil for long-term storage.

Pathogenicity studies: Detached young leaves were inoculated on the abaxial side with mycelia disks of agar. The leaves were then put in petri dishes lined on the bottom with a wet blotter paper and the covered. Incubation was done at 25^{o}C for 7 days. A re-isolation of the organism was attempted to confirm pathogenicity.

Results and Discussion:

Morphology of isolate: The isolate was identified as *C. gloesporioides* based on the microscopic examination of the spores and partly on the nature of mycelia examination of the isolate organism reveals the formation of setose acervuli in culture. The conidia are ellipsoidal, nonseplate and hyaline. They are produced at the tip of phialide conidiophores that arise from the stromatic base.

Pathogenicity studies: Inoculation of the isolate on detached young leaves induced typical dark brown necrotic spots. After re-isolation from inoculated leaf, the organism was found by microscopic examination to posses the same characteristics to those originally isolated. These results indicate that *C. gloesporioides* is the causal organism of the cashew leaf spot.

Summary and conclusion:

The pathogenicity of *C. gloesporioides* on detached young leaves of cashew has been confirmed. However, its pathogenicity on cashew seedling using different techniques will be attempted. There was difficulty in propagating cashew using seeds toward November/December.

References:

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(3) Quimio, T.H. and Quimio. A.J. (1975). Note on Philippine grape and quava anthracnose. *Plant disease reporter, vol. 59 (3):* 221-224.

Title of Programme: Cashew Programme (Leader: Dr. Adebola)

Experimental title: Sources of Inoculum in the yearly re-infection of cashew plantation by the Inflorescence blight fungus, *Lasiodiplodia theobramae* (Dongo, L.N., Agbeniyi, S.O. and Otuonye, A.H.).

Introduction: Olunloyo (1979) reported 38.70% average loss per hectare in total cashew nut yield at Iwo cashew plantation due to the floral shoot disease of cashew caused by the *Lasiodiplodia theobramae* fungus. In light of these facts, the present investigation is undertaken to identify the medium for the fungal survival during the absence of flowers on cashew tree, as this fungus attack has continued to affect the yield of this economic tree year in year out.

Objective: To identify the sources of inoculum and the routes of infection of the fungus.

Materials and Methods: Soil medium were collected with the aid of soil auger at a depth of 0-25 cm from five different spots from SW3/1 plot, cashew nursery, newly established cashew plot toward Onipe gate in CRIN headquarters. The samples were subjected to laboratory examination by using the serial dilution technique. The resulting filtrates were then plated out on PDA. Subsequent isolations to separate and obtain pure cultures of the fungal colonies that resulted before microscopic examination followed.

Result: Laboratory phase of the experiment is on going.

Constraints: Fund availability limited the scope of this investigation, as most of the materials needed to fully execute the research activities could not be bought. Also the incessant electricity power outage for several weeks and months experienced last year compounded issues, as many times the laboratory phase of the investigation had to be repeated. Hence, the other phases that involves microscopic examination and inoculation using the technique of Burdakin (1963) to confirm result could not be carried out.

Continuation: This year, Musa spp. (Banana) that were found around plots near the cashew plantation and have been reported by Kuanz *et al*., (1978) to host this fungus will be investigated. Also, cashew parts, stem, root and twigs will be examined.

Experimental Title: Germination and seedling performance of cashew (*Anacardium occidentalke,*L) as affected by nut-sowing orientations and cotyledon removal in the nursery. (Adeyemi E.A and Hammed L.A).

Introduction: Cashew (*A. occidentale,* L.) is a fast-growing tree crop reaching maximum germination rate at 4 weeks after sowing (WAS) (Hammed and Aliyu, 2002; Adeyemi and Hammed, 2003). This important trait perhaps, bends the cultivation of the crop to direct seeding method of sowing by some farmers besides eliminating the costs of nursery materials and operations. The germinating seedling develops its root system, especially, tap-root, naturally with no disturbance to the rhizosphere (Ohler, 1979). Despite the cost effectiveness and time-sowing of this method of sowing, its major set back, among others, includes marauders: rodents, monkeys and lizards preying on the emerging freshly green cotyledons of the seedlings. This problem equally applies to potted cashew seedlings in the nursery. This the affected seedlings either be 3 come weal and hardly recover or completely destroyed by theses predators. A large population of cashew seedling could be lost to cotyledon predation, especially, where these predators are numerous.

The experiment is set up to find agronomic solution to in addressing the problem, the practicability and feasibility of the solution to the majority of the cashew farmers is considered.
Objectives: (1) To agonomically address the problem of cotyledon predation in cashew seedlings by studying the effects of cotyledon removal on the performance of cashew seedlings in the nursery, and (2) To study the effects of nut-sowing orientation on the germination and seedling performance of cashew in the nursery.

Methodology: The experiment was set up under a matured cashew tree (with scattered shade) at the headquarters of CRIN, Ibadan. Consisted of only the current year, medium-nut size of cashew, the experiment was a 2 factor Laid out in split plot in randomized complete the block with three replications. The blocking was to eliminate the effect of sun's orientation of the canopy shade: While factor A was sowing orientation (SO) at five level: stalk-end up (SEU), stalk-end down (SED), Flat (F), stylar-end up (STU) and stylar-end down (STD), factor B consisted of seedling cotyledon removal (CR) at four levels: 1- cotyledon removed (CRI) 2-cotyledons removal (CR2) cotyledon earthen up (CB) and the control (CO) in which the cotyledons were intact.

Forty cashew nuts were sown per each of the factor A level per replication at a depth of 3cm. Five uniformly germinated seedlings were sleeted from each of factor A levels for each of factors B level. Eventually, there were 20-cashew seedling per replication for each of factor B levels. Factor B was imposed immediately the plumule elongates at which period the freshly green cotyledons becomes conspicuous and attractive to the predators (marauders) on the field.

Germination rates at 2,3 and 4 WAS were taken for factor A. plants vigour (performance) of the resultant seedlings, after the application of factor B, was quantitative assessed through the plant height, number of leaves, leaf area and stem circumference at 4, 8 and 12WAS> The data obtained were analysed through the analysis of variance procedures and the mean performance of the plants were separated using LSD.

RESULTS:

Sowing orientations of cashew nuts recorded significant (P<0.01) effect (Table 1) on the mean germination and earliness in the germination of cashew nuts in the nursery 2, 3 and 4 WAP. Nuts sown flat and those sown with their stylar-end up germinated early and recorded maximum mean germination of 91.67 and 92.50 respectively while nuts sown with stalk and down germinated poorly (Table 2). Non of the sowing orientations was able to naturally bury the cotyledons of the germinating cashew seedlings in the soil.

Removal of the cotyledon of the seedlings recorded significant (P<0.01) effects in all the plant vigour parameters estimated for, and in almost all the period of observation (Table 3). While sowing orientation only recorded significant (PN0.05) effects in one of plant height and number of leaves, the factor did not significantly interact with cotyledon removal (P<0.05) (Table 5). Although, stylar-end up recorded highest germination rate (Table 2) but its performance with respect to plant height irrespective of the cotyledon removal is low compared to others. With cotyledon removal, however, cashew seedlings with the two cotyledons removed CR2 performed poorer compared to others especially the control (Table 4). Similar performances were observed in the number of leaves of cashew seedlings with respect to cotyledon removal. Seedlings with the two cotyle3dons removed (CR2) produced the least number of leaves, while the control recorded the highest number of leaves though statistically the same with that of earthen-up cotyledons (CB) 4WAP and 8WAP (Table 5). The effects of cotyledon removal on leaf area was not different from above (Table 6). While the CR2 recorded least leaf area, the control had the highest followed by CB. Stem circumference assumed similar pattern of response to cotyledon removal (Table 7).

Table 1: Germination rates of cashew nuts as affected by sowing orientations in the nursery (n=600).

Observation period	Mean germination	C.V (%)	Sowing orientation (SO)
2 WAP	8.33	39.88	9.72 **
3 WAP	51.63	20.74	15.99**
4 WAP	76.50	12.07	10.18**

Note: C.V (%) = coefficient of variation
WAP = Weeks after planting
** = significance at P<0.01

Table 2: Comparisons of mean germination rates of cashew nuts as affected by sowing orientation of nuts in the nursery.

Sowing orientation (SO)	2 WAP	3WAP	4WAP
SEU (Stalked-end up)	3.33	35.83	77.50
SED (Stalked-end down)	2.50	22.33	51.67
F (Flat)	15.83	75.00	91.67
STU (Stalked-end up)	13.33	79.17	92.50
(STD (Stalked-end down)	6.66	45.83	69.17
LSD (0.05)	6.62	20.17	17.39

Table 3: Performance of Cashew (*A. occidentale)* seedlings as affected by sowing orientation of nuts seedling cotyledon removal in the nursery (n=300)

Variables	Means	Sowing orientation (SO)	Cotyledon removal (CR) F=ratio	So x CR
4WAP:				
Plant height (cm)	12.33	4.75*	15.00**	0.68^{ns}
Number of leaves	6.06	2.00^{ns}	10.61**	0.50^{ns}
Stem circumference (cm)	1.42	0.99^{ns}	2.21^{ns}	0.60^{ns}
Leaf area (cm2)	19.26	2.46^{ns}	5.34**	0.15^{ns}
8WAP:				

Plant height (cm)	19.26	1.06^{ns}	18.75**	0.68^{ns}
Number of leaves	9.7	3.99^{ns}	27.74**	0.79^{ns}
Stem circumference (cm)	1.58	0.52^{ns}	15.17**	0.64^{ns}
Leaf area (cm2)	22.28	0.63^{ns}	15.48**	0.37^{ns}
12WAP:				
Plant height (cm)	24.21	5.57^{ns}	41.66**	0.90^{ns}
Number of leaves	12.77	2.02^{ns}	10.31**	0.34^{ns}
Stem circumference (cm)	1.89	2.06^{ns}	23.85**	0.73^{ns}
Leaf area (cm2)	36.35	1.34^{ns}	11.68**	0.36^{ns}

Note: * = Significance at P<0.05

** = Significance at P<0.01

ns = Not Significance at P<0.05

WAP = Weeks after planting

Table 4: Comparisons of mean plant height (cm) of cashew seedlings as affected by sowing orientation of nuts and removal of seedling cotyledon in the nursery.

Treatment Factor	4WAP	8WAP	12WAP
Sowing orientation:			
SEU (Stalked-end up)	13.96	ns	26.75
SED (Stalked-end down)	9.42	ns	21.98
F (Flat)	14.44	ns	26.00
STU (Stalked-end up)	13.27	ns	24.95
(STD (Stalked-end down)	9.58	ns	21.35
LSD (0.05)	3.65		4.02
Cotyledon removal:			
CB (Earthen-up cotyledon)	13.72	19.10	22.78
CR1 (1 cotyledon removed)	13.12	18.43	22.10
CR2 (2 cotyledon removed)	8.78	14.42	17.25
CO (control)	12.92	25.10	34.69
LSD (0.05)	1.69	2.94	3.32

Note: ns = significant (PL0.05)

Table 5: Comparisons of mean number of leaves of cashew seedlings as affected by sowing orientation of nuts and removal of seedling cotyledon in the nursery.

Treatment Factor	4WAP	8WAP	12WAP
Sowing orientation:			
SEU (Stalked-end up)	Ns	9.88	ns
SED (Stalked-end down)	Ns	8.67	ns
F (Flat)	Ns	10.71	ns
STU (Stalked-end up)	Ns	10.25	ns
(STD (Stalked-end down)	Ns	9.33	ns
LSD (0.05)		1.30	
Cotyledon removal:			
CB (Earthen-up cotyledon)	6.97	10.83	13.53
CR1 (1 cotyledon removed)	6.27	9.73	12.17
CR2 (2 cotyledon removed)	4.70	6.77	10.07
CO (control)	6.30	11.73	15.30
LSD (0.05)	0.85	1.16	1.41

Note: ns = Not significant (PL 0.05)

Table 6: Comparisons of mean leaf area (cm^2) of cashew seedlings as affected by sowing orientation of nuts and removal of seedling cotyledon in the nursery.

Treatment Factor	4WAP	8WAP	12WAP
Cotyledon removal:			
CB (Earthen-up cotyledon)	23.48	22.71	36.17
CR1 (1 cotyledon removed)	20.41	21.74	35.73
CR2 (2 cotyledon removed)	12.83	13.68	25.76
CO (control)	20.34	30.99	47.61
LSD (0.05)	5.67	5.20	8.39

Table 7: Comparisons of mean stem circumference (cm) of cashew seedlings as affected by sowing orientation of nuts and removal of seedling cotyledon in the nursery.

Treatment Factor	4WAP	8WAP	12WAP
Cotyledon removal:			
CB (Earthen-up cotyledon)	ns	1.56	1.82
CR1 (1 cotyledon removed)	Ns	1.52	1.74
CR2 (2 cotyledon removed)	Ns	1.35	1.48
CO (control)	Ns	1.91	2.52
LSD (0.05)	Ns	0.18	0.23

Note: ns = not significant (PL 0.05).

Experimental Title:

Establishment, yield and yield components of cashew plant (*A. occidentale,* L.) as affected by high planting density. (Hammed L.A. and Adeyemi E. A.)

Introduction: Cashew is grown in all ecological zones of Nigeria; It is extensively cultivated in the north-central or middle region of the country. Like coca, cashew is of international commerce and the increase in the global demand of the crop for processing into kernel and other by-products has further generated the influx of the affluent farmers into the agri-business of the crop. This development now faces the problems of increasing the productivity per hectare. High density planting (HDP) provides an intervention technology that of satisfies the yearnings of increasing the productivity per plot of cashew. High density planting is defined as the one with a plant population in excess of that which would produce maximum yields at maturity when individual plant can grow to its full natural size (Posnette, 1981). HDP has been found to astronomically increase the nut yield per hectare of cashew (Salaam, 1997).

Objectives: (1) To study the effect of HDP on the establishment of cashew using early growth attributes.

(2) To study the consistent nut yield per plot of cashew with time through HDP.

(3) To determine the implication of the technology on the fruit quality of cashew.

Materials And Method: The experiment was laid out in RCD with three replications. Cashew nuts of jumbo size (<169) was used for planting. The treatments include 123 plants/ha (9m x 9m), 204 plants/ha (7m x 7m), 400 plants/ha (5m x 5m), 816 plants/ha (3.5m x 3.5m) and 1,600 plants/ha (2.5m x 2.5m). The need to afford even light interception necessitates planting at square spacing.

Result And Discussion: Re-establishment in progress. Lack of adequate manpower for labour hindered the last establishments made.

Experimental Title: Assessment of floatation test as a criterion for Germinability of

Cashew nut.(Adeyemi, E.A. and Hammed, L.A.)

Introduction

Production of cashew (Anacardium occidentale, L) is generally from nuts. Germinability of nut is determined by floatation, whereby nuts are soaked in water for 24 hours, during which some nuts float while others sink. Floaters are usually discarded because it is assumed that most of them will not germinate into vigorous seedling suitable for field establishment. Floaters, which are discarded sometimes, represent up to 40 percentage of seed lot.

Objectives

- To assess the floatation test as a criterion for germinability of cashew nuts.
- To determine factors responsible for floatation of nuts is cashew.
- To increase availability of planting materials in cashew

Materials and Methods:

Iwo selections cashew nuts of 7.6g mean weight harvested from cashew plantation located at North East Block, CRIN Headquarters, Ibadan were used for the experiment. Three months after harvest, the nuts were soaked in water at ambient temperature for 24 hours. Forty nut samples for each of floaters and sinkers were randomly selected, systemically split and assessed the kernel for maturity and complete filling of the shell by the kernel. Floaters and sinkers were sown separately at 5cm depth in polythene pots containing forest topsoil. The experiment, which was sited under a cashew plantation at CRIN Headquarters, Ibadan, was conducted twice each in years 2001 and 2002. It was laid out in a Completely Randomised Design in three replicates. Germination count was done 3 and 4 weeks after sowing and the data were subjected to descriptive statistical tools and analysis of variance (ANOVA).

Results and Discussion

Table 1 shows the statistics of the assessment of the nut. In the 40 sample nuts for each of floaters and sinkers, total spaces calculated in the shell were 20.66 and 13.70 respectively. The higher space in the floaters than in sinkers could have been responsible for the floatation. Minimum internal space was zero in the two categories of nut. This implies that some floaters had no space in the shell nonetheless, they floated. Sixteen (16) and nine (9) nuts of sinkers and floaters respectively had their shell completely filled by the kernel. Examination of the kernel showed state of immaturity among floaters, which could have been a factor responsible for the floatation of nuts internal space.

Result of germination showed that there was no significant difference in germination between floaters and sinkers. Mean percentage germination for floaters and sinkers at 4 weeks after sowing (WAS) were 93.15 and 91.67 for first and second trials respectively in year 2001. The same trend was observed in year 2002 (Table 2). Coefficient of variation of 5.45 and 6.30 obtained in year 2001 first and second trials respectively further buttress the fact that floaters and sinkers were not different in germination.

Visual observation of the seedlings of floaters and sinkers showed no difference in vigour. The seedlings were transplanted to the field for comparative field performance.

Summary and Conclusion

Conclusively, results of this experiment have revealed that floaters are as good as sinkers for use as planting materials. Floatation in cashew is attributable to two factors namely: presence of unfilled larger space in floaters as compared to sinkers and the immature state of kernel observable in floaters. There is then the need to research into a reliable method for testing viability of cashew nut prior to sowing.

Table 1:physical parameters of floaters and sinkers of cashew nut

Physical parameters	sinkers	floaters
Total space estimation (cm^3)	13.70	20.66
Mean of total space estimation	0.33	0.5
C.V (%)	8.60	8.57
Minimum internal space (cm^3)	0.0	0.0
Maximum internal space (cm^3)	1.0	1.05
Mode of existing internal space	0.0	0.5
Number of nuts totally filled with kernel	16	9
Percentage germination	93.59	85.24

Table 2 Variations in % germination of floaters and sinkers of cashew nuts 4 WAS

Treatment	**Mean**	**F-ratio**	**C.V (%)**
2001 first trial	93.15	2.45^{ns}	5.45
Second trial	91.67	4.50^{ns}	6.30
	2002 Experiment:		
First trial	85.30	0.06^{ns}	0.91
Second trial	88.23	5.98^{ns}	6.66

Title of Programme: Cashew Programme (Leader Dr. Adebola, P.O.)

Experimental Title: Response of cashew seedlings from different nut sizes to phosphate fertilizers and VAMY corhizal inocalation. (Ibiremo O.S., M.O. Ogunlade/ C.I Iloyanomon and A.A. Yabagi).

Introduction: Recently, cashew plantations are springing up across the country and the demand for cashew nuts is very high especially large nuts because of their growth characteristic in terms of etc. fertilizer at planting together with Vamycoorhizal inoculations can greatly improve the growth of seedling from small nuts.

Objective: (1) To determine the effect of phosphate fertilizer, Vamycorrhizal inoculation on growth seedling from different cashew nut sizes.

Materials and Methods: The study was a factorial experiment carriedout in a greahow in 2003. Twelve treatment combinations comprising two cashew nut size (small size of 4 to 6g per nut and large nuts of 8-12g/nut); 3 types of phosphate fertilizer (no P application; P-application through SSP and Por- P application through Sokoto rock phosphate) and tro Vamycorrhizal inoculation (with – M, or without Mo). The experimental design was a completely randomised design with three replications. The nuts were planted in 5kg topsoil obtained from the cashew plantation with in the Estate at 0-30cm depth. The phosphate fertilizers were applied at 30kgP205/ha while 20g of the Vamycorrhiza was applied just below the nuts.

Results and Discussion: The effect of Vamycorrhiza inoculation on cashew seedling height was significantly higher than see those without inoculation at 2 and 4 M AP(P 0.05). Similar observation was obtained for dry matter yield at 4M AP (Table 1. The interaction effect of phosphate fertilizers (SRP & SSP) with Vamycorrhiza significantly enhanced both the dry matter yield and seedling height at 2 (MAP) (P 0.05). Plant height of cashew seedlings from large nuts was significantly improved when compared with small nuts in 2 and 4MX P.

TABLE 1: PLANT HEIGHT AND DRY MATTER OF CASHEW SEEDLINGS AS INFLUENCED BY CASHEW NUT PHOSHATE FERTILIZERS AND VAMYCORRHIZAL INOCULATIONS AT 2 AND 4 WAP.

	PLANT HEIGHT (CM)		DRY MATTER (G)
	2MAP	4MAP	4MAP
TREATMENTS			
PHOSPHORUS (P)			
No Phosphorus	18.54b	24.29a	7.53a
Single Super Phosphorus	23.42a	32.61a	6.17c
Sokoto Rock Phosphorus	23.58d	21.89b	6.86b
SE + (0.05)	0.512**	0.323**	0.190**
NUT SIZE(S)			
Small Nut	15.39b	16.92b	5.04b
Larger Nut	28.31	29.61	8.67a
SE + (0.05)	0.418	0.263	0.155**
MYCORRHIZA			
No Mycorrhiza	18.83b	20.90b	6.73
Vamycorrhiza	24.87a	25.63a	6.98
SE + (0.05)	04.18a	0.265**	0.155NS
INTERACTION			
P X S	NS	NS	**
P X M	**	**	**
S X M	**	**	NS
P X S X M	**	**	**

Means with the same letter(s) within the same treatment group and column are not significantly different at 50% level of probability using Duncan Multiple range test.
Abbreviations

*Significant at 5% level of probability **Signification at 1% level of probability

NS – Not Significant MAP months after planting

Se – Standard Erro

Table 2: Interaction effect of phosphate fertilizer and vamycorrhiza on plant height (cm) and Dry matter yield of cashew seedlings.

		Plant Height (cm)				Dry matter	
Treatment Interactions		**2MAP**		**4MAP**		**4MAP**	
P X M		M0	M1	M0	M1	M0	M1
	P0	14.50c	22.58b	20.80d	27.8a	7.76a	7.29a
	P1	20.50c	26.80a	21.58d	25.68a	5.70c	6.64b
	P2	21.05c	25.22a	20.37d	23.42d	6.72b	7.00a
		SE ± (0.05)	0.724**	SE± (0.05)	0.456**	SE ± (0.05)	0.268**
SXM		M0	M1	M0	M1	M0	M1
	S1	10.89d	19.90c	13.87d	19.97c	4.70	5.37
	S2	26.78b	29.83a	27.93b	31.29a	8.76	8.58
		SE ± (0.05)	0.591**	SE ± (0.05)	0.372**	SE ± (0.05)	0.219ns
PXS		S1	S2	S1	S2	S1	S2
	P0	12.62	24.47	17.88	30.70	6.66b	8.39a
	P2	16.48	30.37	17.17	30.05	3.43d	8.91a
	P2	17.08	30.08	15.70	28.05	5.02c	8.71a
		SE ± (0.05)	0.724ns	SE ± (0.05)	0.456**	SE ± (0.05)	
/PXSXM		M0	M1	M0	M1	M0	M1
	P0	S1 7.10c	18.13d	S1 12.70a	23.07c	S1 6.04d	7.29c
		S2 21.90c	27.03b	S2 28.90c	32.50a	S2 9.49a	7.29c
	P1	S1 9.40c	23.57c	S1 14.17h	20.17j	S1 3.16f	3.70f

	S2	30.70ab	30.03d	S2	28.90c	31.20ab	S2	8.24 bc	9.57a
P2	S1	16.17d	18.00d	S1	14.73h	16.67g	S1	4.91c	5.12dc
	S2.	27.73b	32.43a	S2	26.00d	30.17ab	S2	28.53ab	8.88ab
	SE ±	(0.05)	1.024**	SE ±	(0.05)	0.645**	SE ±	(0.05)	0.379**

Means with the same letter (s) within same treatment are not significantly different at (P>0.05) using DMRT.

Abbreviations

* Significant at 5% level of probability
P1 = Without phosphorus.
Ns = Not significant
MAP = Months after planting
SE = Standard Error
P1 = Single super phosphate
S1 = Small Nut
M0 = Without mycorrihiza
** Significant at 1% level of probability
P2 = Sokoto rock phosphate
S2 = Large nut
M1 = With Vmycorrhiza

TEA PROGRAMME
ANNUAL REPORT 2003

Title: Effect of organic and NPK fertilizers on tea (*Camellia sinensis* L.) performance in a humid ecological area of south western Nigeria

Introduction:

The legendary history of the tea plant dated back to about 3000 BC but it got to Nigeria by 1971 with commercial cultivation on the Mambilla plateau. The annual tea leaf yield from the Mambilla has become grossly too low to meet the optimum capacity need of the Nigerian Beverage Company and other allied companies in Nigeria that needs tea leaves as their raw material. The shortage in tea leaf supply was a combination of factors among which are: limited land area for field expansion as well as inadequate inorganic fertilizer supply to meet farmers need for tea production. This investigation was to look into the possibility of growing tea in the humid area of Ibadan with large expanse of land to determine the rate of both organic and inorganic fertilizers for optimal tea performance.

Materials and methods:

The experiment was carried out at Idi-Ayunre location of the Cocoa Research Institute of Nigeria (CRIN), Ibadan. Tea seedlings were collected from Kusuku, Mambilla and were allowed to equilibrate for two weeks before transplanting into plastic pots filled with top soil collected at 0-15 cm depth. Organic fertilizer materials in form of cocoa pod husk CPH), cow-dung (CDG), poultry dropping (PDG), Siam weed (SWD) and tea fluff (TFF) were applied at 0, 75, 150 and 300 kg N/ha. The treatments were applied in four replicates and arranged in a completely randomized design (CRD). Data on growth parameters were taken on monthly basis for 12 months and analyzed statistically using the least significant difference (LSD) at 5% for mean separation.

Results and discussion:

The various fertilizer types and rates showed statistically significant treatment effect on the tea seedling parameters ($P = 0.05$). The cow-dung gave the highest average height value, followed by Siam weed, poultry dropping, NPK, tea fluff and cocoa pod husk (Table 1). These values except for cocoa pod husk were superior to the control value. The average tea stem girth values showed that Siam weed was followed by NPK, PDG, CDG, TFF CPH in a decreasing order. The plant number of leaves indicated the trend CDG > TFF > SWD > PDG >NPK > CPH, while the optimal number of branches was produced by CDG and SWD treatments. Mean leaf area showed that NPK, CDG, TFF, SWD, PDG and CPH was the order of performance in a decreasing order. The rate of application indicated that NPK, Siam weed, cow-dung, tea fluff and cocoa pod husk were optimal at 150 kg N/ha, while poultry dropping was better at 75 kg N/ha.

Table 1: Organic and NPK fertilizers on tea growth parameters

Treatment	Height (cm)	Girth (cm)	Number Of leaves	Number of Branches	Leaf Area (cm^2)
CPH					
75kgN/ha	15.50	3.05	8	5	123.23
150,,	12.17	3.67	10	6	361.95
300,,	18.33	2.40	5	4	52.47
Mean	15.33	3.04	8	5	179.22
CDG		3.08	22	8	571.27
75kgN/ha	25.75				
150,,	39.13	4.23	20	6	619.52
300,,	40.50	4.98	19	7	679.51
Mean	35.13	4.10	20	7	623.43
PDG	47.33	5.67	21	6	834.27
75kgN/ha					
150,,	15.88	2.7	11	4	280.59
300,,	19.63	4.45	18	6	204.13
Mean	27.61	4.11	17	5	439.66
SWD	30.00	4.70	19	6	415.37
75kgN/ha					
150,,	14.88	4.43	19	6	681.35
300,,	20.13	3.75	16	5	223.78
Mean	21.67	4.29	18	6	440.17
TFF	22.75	4.05	17	4	475.00
75kgN/ha					
150,,	25.00	4.60	19	6	553.05
300,,	34.54	3.63	21	4	876.74
Mean	27.43	4.09	19	5	634.98
NPK	28.38	4.33	13	5	898.69
75kgN/ha					
150,,	29.38	4.05	21	7	916.69
300,,	24.88	4.27	7	4	526.01
Mean	27.55	4.72	13	5	780.46
Control	17.33	4.27	17	5	454.11
LSD (5%)	13.98	1.80	14.08	3.14	185.27

CPH = cocoa pod husk, CDG = cow-dung, PDG = poultry dropping, SWD = Siam weed, TFF = Tea fluff, LSD = Least significant difference

Summary and conclusion:

The various fertilizer materials differ greatly in their required rate for optimal tea performance. This could probably be due to differences in their nutrient composition. Cow-dund, tea fluffs, siam weeds, cocoa pod husk and NPK were found optimal at 150 kg N/ha, and while poultry dropping was optimal at 75 kg N/ha.

Scientist: IPINMOROTI, R. R.

Tea Programme

Annual Report 2003

Title: Field establishment and management of tea seedlings at Ikom

Introduction:

The major problem encountered last year tea programme activities was the lack of tea seedlings to establish the proposed five ha tea plot at Ikom. This was majorly because of the high cost of transportation and other logistics. It is believed that if large hectarage of tea could be established at Ikom, there would be less dependence on tealeaves from the Mambilla to meet local consumption. Experimental activities would be possible and the raising of tea seedlings could easily be intensified in the lowland area of Ikom, for possible supply of tea seedling to local farmers that may be interested in tea farm establishment.

Methodology:

Two hectare of land were marked out for clearing and tea seedlings were to be transported from Kusuku, Mambilla to Ikom using tarpaulin covered truck with adequate watering in transit. Tea nursery was equally planned to take care of over reliant on tea seedling transportation from the high altitude to the lowland area.

Results:

The set goals in this project could not be achieved due to lack of fund, shortage of manpower and mobility. Tea seedlings could not be transported, while the site selection and setting up of tea nursery could not be carried out because of the previously mentioned problems.

Suggestions:

It is suggested that sufficient fund, able hands and the required materials be set aside for the effective carrying out of projects of this magnitude. This is because it could help to sensitize the people in such area to pick interest on tea farming, especially at the lowland ecological zones of Nigeria.

Scientists: Dr Famaye, AO; RR Ipinmoroti; AO Oloyede and MA Daniel

2003 TEA ANNUAL REPORT

EXPERIMENTAL TITLE: Effect of tea/eucalyptus intercrop on the yield of tea [*Camellia sinensis* (L.) O. Kuntze] at Mambilla Plateau, Nigeria.

SCIENTISTS: S. S. Omolaja, R. R. Ipinmoroti and E. A. Adeyemi

INTRODUCTION

The performance of tea depends on the prevailing environmental condition such as temperature, rainfall, humidity, sunshine intensity and duration (Ng'etich, 1996), soil fertility level, soil pH, soil moisture and other physical properties of the soil (Bore, 1996). Tea has been reported to respond to management practices such as weeding (Onsando, 1996), pruning and cut-back of tea plant for proper plucking table formation (level at which tea flushes are harvested) (Ng'etich, 1996) and plucking frequency (Herman *et .al* , 1990). Tea performed well under sole cropping but literature has shown that it equally does well when intercropped with some arable crops especially during the early stage of its establishment on the field. Arable crops like maize, cowpea and guinea corn had been intercropped with tea at Ibadan, where the plantain served only as shade crop (Obatolu and Ipinmoroti, 2000).

Eucalyptus trees are the most predominant economic trees on the Mambilla plateau. The trees are mostly within the range of 30 - 50 meters tall with the lower stories

and ground floor free of bushes. It was the realization of this that prompted the introduction of tea seedling into the eucalyptus plantation in 1986 at Kusuku (CRIN substation), Mambilla plateau. The work paper evaluated the performance of Nigerian grown tea intercropped with eucalyptus compared to the sole tea in the open field at Kusuku, Mambilla plateau area of Taraba State.

MATERIALS AND METHODS

Two fields of tea (*C. sinensis* L.) were established in 1986 at Kusuku, Mambilla Plateau, Taraba State. The tea clone used was 236. One of the field was sole crop without shade, while the other was under an already growing eucalyptus tree planted in 1976. The tea field containing eucalyptus tree represented the intercropped tea field. The eucalyptus was used because it is an adapted economic tree to the Mambilla climate.

The tea seedlings used for this experiment were collected from the nursery unit of the Cocoa Research Institute of Nigeria Substation at Kusuku. In the open field, the tea seedlings were transplanted at 1.0m x 0.6m; for the intercropped field, the tea seedlings were transplanted at similar spacing in-between rows of the eucalyptus trees. A total of $90m^2$ land area was used for each field. Each field was divided into ten equal blocks and three tea stands were randomly selected from each block and tagged for yield data collection. A total of thirty tea stands were selected from each field for yield data collection. The planting distance of the eucalyptus was 5.1m x 5.1m.

Normal management practices such as cutback and pruning were carried out on the tea plant from one year after planting to encourage early formation of tea plucking table. The cutback height was 30cm.

The plucking table is the level at which tea leaves or flushes would be harvested. The tea plant had their first harvest two years after planting. Yield data for this study was however, collected between January 1999 and January 2002. The tea-leaves harvested from each tagged tea plant was weighed using electronic weighing balance in gram. The record of other growth parameters such as number of leaf per plant, stem girth, stem height and diameter of plucking table (canopy width) were equally taken. The average yield data under each treatment was calculated and the results from the two fields were subjected to T-test (Gomez and Gomez, 1984) and analysis of variance.

TABLE 1: Growth performance of tea in tea sole and tea / eucalyptus intercrop

	Stem girth (cm)	Canopy width (cm)	Stem height (cm)
Tea sole crop	1.1	60.4	55.7
Tea / eucalyptus	1.5*	85.8*	55.9
LSD (0.05)	0.3	15.1	1.11

TABLE 2: ANOVA showing the significance of tea / eucalyptus intercrop yield over tea sole crop yield.

SOV	NOD	DF	MV	SS	MS	F cal	
						0.01	0.05
Tea	10	9	4.99	0.06181	0.069	7.92*	3.18

Tea/				
Eucalyptus 10	9	42.9	489.4	54.4

SOV: Source of variation; NOD: Number of data; DOF: Degree of freedom; MV: Mean value; SS: Sum of square; MS: Mean square.

* Significant at $p < 0.05$

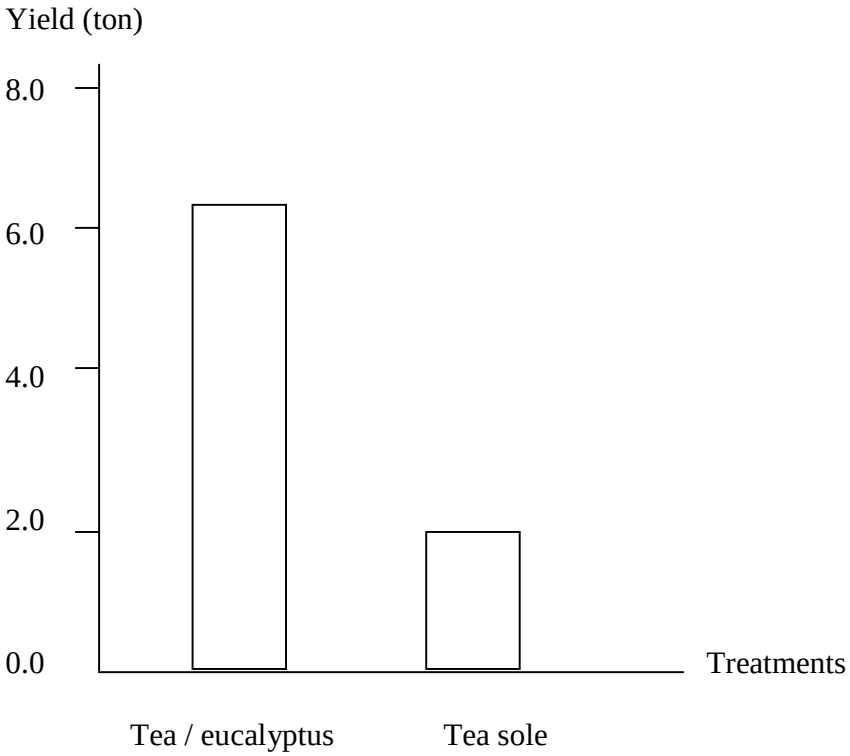

Fig. 1: Tea yield (ton/ha) under sole and tea/eucalyptus intercrop.

RESULTS AND DISCUSSION

The result indicated that tea yield from tea sole was three times lower than tea yield from tea / eucalyptus intercrop. The mean yield per tree were 2.08kg and 6.9kg for sole tea and tea / eucalyptus respectively. This translated to about 2.08t/ha for tea sole and 6.9t/ha for tea / eucalyptus intercrop (Fig. 1). The yield

obtained under tea sole agreed with earlier report of 1.5 - 2.0 tons per hectare for tea on Mambilla plateau (Obatolu, 1984). The yield obtained under tea / eucalyptus intercrop was significant higher than tea sole ($p < 0.05$). The superior performance of the tea under tea / eucalyptus intercrop was probably due to the conducive micro-climatic condition that the eucalyptus provided for the tea bush growing under it (Othieno, 1988). This was not the case for the tea in the open field. The result agreed with Obatolu and Ipinmoroti (2000) who reported better tea performance under plantain shade as compared to tea without shade in Ibadan, South Western Nigeria.

The modified micro-climate under the eucalyptus must have reduced the ambient temperature, increased litter falls by the trees, improved soil water conservation and reduced sun scorch on tea leaves than would be experienced by tea bush in open field. The eucalyptus trees might also had positively influenced the soil condition by way of releasing beneficial root exudates in the soil, increase soil organic matter content and improve the nutrient release pattern to the tea plants.

CONCLUSION

Tea yield under tea / eucalyptus intercrop was superior to tea planted sole. The quality of the resultant made tea from the harvest however, is of prime importance. Hence, whether the harvest from tea / eucalyptus intercrop would be of equal quality or superior to the tea harvest from the sole tea crop is a matter that needs further investigation. According to Owuor (1996) the quality of made tea is defined primarily by the chemical composition of the tea leaves that are harvested. To be able to make a categorical statement on this, investigation on the chemical composition of the harvests from the two different fields would need to be carried out in subsequent study.

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Statistics-Socio Economic & Techno-economic Studies

1.Title: Cocoa Production and Food Crop Diversification in South East Nigeria **(Obatolu, B. O.)**

Introduction: Cocoa farms create employment for over 300,000 households in Nigeria, though most of these farm-holdings are in small farms of less than ten hectares. Information on the nature of existing diversification or non-diversification of cocoa farms will assist government and non-government organisations in effective planning of new projects at national and state levels targeted at cocoa farmers, to take advantage of the farmers practices on diversification. It is of interest in this study to investigate the nature, scope and factors necessitating farmer's diversification or non-diversification in cocoa production. Furthermore there is a need to establish if these factors have established an equilibrium or dis-equilibrium in the Nigerian cocoa industry.
Objectives: i. to determine factors influencing the diversification and/or non-diversification of farmers;
ii. to examine the socio-economic characteristics of cocoa farmers;
iii. to analyse returns and levels of profitability of farmers farm enterprises.

Methodology: A multi-stage sampling procedure is considered for this study. Purposive sampling is used in picking Cross River State, which is the second largest producer of cocoa. Four Local Governments Areas (LGA) were selected for the purpose of this study to include (I) 2 high producing (LGA), (ii) 1 medium producing (LGA) communities, (iii) 1 low producing (LGA). A random sampling technique was used to select 110 respondents from the study area, from the list of cocoa farmers Registered with State Agricultural Development Programme office in Ikom. A LGA is the third tier of government after the state and the federal. It is a political administrative block into which a state is divided which may vary in number for different states. Data were collected with the aid of a well - structured questionnaires and interview schedules. Information on the following was obtained, socio-economic data, production data, and marketing data.

Correlation analysis, Gross Margin, ANOVA and LOGIT analytical tools were used for the analysis of the results.
Results and Discussion: The results of the findings are discussed bellow.

Table 1: Distribution of the Diversified Farmer's According to various Farm Enterprises.

Enterprise	*Frequency*	*Percentage*	*Average Hectares*	*Avg. Cost/ha* ₦	*Avg. Rev/Ha* ₦	*Gross Margin/ Ha* ₦
Cocoa +Cassava +Maize	49	46.2	1.5	9,500	69,300	59,800
Cocoa + Yam	16	15.1	2.0	9,000	66,400	57,400
Cocoa + Plantain/ Banana	11	10.4	6.3	8,000	66,000	58,000
Cocoa + cocoyam + melon	22	20.8	3.7	8,500	67,300	58,800
Cocoa + Oil palm	8	7.5	8.6	8,400	65,000	59,100
Total	***106***	***100***	***22.1***	***43,400***	***33,4000***	***29,3100***

Source: Field Survey

Findings revealed that the types of cocoa farm enterprises include Cocoa + Cassava + Maize, Cocoa + Yam, Cocoa + Plantain / Banana, Cocoa + Cocoyam + melon and Cocoa + Oil palm. Table 1 shows the gross margin of the various farm enterprises which indicates that the cocoa + cassava + maize combination has the highest gross margin.

Table 2: Logit Table

Determinants	Variable Mean	Coefficient from model	Marginal value
Access to credit	0.547368	1.257	0.09
House hold size	0.147364	1.5716	0.02

The logit table showed that of the possible determinants of diversification only access to credit and household size had a significant relationship in determining the farmer's diversification into food crops.

Reasons for farmers diversification; based on a number of factors farmers reasons for diversifying when ranked revealed the following results based on the frequency of responses,

1. Food security reasons. Farmers are interested in having sufficient and available food at times of the year for themselves and members of their household.

2. Reducing risk and diversifying income; Framers are interested in diversifying income especially during the off season of cocoa and avoiding total crop loss to disease outbreak and also providing income in short periods rather than waiting for a season.

3. New market demands; findings revealed that some farmers are picking interest in crops such as cassava especially in recent times as the export demand has been increasing and thereby serving as a means of increasing income.

4. Land fragmentation problems: in certain areas thereby reducing the availability of land for variety of uses as the land is passed down from one generation to the other.

Proposed Policies to Improve Cocoa Production Sector in a Liberalised Context:

i. The Federal Ministry of Agriculture, State Agricultural Agencies and Cocoa Research Institute of Nigeria should encourage farmers to combine cocoa production with other tree and food crops. This will help to reduce the risk of total cocoa crop failure, enhance the food security position of the nation and also diversify farm income from cocoa.

ii. A farm advisory system should be set up by the Governments to advise the farmers on the types of crops that could be profitably grown with cocoa without jeopardizing the need for cocoa production taking into consideration the availability of markets for different agricultural produce.

iii. There should be a capacity building programme Extension and the co-operative worker's as well as the executives of these NGOs on resource utilization and management in cocoa

production and marketing. This can be done periodically to aquatint them with the dictates in the cocoa industry.

2.Title: Fund Sourcing and Fund Utilisation by Coffee Farmers in Nigeria Introduction **[Lawal, J. 0. (Mrs.) and R. A. Sanusi.]**

Introduction: **The quickest source of fund for business/production activities is from loans. Hence, business concerns, of which agri-business is one, usually borrow money to finance economic activities. The advantages inherent in borrowed funds include guaranteed cash for business activities, payment at convenience, etc.**

Objective: This study aimed at finding the sources of financing coffee production activities by farmers and the various uses of fund. This study emanated from information obtained during Coffee Marketing Problems research of 2000 to 2002.

Methodology: Due to dearth of funds in the Institute, the study could not be executed. However, the loan portfolio of the Nigerian Agricultural and Cooperative Bank (NACB) which is now the Nigerian Agricultural, Cooperative and Rural Development Bank (NAC&RDB) Limited was examined to assess the level of financing tree crop production by the bank in comparison with other sectors especially agricultural sectors. Hence, the data used for this study was obtained from NAC&RDB. The data covered 1981 to 2000.

Result and Discussion: For the four branches considered, the funding of tree crop production (TCP) was found to be generally poor since 43.45% of the disbursed fund went into tree crop (Table 1). However, Ekiti branch was found to be "tree crop project friendly," funding projects of which TCP constituted 67.71% (Table 1). Also, 51.7% of loan disbursed went into TCP. This is due to the fact that the (Ekiti) branch was in a state that was formerly part of Ondo State that produces the highest quantity of cocoa beans. Agege branch did not fund any TCP despite the fact that Ikorodu is noted for kolanut production.

Table 1: Loan Disbursement by NAC&RDB (1981-200)

Branch	**Year**	***Tree Crop project (a)***	***Total project financed (b)***	***a/b %***	***Fund disbursed for TCP (c)***	***Total fund disbursed (d)***	***c/d%***
Ife	1988-1999	171	612	27.94	2,488,499	23,005,065.45	10.81
Ekiti	1982-2000	1,082	1,598	67.71	1,779,981.18	3,442,683	51.70
Akure	1981-2000	770	2,113	36.44	1,443,671	8,234,827	17.53
Agege	1981-2000	0	333	0	0	2,523,064.54	0
Total	***1981-2000***	***2,023***	***4,656***	***43.45***	***5,712,151.18***	***37,205,639.99***	***0.15***

Source: NAC&RDB (2003)

3.Title: Socio-Economic Impact of Cocoa Powder Cottage Industries in Nigeria **(Sanusi, R. A.)**

Introduction: Nigeria, hitherto, the world's second largest cocoa producer has been recording low cocoa production since the mid-1970s. This has been traced to old age of cocoa trees and farmers, trade liberalization, low indigenous utilization, world (cocoa), market crisis, etc. Despite

this fact, Nigeria was requested alongside other major West African producers i.e. Cote d'Ivoire, Ghana and Cameroon to withdraw a total of 252,000 MT in the year 2001 from the international market by the International Cocoa Organisation (ICCO) as part of an origin-withholding scheme. However, the Market Supply Strategy Committee (MSSC) of the Cocoa Producers Alliance (CPA), suggested (in 1999) that bean processing together with diversification of cocoa processing in origin countries need be encouraged, cocoa consumption need be promoted, and new markets such as Russia, China, Japan, etc, need be found. This was believed to be capable of turning round the fortunes of cocoa production in the origin countries.

Objective: This study was to determine the level of consumer acceptability of the cottage firms' instant cocoa beverage (SCB).

Methodology: 700 respondents were randomly sampled and interviewed in South-west Nigeria. The interview schedule was done with the aid of structured questionnaires.

Result and Discussion: The findings so far indicated that about 55.3% of respondents consume SCB while about 44.7% were non-consumers (Table 1). Furthermore, SCB was found to have low cost per unit when compared to other beverage types (Table 2). For instance, the cost SCB per unit is about 50% of the cost per unit of the (LCB) large-scale firms' cocoa beverages e.g. bournvita, vitalo, milo, etc.

Table 1: Ratio of SCB Consumers to Non-consumers in South-west Nigeria

Respondent Category	***Frequency***	***Percentage***
Consumers	387	55.3
Non-consumers	313	44.7
Total	***700***	***100.0***

Source: Field Survey, 2002/2003.

Table 2: Average Cost Per Unit of SCB, LCB, Tea and Coffee Instant Beverages

Beverage	***Cost/Unit (₦)***
SCB	0.40
LCB	0.83
Coffee Beverage	3.00
Tea Beverage	***1.15***

Source: Field Survey, 2002/2003.

The above findings indicate that the market for cottage firms' instant cocoa beverages is existing and if developed can assist in the drive for a sustainable cocoa economy.

The study is still in progress.

4. Title: The Determinants of Cocoa Beans Quality in the South-western Part of Nigeria.
(Oluyole, K.)

Introduction: Nigeria has been noted for the production of good quality cocoa (CAN, 1997). For Nigerian Cocoa to enjoy continuous recognition internationally, there is need for the country to be exporting only good quality cocoa beans. As a result of this, Nigerian government has established produce Inspection Service (PIS) both at state and Federal Levels to ascertain the quality of cocoa beans before it is exported. However, ED & F Man (2002) affirmed that the quality of cocoa could be improved by early harvesting of cocoa pods, well-matured and ripened pods, proper fermentation, proper drying as well as good storage.

Objectives: 1. to determine the selected socio-economic characteristics of cocoa farmers in the study area;

2. to determine the costs - benefits of good quality cocoa beans;

3. to determine the factors affecting cocoa quality.

Methodology: One hundred questionnaires were administered to cocoa farmers in both Ondo and Osun States. Two Local Government Areas were involved in each of the States. Apart from this, personal interview was conducted among both the Licensed as well as Local Buying Agents (LBAs) in the two States.

Results: From the personal interview conducted among the LBAs, it was discovered that the quality defects in cocoa beans include mouldy beans, slaty beans, germinated beans and weevilled beans. The level of these in a lot of cocoa beans would determine the grade in which cocoa beans would be grouped into. Meanwhile, some of the administered questionnaires are being retrieved from the farmers. The study is however in progress. Data analysis, data interpretation and the final report writing will be done later.

5.Title: Determination of Adoption Level of Cashew Apple Processing and its Impact on Cashew processing Household in Ogun, Kogi and Niger States. (Shittu, T. R.)

Introduction: Cashew marketing in West African sub-region as a whole has been restricted to only the nuts while the apple (false fruits) is mainly consumed raw when ripen or allowed to rot away on the farm for the nuts to be picked later (Shittu et al 2001).

Due to lack of (proper) storage technique for this apple, a greater percentage of it, is wasted while citizenry suffered malnutrition during its off-season. To ensure all the year round availability of this produce, CRIN developed a locally fabricated cashew juice-processing machine for extension to cashew farmers so as to arrest the ugly incidents. The need therefore arises for determination of level of adoption of this processing technology and its impact on the farmers.

Objectives:

(i) evaluation of adoption level of cashew apple processing technology;

(ii) comparative assessment of the performance of cashew growing household in the selected states;

(iii) estimation of marginal revenue resulting from such value addition;

(iv) provision of guidelines for enterprise diversification within the cashew industry.

Methodology: Structured questionnaires were used in collection of primary data required for the study and were administered on both the adopters and non-adopters. Information was also obtained on consumers and marketers of processed cashew apple alike.

Result and Discussion: The preliminary finding revealed that the technology was not widely extended as it was only extended to Ogun State, NALDA to be precise. This NALDA did not help matter as it was expected to go out and train others but rather than do this it only waited for any interested farmer's to come around thus revealing a very low level of adoption in that state. However, comparative assessment among the selected states could not be done as required visitation could not be done due to financial constraint, which hindered extensive coverage of the other states.

Summary: Following the findings from the study, it could be summarised and recommended that on-shelf technologies in the institute should be extended and publicized so that they would be available for the end-use.

Conclusion: The study will be revisited this year (2004) if there is improved funding of research.

6. Title: Economic Losses in Cashew (Shittu, T. R.)

Introduction: Available evidence shows that opportunities exists within the country for the farmers to increase their income through appropriate increase is cashew nut production cum apple processing by way of diversification in form of value addition.

Increased local consumption through appropriate promotion effort could rake in enormous revenue when sold locally and also world price would be enhanced. However, a lot of factors determine the yield obtainable from a cultivated cashew farm, these include pests, disease, apple malformation, pests and diseases complex among controllable factors and the non-controllable factors.

Objective: This work looked into the proportion each of these agents, contributed to the loss of the additional revenue by cashew farmers of their potential output before and after harvesting. So as to be able to predict possible loss due to neglect or refusal to control one or more of these agents of deterioration due to untimely harvest of their ripe apples.

Methodology: A total of 40 cashew trees were randomly selected from Onigambari experimental plot in a study that stretched over 10 weeks. Records of apples that were whole, diseased, pests infested, pests and diseases complex were taken on every other day. These variables were the focus of attention as combination of all these greatly accounted for the total number of apples/nuts produced per tree/has hence the revenue generating potentials of the cashew farmers in particular, health living of the society and the foreign exchange earning of the country as a whole.

Assumption: We assumed that all necessary cultural operations needed have been done thus cost of production are not determined.

Results and Discussion: An assessment of the specific and joint effects of the agents of degradation or deterioration on the cashew trees as well as on farmers income shows a wide variation between the realizable income and accruable income. The result showed that a total of ₦18,483 could have been generated from cashew that were timely harvested while that from conventional method was ₦232..50 thus implying that the sum of ₦18, 250.50 was lost to those agents given a 98.74% loss caused by them. However, specific contribution of each of these agents to the loss were summarized in the table below:

Agents of destruction	% Contribution	Naira Equivalent	CV	Std CV
Malformed	2.05	373.50	98.71	0.6876
Pests	8.24	1,504.50	99.10	0.6922
Disease	7.91	1.44.30	98.97	0.6876
Pests & diseases complex	81.69	14,908.80	97.90	0.6834

It therefore implies that we are at least 68% confident that any of these agents of destruction is capable of reducing the farmers income by the said amount if fruits were not harvested as at when due but allowed to drop before they are picked.

7. Title: Analysis of Coffee Output and Hecterages in Selected States of Nigeria
(J. O. Lawal and R. A. Sanusi.)

Introduction: Coffee is one of the leading commodities in international trade. Among the primary commodities produced in and exported from Africa; coffee, apart from petroleum, is the second most important commodity traded between the developed and developing countries. In Nigeria, the internal marketing of coffee has been largely unorganised and uncoordinated thereby making coffee industry less profitable and unattractive. However, following the crisis that engulfed the world (coffee) market in the 1980's which resulted in supply shortfall, owing to price fluctuation coupled with the trade liberalization of 1986 and the abolition of commodity Marketing Board there has been decline output from Nigeria coffee farms. This study therefore examines the trend in coffee output and hecterages.

Objective: to assess the effect of price as a coffee-marketing problem on coffee production in Nigeria

Methodology: The data used in this study were obtained from primary sources. The study covered both major and minor coffee producing states i.e. Kogi, Abia, Taraba, Ondo, Ogun and Oyo States of Nigeria. In Oyo, Ogun and Ekiti States coffee cultivation have been abandoned to such an extent that few stands of coffee planted more than 40 years ago can be found on the plots. However, from the survey, there are still a few (part-time) coffee farmers in Abia States and many (almost) full time coffee farmers in Kogi and Taraba States. Data obtained include total farmland available, Area put to coffee, volume of output, and prices. Purposive and simple random sampling techniques were used and the data were analysed using descriptive statistics.

Result: The survey taken in the years 2000/2001 involved about 50 farmers (sampled state. Statistics from the survey conducted in Kogi, Abia and Taraba States indicated that an average of 14.35, 10.53 and 5.50ha of farmland respectively was available to the farmers, while and average of 10.31, 4.73 and 2.71 ha respectively were planted to coffee in the states giving a percentage of 71.85, 44.95 & 49.27% area of the total farmland planted to coffee in the respective states (Table 1). The

average output of coffee in the three selected states were 8.62, 3.11, and 2.94 tons respectively (Table 2). The average price per ton was ₦58,410; N26,000; N70,080 respectively (Table 3). Kogi State which had the highest amount of land put to coffee had the highest output also. The farmers in Kogi had an encouraging price on the output hence this may have made them to sustain their production over the years and still get a better output. Taraba being the least in terms of area put to coffee had a better price for the produce and this had made them put almost 50% of their land to coffee (Table 1). We can also deduce that the glut in Kogi market caused the drop in price compared with that of Taraba. Also the difference in price in Taraba and Kogi must be due to varietal difference. The Arabica coffee (planted in Taraba) is better priced than the Robusta (of Kogi) in the world market. In Abia State must farmers abandoned their farms because of the low prices offered for the coffee. This low pricing did not encourage production in the state. Absence of sustainable market and market information is a major problem. Looking at the percentage change in farmland available and the land put to coffee in Abia State it increased through the years. This is responsible for the continual increase in output from the years 1998 to 2000 (2.22 – 3.83 tons). Also, the price/ton did dropped slightly from ₦27,000.00 in the previous year, 1998) to ₦25,000 in 1999, rising slightly to ₦26,000 in year 2000. The rate of change in cultivated farmland also increased with the price and output but the slight drop in price in 1999 caused the drop in the rate of increase in coffee cultivation in Abia, to 60,87% from 109,09% in 1998 (Table 4).

In Taraba, the gradual drop in prices resulted in the drop in output but looking at the rate of change in farmland available it increase from 2.44% to 5.14% which resulted in the increase in coffee land cultivated by 16.46% due to the prevailing price of ₦75,790/ton but as the price continued to drop, the rate of increase on the land use dropped also to 1.41% when the current price dropped down to N64.380/ton (tables 3 and 4). From a 1999 census of 271 coffee farmers in Abia State, it was revealed that only 21.75% of farmland available.

Table 1: Average Volume of Coffee Output, available Farmland and Area put to Coffee (1998 – 2000)

States	*Vol. of Out-put (ton)*	*Farmland Available (ha)*	*Area put to Coffee (ha)*	*% Area put to Coffee*
Kogi	8.62	14.35	10.31	71.85
Abia	3.11	10.53	4.73	44.92
Taraba	2.94	5.50	2.71	49.27

Source: Field Survey, 2000 – 2001.

Table 2: Average (yearly) Volume of Coffee Output (ton)

States	*1998*	*1999*	*2000*	*1998 - 2000*
Kogi	10.13	8.78	6.99	8.62
Abia	2.22	3.29	3.83	3.11
Taraba	2.32	3.11	3.38	2.94

Source: Field Survey, 2000 – 2001.

Table 3: Average (yearly) Prices of Coffee (per ton)

States	*1998*	*1999*	*2000*	*1998 - 2000*
Kogi	62.06	55.70	57.46	58.41
Abia	27.00	25.00	26.00	25.00
Taraba	75.79	71.88	64.38	70.68

Source: Field Survey, 2000 – 2002.

Table 4: Average Rate of increase / Percentage change in available Farm Land and Land put to coffee

States		*1998 – 1999*	*1999 – 2000*
Kogi	FL	2.78	8.81
	CF	6.28	5.72
Abia	FL	30.77	33.33
	CF	109.09	60.87
Taraba	FL	2.44	5.14
	CF	16.46	1.41

Note:- CF - Coffee farm, FL - Farmland
Sources: Field survey, 2001

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8. Title: Effect of Ideal and Unideal Weather Condition on Cocoa Production in Nigeria
[***M. O. Adejumo (Mrs.) and R. A. Sanusi.***]

Introduction: The role of agriculture in the economic and social life of human beings has made this Economic sector a great concern for Government and people no matter the level of development of any society. Nigeria agricultural scientist are continuously carrying out research on problems of Nigerian agriculture while the governments too focus on agriculture in fiscal and monetary policy pronouncements Nigerian government and research scientists efforts in sustaining agricultural production can be said to be effective through what can be termed controllable fact such as technology, material inputs, management e.t.c. However, a single (uncontrollable) factor that can considerable degrade the effect of this is weather. This is because weather characteristics are the major factor influencing variations in crop yield/production, soil Utilisation and conservation and can relegate all other factors especially the social and Economic factors into relatively minor positions.

Objectives: This study estimates the influence of climatic variation (rainfall, temperature and relative humidity) on the production of cocoa in the study area. Specifically, the study was:- (i) to identify the problems that affect cocoa production when there are changes in the climatic elements (rainfall, temperature and relative humidity); (ii) to determine the effect of ideal and unideal weather on the yield of the crops; (iii) to see a way of improving the growth a production of cocoa in Nigeria.

Methodology: The data used this study were obtained from secondary sources. In decomposing total yield variation into technology and weather effects, so as to quantitatively isolate the magnitude of yield variations arising from weather factors from those arising from trend factors, statistical techniques used to test the hypotheses and analyse the data include multiple correlation analysis, student (t) test and Spearman's rank correlation coefficient. Spearman rank correlation coefficient was used here to examine the partial correlation or relationship between each of these climatic variable namely temperature, rainfall and relative humidity and cocoa yield.

In the light of the objectives of this study, the hypothesis to be tested include:

(i) no significant relationship between temperature and cocoa yield;

(ii) no significant difference between rainfall and cocoa yield;

(iii) no significant difference between relative humidity and cocoa yield;

(iv) no significant difference between the climatic variables (i.e. temperature rainfall and relative humidity) on cocoa yield.

Result: From the analysis, it was gathered that the value of correlation between temperature and cocoa yield was 0.483, and since the direction is positive, we say that as the temperature increases, cocoa output increases within the period. It was gathered that there is a negative correlation between rainfall and cocoa yield as the result shows – 0.207. This implies that heavy rainfall did not improve the yield of cocoa. There is also a positive relationship between relative humidity and cocoa yield as the result, which is 0.492, so we can infer that as the relative humidity increases the cocoa yield increase too. Then from multiple correlations, it shows that there is a strong correlation between climatic variables and cocoa yield.

Yield from 1980 to 1990

YEAR	TOTAL ANNUAL RAINFALL (MM)	YIELD / POD HARVESTED (KG)	MEAN ANNUAL TEMP (^{0}C)	MEAN ANNUAL HUMIDITY
1980	1575	16271	26.08	82.7
1981	957	17559	26.75	72.6
1982	735	15634	26.29	78.0
1983	683	25530	25.04	78.1
1984	1393	40716	24.29	79.1
1985	1447	21874	24.37	78.9
1986	1062	27734	24.79	75.0
1987	1345	27730	2425	72.0
1988	1373	16724	23.58	74.2
1989	1220	20588	24.25	70.0
1990	1569	16026	24.33	74.6

9. Title: Adoption of Coppicing Technology among coffee farmers in Kogi State of Nigeria. **(Oduwole.O.O and Agbongiarhuoyi, E. A)**

Introduction: Coffee production in Nigeria continues to decline despite effort in research to increase productivity per tree. Coppicing is an agronomic technique for increasing the productivity of old coffee trees. It has been shown that coppiced trees are better producing than old and aging trees. In Kabba, Kogi State, a major coffee-growing area of Nigeria, productivity of farms are low due to old age of trees despite the transfer of this technology to them. There is therefore the need to examine the factors affecting the adoption of the technology.

Objectives: The main objective is to determine the level and constraint to adoption of coppicing technology by farmers in Kabba area of Kogi State.

Methodology: 60 farmers were randomly selected across the localities. Structured questionnaire was used to collect necessary information from farmers. The information covers farmer's characteristics, sources of information, awareness and understanding of coppicing technology and constraints. At the end of the exercise 40 completed questionnaire were found useful for analysis.

Analysis and Result: From the descriptive analysis, there is a significant difference between adopters and non-adopters with respect to family labour and output of uncoppiced trees (Table 1). It was found that about 80% of farmers are aware of the technology but only 33% have adopted one or more of the method while only 14% have complete understanding of the technology. Weak technology transfer linkage and poor knowledge of the technology are the two most important factors affecting the adoption of coppicing technology (Table2).

Table 1. Descriptive statistics of Adopters and Non Adopters

	Adopters	**Non Adopters**	**CV**	**F. Value**	**Pr> F**
Age (yrs)	**60.16**	**58.35**	**18.03**	**0.02**	**0.7006**
Farm size (ha)	**8.66**	**5.24**	**6.21**	**0.55**	**0.2203**
Yrs of Experience	**29.00**	**30.81**	**19.64**	**0.11**	**0.7370**
No of Children	**8.67**	**6.09**	**64.25**	**1.92**	**0.1747**
Hired Labour	**8.00**	**5.17**	**98.91**	**1.13**	**0.2949**
Family labour	**15.20**	**4.36**	**82.92**	**18.71**	**0.0002 *****
Yield per Ha (kg)	**1400.00**	**719.70**	**119.23**	**1.78**	**0.1920**
No trees coppiced	**495.00**	**373.00**	**93.85**	**0.22**	**0.6504**

Coppiced trees output (kg)	**900.00**	**682.90**	**135.94**	**0.27**	**0.6790**
Uncoppiced trees output (kg)	**666.7**	**202.2**	**63.10**	**18.03**	**0.0005*****

Source : Field Survey 2003

Table 2 OLS Regression of Constraint to Adoption

Variables	**Regession Estimate**	**Standard Error**	**T. Values**	**Pr > t**
Intercept	**0.5000**	**0.3579**	**1.40**	**1.1717**
Weak Linkage	**-0.7063**	**0.1849**	**-3.82**	**1.006*****
Poor Knowledge	**-0.5145**	**0.2864**	**-1.80**	**0.0816***
Poor Marketing	**-0.0121**	**0.5784**	**-0.02**	**0.9034**
Poor infrastructure	**-0.7185**	**0.5853**	**-1.23**	**0.2283**
Poor input	**1.4878**	**1.1095**	**1.32**	**0.1891**
Labour cost	**0.2452**	**0.3982**	**0.62**	**0.5424**

Model Sum of square =4.52112 **Root Mean Std Error = 0.50619**

Coeff Regression = 51.91185 **R.Square = 0.3484**

F- ratio = 2.94 **Pr > F = 0.0207 (significant at 5%)**

Conclusion : it is suggested that extension training should be given to farmers through appropriate farm demonstration or farmers field school methodology in order to improve the adoption of coffee coppicing technology and increase farm productivity**.**

10. Title: Establishment of Rooted Cuttings and High Yielding Coffee Genotypes in Ikereku(On–FarmAdaptiveResearch–OFAR) (Agbongiarhuoyi, E. A. and R. A. Sanusi.)

Introduction: In an effort towards promoting coffee development and research, a model coffee farm has been established in Ikereku village in Akinyele Local Government Area of Oyo State. This was made possible by the combine team of coffee programme.

Objectives: To extend CRIN's improved coffee rooted cuttings to farmers and encourage participation on their farms.

Methodology: The coffee farm was established at Ikereku village in Akinyele Local Government Area of Oyo State. Preliminary visits were made to the village. Farmers' plots were randomly selected for the

project. The farm size is half an acre with a plant population of 234 stands of coffee and equivalent number of plantain suckers as shade crops.
Extension contact – some contacts were made to the farm after planting for monitoring.
Results and Discussion: It was observed that the coffee plants are growing well and the farmer involved is maintaining the plots by clearing round the crops. With the cultivation of coffee in farmers' farm, it is expected that many farmers will be opportune to adopt the improved coffee cuttings and in turn plant them on their farms. The establishment of coffee on – farm will encourage cooperation between research, extension and the farmers. The project is still on going in Ikereku village.

10. Title: Assessment of experimental plots in the CRIN's Headquarters (Adebiyi, Solomon.)

Introduction: CRIN headquarter has 144 experimental plots which at present are serving as sources of income to the Institute. Most of these plots were poorly established while some became less productive due to old age. Their years of establishment were dated between 1934 and 1979. Also, poor maintenance culture attributed to decline in productivity. In the light of these conditions, there is need for on-the-spot assessment of the experimental plots in order to know the suitable rehabilitation techniques to enhance productivity.

Objectives: **(1) to know the present situation of the experimental plots; (2) to determine the suitable rehabilitation techniques required by each plots.**

Methodology: Information on the size in hectare (HA) of each plot was obtained from plantation manager see Table II after which on the spot assessment was conducted throughout the nine zones. Crops available in each of the zones were observed and the types of rehabilitation needed in each of the zones were equally noticed. Fermentary unit also supplied information on the production in the last three years.

Results and Discussions: Data in Table I revealed that, cocoa production in the year 2000 and 2001 are almost the same which are 10.75 tons and 10.29 tons respectively, production in 2002 was reduced to 7.24 tones and the reasons were traced to heavy shade and poor maintenance of plots, and shortage of man power production in 2003 was shot up to 15.66 tons, which was as a result of shade reduction, quick harvesting and other maintenance culture required of good cocoa management activities.

Cocoa Production From 2000 – 2003
Table I

Years	Tone produced	Number of pods produced per year
2000	10.75	366 398 pods
2001	10.29	344 739 pods
2002	7.24	236 986 pods
2003	15.66	557 959 pods

Production in the last three years and the evaluating year

Data in table II showed that the total land put in to cultivation was approximately 283.05 hectares out of which 130 hectares was effectively cultivated with regards to plant population /ha. 70% of the total land was put to cocoa cultivation, while other mandate crops such as kola, cashew and coffee shared the remaining 30%. Most of these crops are still productive while some have declined in production due to old age and incidence of disease attack. It is concluded; that most of the experimental plots need to be rehabilitated using such appropriate methods as gapping up, shade reduction, coppicing, pruning, thinning

out and removal of mistletoes. Routine maintenance and spraying as recommended to farmers need to be adopted to enhance the plot productivity. Also the previous result of cocoa production revealed obtained, that more labour should be recruited to improve on all routine managements for better productivity.

Table II

Zone	Size (HQ)	Effective HQ	Dominating crop	Rehabilitation Techniques required
I	49.01	32.45	Cocoa	Gapping up, shade reduction
II	9.91	2.1	Cocoa	Coppicing, Gapping up
III	4.78	1.4	Cocoa	Gapping up, coppicing
IV	31.20	5.03	Cocoa	Pruning, coppicing (there is newly established plots kola:7.0ha, cocoa:5.0ha cashew:3.0ha)
V	37.86	15.72	Cocoa	Removal of mistletoes pruning, Gapping up
VI	53.087	14.64	Cocoa & cashew	Gapping up, pruning
VII	26.48	10ha	Kola	Thinning out, Gapping up
VIII	39.76	26.76	Cocoa & oil palm	Gapping up,
IX	29.35	11.90	Cocoa	Gapping up, shade reduction removal of mistletoes
Total	**283.05ha**	**130ha**		

Zone I **– Cocoa is the major crop other crops planted are kola, coffee and cashew.**
Zone II – Cocoa is the major crop, while kola is the minor crop. There are newly established plots of cocoa, kola and cashew.
Zone IV – The major crop is cocoa; coffee is also present as minor crop.
Zone VI – The major crops are cocoa and cashew. There are newly established plots for cocoa and cashew (about 6ha for cashew, 8.5ha for cocoa.
Zone VII – Exclusively known for kola
Zone VIII cocoa and oil palm are the crops found in this zone. Cocoa in this zone is effectively producing. Some of the cocoa trees are super trees. The production is highly commendable.
Zone IX – Cocoa is the major crop. Cashew is also present as a minor crop.

11. TITLE: **Land Tenure System And Its Implication On Women Cashew Farmers In Kogi State, Nigeria.*(Adeogun, S. O. and Uwagboe, E. O.)***

Introduction: In the 1960's, agriculture accounts for more than 80 percent of total exports, and about 60 percent of the Gross Domestic Product in Nigeria. With the advent of oil boom in the 1970's, agriculture was seriouslyneglected; there was unbridled rural urban drift and consumption of foreign goods.

In the 1980's, there was limited technical support for small-scale farmers; hence, agricultural production has been on the decline in the country. Nigeria virtually became a constant dependent capitalist economy (Ayobolu, 2003).

Accessibility to land for agricultural practices has also constituted a hindrance to increase in Agricultural production in Nigeria (Ayobolu, 2003). Land tenure refers to a set of rights which a person or organization holds on a piece of land (FAO, 1995). Security of tenure is not limited to private ownership but can exist in a variety of forms such as lease on public land or user rights to communal property. (If tenure is secure, the holder can reasonably expect to use the land to its best advantage in accordance with the right, reap a timely and fair return and be able to enforce the right against non-holders) (FAO, 1995). Land tenure security exists when an individual perceives that he or she has right to land on a continuous basis. Free from imposition or interference from outside sources as well as the ability to reap the benefit of labour and capital invested in that land, either in use or upon transfer to another holder (Migot- Adholla and Bruce (1994).

In Nigeria, natural resources at the local level are held as a common property. Rights to natural resources such as land, plants, animals, and water are often communal and the communal tenure enjoys strong propriety and security value in the rural areas. Failure of the land users to acknowledge traditional tenure rights on project design and execution had led to chaos culminating in over-exploitation, deforestation and dereservation. Therefore, Land tenure system influence the use to which land is put for economic and social development (Osemeobo, 1997)

The land owners have full user rights over all land acquired through pioneer clearing, inheritance, sales and gifts. They also have rights and privileges to manage and control resident wild biotic resources, water and soils for domestic and commercial purposes.

Akande and Lawal (2004), stated that land tenure vary from one rural community to another and often pivoted by either communal or individual ownership. The control of land is generally vested in the

council of elders who hold the land in trust for all members of the community. They further stated that land could be allocated to individuals or households where there is no conflicting right and such land could be passed from generation to generation with the customary rule of succession.

The land tenure system in various communities dictates so many things ranging from who owns the land, to the right on produce from agricultural lands. It also determines the right that the individual has to transfer land to another person. The favoritism being enjoyed by men in the area of land ownership in Nigeria has encouraged a situation where majority of the available lands (whether for agriculture or other purposes) are in the hands of men. Security of tenure for women must be viewed as a key link in the chain from household food production to national food security.

The problem of land ownership has been identified among women cashew farmers in Kogi state. This study therefore aimed at determining the effect of land tenure system in kogi state on the activities or contributions of women cashew farmers on cashew production in Kogi state.

Main Objective: To determine effect of land tenure system and its implication on women cashew farmers in Kogi State.

Specific objectives: The specific objectives of this study are to

1. describe selected personal characteristics of women cashew farmers in the study area.
2. determine the involvement of women in cashew production in the study area.
3. investigate problems associated with land acquisition by women cashew farmers in the study area.
4. determine the system of land ownership of women cashew farmers in the study area.
5. determine women cashew farmers' attitude towards the existing land tenure system in the study area.
6. identify the various farming system practiced by women cashew farmers in the study area.

Hypotheses

H_{01}: There is no significant relationship between selected personal characteristics of women cashew farmers and their attitude towards land ownership pattern in the study area.

H_{02}: There is no significant relationship between women involvement in cashew production and their attitude towards land ownership pattern in the study area.

Methodology: - Data were supposed to be collected from three of the twenty-one local government areas of Kogi state by random sampling. These local governments areas are Ankpa, Idah and Ayangba. From each local government area, 40 respondents who were of cashew women farmers will be selected using the simple random sampling techniques, given a total sample size of 120 women. Twenty statements were set in a questionnaire format to elicit information on their attitude towards land ownership pattern in the state.

Result/ Constraint:. Fieldwork could not be done due to non-availability of fund

Title of Programme: **CPU-EUR PROGRAMME**
Experimental Title: Potentials of Cocoa Husk Pulp as a sole feeding stuff for African Giant Land Snail. (*Archachatina marginata*) (R.A. Hamzat)

Introduction: Snail meat is tasty, tender, nutritious and contains negligible cholesterol contents and medicinally useful. These make it a delicacy for people of all ages in most countries of the p world. Snails are herbivorous in nature and hence could convert inedible farm wastes e.g. cocoa husk pulp to edible snail meat. CHP is the succulent part of the cocoa husk. Cocoa husk is wasting in abundance on our cocoa farms. Previous research efforts have focused on the utilization of CHP in broilers, CHP in Rabbits, CHP in Liquid soap production, CBS in layers but paucity of information on the use of CPH.

Objectives: To explore the use of cocoa husk pulp as a sole feeding stuff for African Giant land snail (*Archachatina marginata*).

Materials and Methods: Fresh, mature and unripe pawpaw fruits were plucked daily, citrus pulp removed from fresh orange fruit after squeezing the juice, kola nut testa was collected fresh from the kola unit of CRIN and refrigerated there after. Cocoa husk pulp (CHP) was collected from the fermentary unit of CRIN by scrapping it from the broken cocoa pods. 144 (20-45g) growing snails were randomly assigned to 4 treatments: PPF-100% pawpaw fruit, CFP-100% citrus pulp, KNT-100% kola nut testa and CHP-100% cocoa husk pulp. Proximate analysis of the feeding stuff was conducted. 36 experimental snail/treatment was containing 3 replicates in a completely randomized design (CRD).
Each treatment group was subdivided into 3 replicates of 12 snails in a 0.5mx0.5mx0.5m compartment each and snails labelled for easy identification.
Feed and water served 2nd libitum and weigh gained was recorded daily using 2 digital balance at the beginning and thereafter on weekly basis.

The shell breadth, length and aperture radiuos were measured using a venier caliper and shell thickness measured assured using a micrometer screw gauge. Data were subjected to ANOVA test and means separated by DMRT.

Results and Discussion: The results of the experiments are as follows:
Table I. Proximate Composition of Experimental Diets

Nutrients	Pawpaw fruit (PPF)	Citrus fruit pulp (CTP)	Kola nut testa (KNT)	Cocoa husk Pulp (CHP)
Moisture contents(%)	90.190	75.530	88.010	74.660
Crude protein(%)	1.320	0.243	1.585	1.480
Crude fibre	0.570	12.520	1.720	14.880
Ether Extract%	0.130	0.002	0.164	0.060
Ash (%)	0.710	7.550	1.460	6.450
Nitrogen free(%) Extract (%)	7.090	4.155	7.070	2.470

Table 2: Performance characteristics of grower edible giant land snails (*Archachatina marginata*) fed on cocoa husk pulp

Parameters	Pawpaw fruit (PPF)	Citrus fruit pulp (CFP	Kola nut testa (KNT)	Cocoa husk pulp (CHP)
Feed intake (O/S)	636.48^{a}	546.17^{b}	116.37^{d}	302.51^{c}
Total weight (g/s)	181.11^{a}	154.14^{cd}	159.27^{c}	175.78^{b}
Total shell length increment cm/s	8.58^{a}	6.59^{b}	5.85^{c}	6.61^{b}
Total shell width increment cm/s	3.504	3.413	3.23	4.203
Total aperture radius cm/s	6.825	5.986	5.334	5.951

Means with different superscripts are significantly different ($P<0.005$)

Summary and Conclusion: The overall performance of snail followed this pattern: PPF>CPH>CFP>KNT> This study has revealed that cocoa husk pulp (CPH) is very useful as a feeding stuff for snail. Suitability of cocoa production is achievable by raising snails under the natural habit at available under cocoa plantation using CHP as a feeding stuff.

Experimental Title: Development and consumer acceptability of Cocoa –Custard ('Koko-Ogi') (Ogunwolu, S.O. and O. Olubamiwa)

Objective: To increase the local utilization of cocoa through the development of cocoa custard.

Introduction: The need to increase the utilization and consumption of cocoa in the producing countries cannot be over emphasised, particularly with the glut in the supply and the unstable price of cocoa in the World Market. Maize is a major staple food in Nigeria and is used to prepare various kinds of traditional food products like 'Ogi'. The inclusion of cocoa in the Africa indigenous food (Ogi) recipe is expected to increase the utilisation and consumption of cocoa in the rural areas and at the same time improve the nutritional quality of Ogi.

Materials and Method: Maize (white var.) skimmed milk, sugar and preservative were all purchased from open market in Ibadan, while the cocoa powder was obtained from CRIN. The maize was cleaned, fermented for 72hrs at ambient temperature (about 27^{o}C), washed and milled, sieve, dewatered and dried at 50^{o}C for about 5hrs and then sieved.

In the development of cocoa-custard, maize flour and cocoa powder were blended in various proportions:- 100:0, 90:10, 80:20, 70:30, 60:40 and 50:50, maize: cocoa powder respectively and other ingredients added to each proportion and packed in polythene. The prepared coded cocoa custard ('koko ogi') were presented to 15 panelists to evaluate on a 9-point hedonic scale, where 9 represent 'extremely acceptable' and 1 represent 'extremely unacceptable'. Commercial custard from Lisabi Foods Nig. Plc. was used as the control. Data obtained were statically analysed using ANOVA and the means were separated by Duncan's multiple range test.

Results and discussion:

Table 1: Sensory means scores of Cocoa-Custard (Koko-Ogi)

Attributes	Samples (Maize: Cocoa)						
	100:0	90:10	80:20	70:30	60:40	50:50	Control
Colour	5.8_b	6.9_a	6.8_a	6.7_a	7.3_a	5.9_b	7.0_a
Gelatine	7.3_a	7.3_a	7.2_a	7.1_a	5.7_b	5.6_b	7.2_a
Taste	6.0_b	7.0_a	7.3_a	7.2_a	5.8_b	5.9_b	7.2_a
Sourness	7.3_a	7.2_a	7.1_a	7.1_a	5.9_b	5.8_b	7.1_a
Sweetness	6.0_b	7.3_a	7.2_a	7.2_a	5.6_b	5.7_b	7.2_a
Overall Acceptability	6.8_a	7.1_a	7.1_a	7.3_a	5.6_b	5.6_b	7.0_a

a,b = means with same subscripts in a row are not significantly different (P>0.05).

As the inclusion of cocoa powder in the custard recipe increased, the colour of the custard became more acceptable (Table 1), however, the acceptability of the gelation, sourness and sweetness attributes of the cocoa-custard decreased with increased cocoa powder inclusion.

Summary and Conclusion: The cocoa-custard of 10%, 20% and 30% cocoa powder compared favorably with the control in all the sensory attributes considered at 5% significant level. Cocoa-custard (Koko-Ogi) of 30% cocoa powder is however recommended. The nutritional evaluation of the cocoa-custard (koko-ogi) is in progress.

Experimental Title: Effects of varying extraction technique on the quality parameters of *Anacardium occidentale* L. Kernel oil (Yahaya, L.E, Ajao, A.A., Ogunwolu, S.O. and Igbinadolor,R.O.)

Introduction: There has been growing interest in cashew because of the purported dual role of the kernel. It can be used as a substitute for pea nut as an almond in confectionery industry and also important source of lipids and proteins (Lerker,1985 and Ojeh 1985). Processing the kernel to obtain quality edible oil has always posed problem for oil processors.

Objectives: 1.The study was aimed at elucidating the effects of three different methods on the quality parameter of cashew kernel oil.

2. To ascertain which method is most effective and that could be adopted by oil processors.

Materials and Method: Kernels were roasted and blended using an automated blender. Soxhlet extraction was carried out according to the procedure of AOAC (1990) using in-hexane. The aqueous method of extraction employed the method of Fellow and Hampton (1992), while the mechanical method employed the use of hydraulic press. Physico-chemical assay of the oils Viz: Retractive index, Specific gravity, Acid value, Free fatty acid, Iodine value, Saponification value, Peroxide value etc were performed.

Results and Discussion:

Table 1: Physical and chemical characteristics of cashew oil

Parameters	Soxhlet	Aqueous	Mechanical
% Yield	48.81	29.41	33.61
Moisture Content(%)	>1	2-4	1-2
Melting Point (^{o}C)	16-17	16-17	17-19
Retractive Index (at 20^{o}C)	1.446	1.446	1.470
Acid Value	4.76	5.049	5.01
Free falty acid (% olecic acid)	2.43	2.607	2.31
Saponification value	159.9	165.4	178
Peroxide value	4.08	10.13	3.16
Iodine value	87.63	93.04	89.41

Summary and Conclusion: The physical constants for the various methods are within acceptable limits for edible oils. The Saponification value, iodine value, acid value, free falty acid are also within limit of acceptance, however the peroxide value showed a high value for the Aqueous method. This can be rationalized on the basis of hydraulic oxidation. It will therefore not be a suitable method of extraction.

Title of Programme: Development of Cashew Toffee (Ogunjobi, M.A.K. and Aroyeun, S.O.)

Introduction: The cashew fruit (Anacrdium occidentale) is made up of the apple and the nut. The apple contains about 82-85% juice of 10% sugar. The ripe cashew apple is highly perishable and has a shelf life of about 2-3days. The apples are usually for fresh consumption with little being processed into juice. Hence the need to look for other means of utilising it to reduce wastage.

Cashew Toffee is a sweet confectionery made by concentrating a mixture of cashew juice, sugar, glucose syrup, milk powder and cocoa butter. It is light brown and has a sweet, fruity taste, combined with a mild milky flavour. The texture is soft and smooth.

Objectives:1. To increase the local utilization of cashew apple in order to reduce wastage 2. To determine the shelf-stability of the product (Toffee)

Materials and Methods: The cashew apples used for this experiment were obtained From the institute's cashew plantation at the headquarters. The nuts were removed before washing the apples. The juice was extracted from the apple into a clean container. The juice was then divided into five equal parts (250ml). To each portion, 100g, 95g, 90g, 85 and 80g of sugar was added respectively. Other ingredients in the formulation remained constant i.e. five samples of Toffee were made. The juice (250ml) was heated and stirred continuously until it was reduced to one-third of its original volume. Sugar (as specified above), glucose syrup (50g), milk powder (40g), cocoa butter (10g) and lecithin (1g) were added and the mixture was heated with continuos stirring to softball consistency.

The product was poured into metal moulds of 1.5cm thick. The pieces were cooled wrapped with foil paper and then packed in moisture-proof glass jars and kept at room

temperature. The samples were examined weekly for 4months for any possible microbial growth.

Results and Discussion: Data on sensory evaluation of the Toffee samples are shown in the table below. The results showed that the Toffee samples had similar scores for colour, flavour and texture but the Toffee sample made with 80g of sugar had a lower score for taste and overall acceptability. This may be due to the lower quantity of sugar added.

Samples	MEAN SCORE OF ATTRIBUTES Colour	Taste	Flavour	Texture	Overall Acceptability
Toffee made with 100g sugar	6.8_a	7.5_a	6.2_a	7.1_a	7.0_a
Toffee made With 95g sugar	6.6_a	7.4_a	6.3_a	7.1_a	7.0_a
Toffee made With 90g sugar	6.6_a	7.4_a	6.2_a	7.2_a	6.9_a
Toffee made With 85g sugar	6.7_a	7.2_a	6.2_a	6.9_a	6.8_a
Toffee made With 80g sugar	6.6_a	6.1_b	6.2_a	7.0_a	5.9_b

Means with similar subscript are not significant at P>0.05

Summary and Conclusion: The toffee produced was generally accepted by the panelists. Lowering the sugar below 85g/250ml of juice did not yield good result. There was no microbial growth noticed among the samples for 4months.
Further work would have to be carried out on the chemical composition of the toffee and possibly the physico-chemical changes during storage. Finally, proper and attractive packaging material would be needed for subsequent presentation to the consumers.

Experimental Title: Insecticidal property of cashew nut shell liquid (Ajao, A.A.)

Introduction: Cashew nut shell liquid is a by-product of cashew. Because it contains phenolic group, it can be effective on killing insects.

Objective: To study the insecticidal action of cashew nut shell liquid

Materials and Method: The cashew nut shell liquid was applied on termites. Both topical application and residual test were carried out.

Results and Discussion: The results are shown in tables 1 and 2.

Table 1 : Topical Application

Concentration of CNSL	Number of termites before applying CNSL	Mortality rate A 10mins	20m.	30m	B 10mins	20m.	30m.	C 10mins	20m.	30m.	D 10mins	20m.	30m.
8%	10	10	10	10	10	10	10	10	10	10	10	10	10
7%	10	10	10	10	10	10	10	10	10	10	10	10	10
6%	10	10	10	10	10	10	10	10	10	10	10	10	10
5%	10	10	10	10	10	10	10	10	10	10	10	10	10
4%	10	10	10	10	10	10	10	10	10	10	10	10	10
3%	10	10	10	10	10	10	10	10	10	10	10	10	10
2%	10	10	10	10	10	10	10	10	10	10	10	10	10
1%	10	10	10	10	10	10	10	10	10	10	10	10	10

Table 2: Residual Testp

Concentration of CNSL	Number of termites before applying CNSL	Mortality rate A 10mins	20m.	30m	B 10mins	20m.	30m.	C 10mins	20m.	30m.	D 10mins	20m.	30m.
8%	10	10	10	10	10	10	10	10	10	10	10	10	10
7%	10	10	10	10	10	10	10	10	10	10	10	10	10
6%	10	10	10	10	10	10	10	10	10	10	10	10	10
5%	10	10	10	10	10	10	10	10	10	10	10	10	10
4%	10	10	10	10	10	10	10	10	10	10	10	10	10
3%	10	10	10	10	9	10	10	10	10	10	10	10	10
2%	10	10	10	10	8	10	10	9	10	10	10	10	10
1%	10	2	7	9	4	6	10	6	9		3	8	10
								10					

Summary and Conclusion: The effects of the cashew nut shell liquid on the termites are as shown in Table 1 and 2. It can therefore be concluded that cashew nut shell liquid is effective in killing insect pests on the farm.

Title of Programme: CPU-EUR PROGRAMME

Experimental Title: Choice of Solvent for the Qualitative Detection of Organic acids inTea wine using Thin Layer Chromotography (Aroyeun, S.O.)

Introduction: The constituents of Teawine like other most wine samples comprise a large number of organic acids, including non-volatile oxoacids, volatile acids and phenolic acids (Mancini *et al* 2000). Organic acids are essentially all metabolic intermediates or by products extracted from brewer's yeast and they indicate consistent fermentation performance in wine samples. Acids such as malic is a product of the carboxylation of pyruvate, is also extracted as well as volatile organic acid found in Tea like acetic acid. Acetic acid presumably arises from the hydrolysis of acetyl CoA (Hough *et al* 1982). Organic acids contribute to the flavour of wine and several have distinctive tastes. There are a lot of positive physiological effects of organic acids – Citric acid is important in contributing to sourness (acidity) of wine.

Thin layer chromatography has been used in many qualitative analysis of foods and allied products for many years. Thin layer has been widely used recently as a result of sophistication of HPLC, GS/MC a GLC in qualitative measurements.

Materials and Methods: Production of Teawines: Tea leaves were infused in hot water, cooled in iced bath, inoculated with fermenting yeast and allowed to undergo fermentation at 30^{o}C for 72hours. The wines produced were LP (made from infused Teabag obtained from Unilever Plc, Nigeria). LT 143 and LT 318 (made from infused loose tea leaves of clones 143 and 318 from the Mambilla Highland Substation of the

Cocoa Research Institute of Nigeria, Ibadan.

Chemical Analysis:The PH, TTA, TSS, Tannin, Polyphenols, volatile acidity, total acidity and fixed acidity have been previously reported, Aroyeun *et al*. 2004.

The Analysis: The plates, precoated with chromatographically pure alumina (20x20cm, Merck, Darmstadt, Germany) were used to separate the organic acids components of the tea wine. Five different developing solvents were used. Toluene/Acetone/formic acid (30:60:10v/v/v); n-Hexane/Diethyl ether (90/10 v/v); Chloroform 100vol. Chloroform/methanol (40/60v/v). n-Hexane/Diethyl Ether (95/5v/v). The spray reagent used to identify organic acids like Oxalic, Citric, Malic, Acetic and Tartaric acids (standards) is Atomized 0.1% ethanolic solution of 2.6-dichlorophenolindophenol sodium salt. After brief warming, the acids appear as red spots on light blue background.

Result and Discussion:
Result: Table 1 Suitability of developing solvents and Detection Agents

Solvent	Movement	Suitability	Detection Agents
1. N-Hex./Diethyl Ether 90/10	Fast	Suitable	2,6 – dichlorophenol indophenol sodium salts
2. Chloroform	Low	Not suitable	"
3. Toluence/Acetic acid/ Formic acid 30/60/10	Low	Not suitable	"
4 .Chloroform/methan (40/60)	Fast	Suitable	'
5. N-Hex./Diethyl Ether (95/5)	Fastest	Suitable	'

Summary and Conclusion: From Table 1, the suitable solvent for the development of the organic acids in Teawine: Citric, Malic, Tartaric, Acetic and Onalic were N-Hexane in Diethyl ether mix (90:10v/v), chloroform/metanol (40:60v/v) and best was N-Hexane/Diethyl ether at (95:5v/v). the reason for this might be due to the polar closeness of the solvent to the eluted compounds.
Conclusion: The detection reagent, 2,6-dicholophenolindophenol sodium salt is a very good one in organic acid detection. Other ones would be tried subsequently. The teawine is rich in organic acids which are responsible for its quality attributes of taste, colour and aroma.

Title of Programme: CPU – EUR PROGRAMME

Experimental Title: Comparative utilization of cocoa and kola pod husk in layer mash

Scientists: Dr. O.Olubamiwa

Dr. R.A. Hamzat.

Introduction: CPH has shown promises as a potential energy substitute for the conventional ones in studies carried out by various researchers. KPH has also been shown to share similar characteristics with CPH.

These products are locally available farm wastes which have been proven to be very useful as partial replacements for maize in broilers, rabbits and sheep feeds.

Objectives: The aim of this study was to compare the utilization of KPH and CPH by laying hens fed diets containing KPH and CPH at different levels of dietary inclusions.

Materials and methods.

1. **Birds and Their Management**

Fifty, twenty –weeks- in - lay, commercial black harco birds were used for the experiment. The birds appeared healthy and there were no visible symptoms of any disease at the time the experiment started. The birds were housed in battery cages with a single bird per compartment. They were randomly allotted to five treatments denoted A,B, C, D, E, with ten birds per treatment. 2 kg of feed was weighed out for each bird at the beginning of every week and fed *ad-libitum* to the birds. The remnants were collected daily and weighed weekly. The water troughs were washed every morning and fresh water was supplied daily in the morning and in the afternoon on hot days, throughout the experimental period.

Experimental Design

Five dietary treatments were prepared (A,B,C,D,E) with A being the control diet. The control diet included 50% maize. The maize in the control diet was replaced by cocoa-pod husk at 25% and 50% replacement levels for diets B and D respectively. Diets C and E composed of 25% and 50% maize replacement levels by kola pod-husk, respectively. All the other ingredients were at the same levels of inclusion for all the five diets. The experiment was designed to be completely randomized

Conclusion: Diets B and C (25% maize replacement with CPH and KPH respectively) were utilized better ($P < 0.05$) than the diets on 50% maize replacement. Comparatively therefore, it can be inferred that cocoa – and kola-pod husks are similar in their extent of utilization by the laying h

Table 1: Gross composition of experimental diets (%) in 100 kg

	Treatment				
Ingredients	A	B	C	D	E
Cocoa - pod husk	-	12.5	-	25.0	-
Kola - pod husk	-	-	12.5	-	25
maize	50.00	37.5	37.5	25.0	25
Soya bean meal	10.00	10.00	10.00	10.00	10.00
Groundnut cake	7.00	7.00	7.00	7.00	7.00
Fish meal	2.00	2.00	2.00	2.00	2.00
Wheat bran	10.00	10.00	10.00	10.00	10.00
Brewers spent grain	10.00	10.00	10.00	10.00	10.00
Oyster shell	8.20	8.20	8.20	8.20	8.20
Bone meal	2.25	2.25	2.25	2.25	2.25
Salt	0.30	0.30	0.30	0.30	0.30
Vitamin premix	0.25	0.25	0.25	0.25	0.25

Table 2: Proximate composition of diets (%)

Diets	MC	DM	Ash	CF	Ca	P	CP	EE
A	10.46	89.52	16.86	7.00	0.27	1.20	17.15	4.15
B	10.97	89.03	15.30	9.18	0.60	0.78	16.89	4.48
C	10.76	89.25	18.03	10.81	0.85	0.88	16.45	5.21
D	11.04	88.97	15.83	9.68	0.69	0.37	17.33	4.02

E	8.70	91.31	13.51	13.87	1.49	0.42	16.63	4.85

Table 3: Performance characteristics of laying hens fed with cocoa and kola pod husks.

Parameter	Diet A	Diet B	Diet C	Diet D	Diet E	S.E
Feed intake	138.4[a]	135.5[a]	137.06[a]	137.76[a]	136.95[a]	1.22
Hen day production	78.13[a]	52.75[b]	54.61[b]	32.97[c]	29.56[d]	2.94
Egg weight	57.68[a]	52.66[b]	51.90[b]	34.90[c]	37.95[c]	1.89
Feed/Egg (kg)	2.42[a]	2.06[a]	2.08[a]	1.34b[c]	1.52[b]	7.79

FSR YEAR 2003 ANNUAL REPORT

Title: Determination of rehabilitation in coffee/kola intercrop

Activity: The effect of hormonal treatment and nodal number on the performance of kola var. larborchi cuttings.

Objective: To determine the effect of number of nodes as well as IBA (Indete Butyric Acid) hormonal treatment on the sprouting, callusing and rooting of kola cuttings.

Methodology: The experiment which started in 2002 at CRIN Headquarters, Ibadan was repeated in 2003 to verify the performance of some kola stem cuttings with specified nodal number subjected to IBA hormonal treatment. The experiment was a Completely Randomised Design (CRD) in a factorial layout of one IBA hormonal treatment (HT) and the other untreated (i.e Water instead of hormone) (H_o). Four different nodal numbers of cuttings with one node, two, three and five nodes tagged N_o, N_1, N_2 and N_3 respectively, were used. The treatments were replicated three times. Meanwhile, other methods adopted were the same with the ones used for the experiment in 2002. This had been reported in the year 2002 CRIN Annual Report. The data obtained were subjected to Analysis of Variance (ANOVA) and Least Significant (LSD) was used to separate all the means.

Results: Just like that of 2002, the differences in the number of nodes on the stem cuttings did not have any significant effect on the number of stems that sprouted (Table 1). However, untreated cuttings gave higher mean number sprouted kola cuttings than the ones treated with IBA hormone but the two were not significantly different. Although the cuttings treated with IBA hormone produced higher mean number of callused stem cuttings, they were not significantly different from the ones not treated with any hormone (Table 2). Also, the mean number of rooted kola cuttings were not significantly different from one another irrespective of number of nodes used as well as whether treated with IBA hormone or not.

In summary this study had further confirmed the possibility of raising kola stem cuttings successfully without treating them with hormone. Not only that, it has been shown that one node would be more

economical to be used in kola stem propagation since there were no significant (P=0.05) differences among all nodal numbers used for the cuttings.

Table 1: Mean number of kola cuttings that sprouted

	N_o	N_1	N_2	N_3	LSD(0.05)
H_o	2.06	3.97	3.82	4.09	NS
H_1	2.01	4.04	3.65	4.20	NS
LSD(0.05)	NS	NS	NS	NS	

Table 2: Mean number of kola cuttings that callused

	N_o	N_1	N_2	N_3	LSD(0.05)
H_o	2.05	2.67	4.00	4.01	NS
H_1	2.96	3.06	5.02	3.55	NS
LSD(0.05)	NS	NS	NS	NS	

Table 3: Mean number of kola cuttings that rooted

	N_o	N_1	N_2	N_3	LSD(0.05)
H_o	2.01	3.05	3.06	4.01	NS
H_1	1.90	4.01	3.05	3.55	NS
LSD(0.05)	NS	NS	NS	NS	

LEGEND

H_o = No Hormone; H_1 = With Hormone No = One Node

N_1 = Two Node; N_2 = Three Nodes N3 = Five Nodes

Experimenters: A.O. Famaye, E.A. Adeyemi, and A.A. Oloyede

Reference:

Ashiru, G.A. and Quarcoo T (1971): Vegetative propagation of kola (Cola nitida) Vent Schott and Endlicher. Tropical Agric. (Trinidad). Vol. 48, No. 1 pp 85-91.

Title: Rehabilitation of moribund coffee/kola intercrop:

Activity: Preliminary studies on comparison of rehabilitation of coffee-kola intercrop using coppicing and total replanting methods

Methodology: This experiment started in year 2001. The treatments were total replanting (where all the moribund coffee and kola trees) were felled and removed before the plot was replanted with young coffee and kola cutting, coppiced plot (the old coffee and kola trees were coppiced and allowed to rejuvenate) and the control (where the old coffee and kola trees were retained). The methods used to achieve these three treatments had been stated in 2001 and 2002 FSR Annual Report. Maize was planted in the coppiced and replanted plots.

Result: The mean weight of berries (coffee only) as well as the rate of regenerated stands, plant height, stem girth and number of leaves for kola and coffee showed that coppiced plot performed better than either the control or the replanted plot. This shows that coppicing might be better than total replanting especially at the early stage of rehabilitation (Tables 1, 2 and 3). Maize yield of 2050kg/ha was recorded on the replanted plot while the maize in coppiced plot produced 1,088kg/ha. It revealed that maize could be used as an arable crop for generating income by the farmer while rehabilitating his farm. (Table 4).

Table 1: Mean survival for seedlings, regenerated stands and number of shoots regenerated after 18 months

Crop	%Survival(seedlings)	% Regenerated stands (coppiced)	Mean No of Shoot Regenerated
Coffee	60.50	-	-
Kola	64.00	83.33	75.60

Table 2: Plant height, stem girth and number of Leaves after 18 months **of rehabilitation**

Treatment	Height(cm)	Girth (cm)	Number of leaves
Coppiced coffee	66.25	2.76	100.62
Coppiced Kola	69.50	5.67	172.90
Replanted Coffee	40.50	1.66	40.70
Replanted Kola	30.00	2.80	25.56

Table 3: Berry yield of coffee and number of flowering stands of Kola

Treatment	Mean berry yield (Kg/ha)	Mean number of flowering stands (kola)
Coppiced plot (Coffee/Kola)	995.76	85.20
Control plot (Coffee/Kola)	451.60	66.66

Table 4: Yield of maize under coppiced and replanted plots

Treatment	Yield (kg/ha)
Coppiced Plot	1088
Replanted plot	2050
Control	NA

NA = Not Applicable

Investigators: A.O. Famaye, E.A, Adeyemi, A.A. Oloyede, and K.O. Ayegboyin.

Reference:

Famaye, A.O. (2000). Effect of shade regimes on growth and nutrient uptake of seedlings and mature trees of coffee species in Nigeria, Ph.D Thesis, University of Ibadan, 223 Pp.

Biotechnology Program

Leader - S.O. Agbeniyi

Experimental title - Comparative studies of the relative efficiency of different media reported for induction of cocoa somatic embryos (Muyiwa, A.A)

Introduction -Tissues from different parts of plant may have different requirement for satisfactory growth (Murashige and Skoog 1962). Media formulations are based on results of soil composition analysis or plant constituents' analysis.
Nutrient medium, which has so far feature prominently, has been based on Murashige and Skoog (1962). Esan (1992) reported on the sourcing of local natural substitutes for nutrient medium components, which satisfactorily served as replacement for salt requirements. A more recent is the development of a standard tissue culture component for cocoa by Maximova and Traore *et al (*2000) and the use of cocoa floral part on synthetic medium.

Objectives: To improve the development of a suitable, biologically degradable and non-toxic plant nutrient medium from locally available naturally occurring substitutes.
To observe the regenerative potential of cocoa floral parts *in vitro* on both the natural and the synthetic medium.

Materials and Method: The Pennsylvania State University protocol was followed while the organic and inorganic component alternative explored were prepared as earlier described by Esan *in press*. Six clones used in the breeding work in CRIN were used namely T86/45, Sca120, T87/79, T85/799, T12/1223 and T79/379.

Results and Discussion: The result of these experiment are as follows: Primary callus- genesis was observed on both the synthetic and natural media after 14 days on two clones T86/45 and T85/799. The highest regenerative potential was observed after 24 weeks. The callus formation in the lagoon seawater medium was similar to the one reported by Maximova and Traore *et al. (*2000).

***In Vitro* morphogenic response among the clones used**

	CLONES	OBSERVATION	REMARKS
1.	T86/45	Callus adventitious root	Morphogenesis present
2.	T85/799	Callus adventitious root	Morphogenesis present
3.	T87/799	Callus friable	Morphogenesis present
4.	T79/379	Callus friable	Morphogenesis present
5.	Sca120.p	Callus friable	Morphogenesis present
6.	T12/1223	Callus friable	Morphogenesis present

None of the natural media so far developed have equaled the effectiveness of the characteristic of the Pennsylvania State University protocol. However, they were found suitable in tissue culture media formulations.
The report is an indicator that natural substitutes could be used.

Conclusion: Work is still in progress.

COCOA RESEARCH INSTITUTE OF NIGERIA, IBADAN
FEDERAL MINISTRY OF AGRICULTURE &RURAL DEVELOPMENT
BALANCE SHEET AS AT 31ST DECEMBER, 2003

	Notes	2003		2002	
		N	N	N	N
Fixed Assets	1		62,284,694		65,287,615
Current Assets					
Stock	2	2,489,630.34		2,972,893	
Debtors	3	4,263,085.04		5,671,034	
Bank & Cash Balances	4	6,977,381.86		4,977,117	
		13,730,097.24		13,621,044	
Current Liabilities					
Creditors & Accruals	5	(23,904,312)		(14,885,727)	
Net Current Assets			(10,174,215)		(1,264,683)
			52,110,479		**64,022,932**
			=========		=========
Represented:-					
Consolidated Fund					
Capital Fund	7a		(93,372,099)		(76,959,646)
Accumulated fund	6		144,512,578		140,012,578
Housing loan fund			570,000		570,000
Car loan fund			400,000		400,000
			52,110,479		**64,022,932**
			==========		==========

Executive Director

Head of Finance and Account

COCOA RESEARCH INSTITUTE OF NIGERIA, IBADAN
FEDERAL MINISTRY OF AGRICULTURE &RURAL DEVELOPMENT
INCOME AND EXPENDITURE ACCOUNTS FOR THE YEAR ENDED 31ST DECEMBER, 2003.

	Notes		2003		2002
	N	N		N	N
INCOME					
Recurrent Allocation	7b		223,904,017.00		195,829,307
Other Income	8		16,435,605.40		11,356,763
			240,339,622.40		**207,186,070**
Expenditure					
Research & Personnel Cost	9	209,392,846.00		189,058,661	
Administrative Expenses	10	31,878,644.00		20,520,549	
Financial & Professional Chr.	11	12,640,925,.46		8,993,829	
			(253,912,415.46)		(218,573,039)
			(13,572,793.0		**(11,386,969)**
			==========		==========

Executive Director

Head of Finance and Account

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Library, Information & Documentation

The Library services focuses on the provision of scientific information to the staff of the Institute and other stakeholders. In terms of acquisition of Library materials, only few documents were added to the collection through subscription to local journals. Other materials were through gifts and exchange programme with other institutions.

Inter-Library cooperation complements the existing gap created by inability to acquire relevant international Journal and Books due to lack of funds. The number of documents used increased when compared with previous years. Also, increase patronage from all the stakeholders was recorded. The Library continued to benefit from CTA organised selective dissemination of information.

Database Creation: Attempt was made in the year to create database on CRIN mandate crop, using MICROCD/ISIS but the experience acquired from a workshop on this was not enough for the job. X-lib Software, which was menu driven and much simpler for such assignment, was recommended but not purchased. The Information Bulletin for the Institute began, and was sustained throughout the year. Also, a 950 generator was purchased to enhance the effective performance of documentary services in the Library.

Printing Unit engaged in commercial impression running in the Kord machine, and was only able to generate small revenue due to NEPA failure to supply electricity.

Photographic Unit:

This section was able to discharge its duty by assisting the researchers in taking photographs of its research activities both at the laboratories and on the field. Photographs of close-up specimens of insects, plants and micro objects, colour slide of agricultural projects and printing of slides into real photographs were carried out. Social activities of the Institute like visitation of important personalities to CRIN were covered. Passport photograph identity card for all CRIN staffs and,

and we laminated the ID passport for all staffs. However, equipments in the Photographic Section are absolute. The only available camera at the moment was purchased in the year 1983 while the air conditioner in the Section got spoilt in the year 2000.

ANNUAL REPORT OF THE INTERNAL AUDIT FOR YEAR 2003 – A.S.B AKANNI

The Internal Audit carried out the audit of all the Institute financial transactions and assets during the year.

OBJECTIVE'S: The Audit programme for year 2003 was to cover pre and post payment check on all expenditures, Revenue controls stores and assets safeguard for both headquarters and the six substations.

OBSERVATIONS/RESULT

All financial transactions for the period complied with Federal government due process. The payments were properly authorized and correctly posted to various ledgers.

PROCUREMENTS

All assets and services acquired during the period were subjected to all laid down procurement procedures.

STORES

All store materials were checked and observed properly stocked with their Ledgers maintained.

SUBSTATION AUDIT

Audit visit to substations was not carried out due to financial contraint of the Institute.

EXTERNAL AUDITORS

The firm of Eddy O. Alalade & Co. Chartered Accountants audited year 2001 Accounts of the Institute.

YEAR 2003 ANNUAL REPORT OF CRIN ENGINEERING DIVISION
HEAD OF DIVISON: MR. G.E.UBANI, SENIOR MAINTENANCE ENGINEER

Introduction

The year 2003 witnessed the successful execution of several jobs in the eight -(8) functional sections of the Group, namely: -

1. Mechanical Section (Automobile, Agricultural Equipment and Production Units)
2. Electrical/Telecommunications Section
3. Carpentry Section
4. Civil (Building/Roads) Section
5. Painting/Sign-writing Section
6. Water Works and Plumbing Section
7. Drawing Office
8. Transport Office

Achievements

Listed below are the jobs recorded in each section: -

1.1 Mechanical Section-Automobile Unit

1. Maintenance of the Institute's fleet of vehicles when due and at the release of funds/materials.
2. Major repair works were carried out as stated below on: -
    1. FG 845 B03, Eicher staff bus: Refurbishment/replacement of the engine, replacements of the clutch and disc, etc
    2. FG 743 B03, Pajero jeep: Overhauling of engine.
    3. FG 240 B03 Toyota Tercel car: Changing of timing-belt, top gasket etc.
    4. FG 511 S03 Peugeot 504 Best line car: Overhauling of the engine, shock absorber, and braking system.
    5. FG 507 S03, Toyota Hilux: Replacement of the bell housing and oil seal.
    6. FG 563 S03 Eicher Truck: Swapping of the brake drums with the Eicher water tanker.
    7. FG 512 S03, Man diesel water tanker: Changing of the brake port, oil filter, fuel filter and engine oil.
    8. FG 06 G03, Hyundai Excel Car: Replacement of the Engine with 'Tokunbo'.
    9. FG 604 S03, Peugeot 504 saloon car: Refurbishment work involving the replacement of the items of the suspension system such as the tie rod, ball joints and gear mounting.
    10. FG 70 J03, Toyota Land cruiser jeep: General servicing, changing of oil filter, fuel filter, engine oil and fan belt.
    11. FG 678 B03, Toyota Hilux pick-up for Ibeku sub-station: Replacement of the Engine with 'Tokunbo'.
    12. FG 240 B03, Toyota Tercel saloon car: Replacement of the Engine with 'Tokunbo'.
    13. FG 564 S03, Tercel saloon car: Replacement of the Engine with 'Tokunbo'.
    14. FG 193 S03, Toyota Hiace bus: Replacement of the Engine with 'Tokunbo'.
    15. FG 509 S03, Eicher water tanker: Changing of the alternator of the tanker to the Eicher bus.

16. FG 605 S03, Volvo ambulance: Renovation of the dashboard and the entire wiring system.
17. FG 741 B03, Mitsubishi pick-up: Replacement of the Engine with 'Tokunbo' for Ikom sub-station.
18. FG 258 A03, Toyota Camry saloon car: Changing of the front wheel bearings, shafts' rubbers, etc.

1.2 Mechanical Section-Agric. Equipment Unit

1. Repair/maintenance of Institute's Tractors,
2. Repair/ maintenance of the Institute's Slashers.
3. Repair of Institute's Knapsack Sprayers.

1.3 Mechanical Section-Production Unit

1. Reconditioning of bolts and nuts, shafts, etc.
2. Production of bushings, cones, shafts, keyways, studs, flanges, bolts and nuts.
3. Cutting and drilling of plates, angle irons/bars, flanges and 4,000 pieces of label plates for CFC fencing wire.
4. Extraction and fitting of pipes for plumbing works.
5. Fabrication of burglary proofs and iron gates.
6. Repair of office chairs, water storage tanks and vehicles.
7. Repair of leaking vehicle radiators, fencing wires and fitting of keys.

2. Electrical/Telecommunications Section

1. Regular maintenance and rapid response to fault reports in the offices and residential quarters.
2. Collaborated with NEPA to maintain improved power supply from the national grid, by contributing manpower, vehicle, tools and materials to assist NEPA's fault clearing efforts, as and when called for.
3. Modest Maintenance of CRIN High Tension (HT) and Low Tension (LT.) power lines.
4. Modest maintenance of the Institute's Electricity Generators: 12.5kVA at the Borehole site, 17.5kVA at the Engineering Block, 27kVA at the Director's Quarters, 50kVA at the Water Works and both 250 kVA at the Laboratory Block and Main Powerhouses.
5. Replacement of LT poles and aluminum conductors damaged by Timber felling Contractors along Road 4.
6. Reactivation of the Street Lights at the JS, TO and SS Quarters.
7. Repair and installation of some Electricity Meters.
8. Installation of Electricity generator at the Borehole site.
9. Reading of Electricity Meter in the residential quarters.
10. Generation and distribution of Electricity bills to residential quarters.
11. Breakdown maintenance of the 200kVA Transformer serving the J.S. Quarters.
12. Mostly breakdown maintenance of the Air-conditioners in the Institute.
13. Routine electrical engineering services support to all segments of the Institute.

3. Carpentry Section:

1. Renovation works at quarters D1, DD1 and other residential and office buildings.
2. Renovation of Quarter PRO4.
3. Design and construction side tables for Director's office.
4. Construction of formwork for all civil engineering jobs.
5. Sundry repair of doors/replacement of lock sets.
6. Repair of roofs blown out by windstorms.
7. Repair of the temporary roof for the new 250kVA generator in the newly constructed SSQ powerhouse.
8. Reconstruction of the Plantation management's Car Park.
9. Re-roofing of Fermentary's office.
10. Construction of Fermentation Trays
11. Construction of shelves for the CRIN's Late Adenikinju's Library.
12. Roofing of CRIN's Bakery.
13. Construction of Table and Chairs for the CI&CS.
14. Fencing of Quarter D1.
15. Renovation of Chemical Store's ceiling.
16. General repair jobs within the Institute.

4. Civil (Buildings/Roads) Section:

1 Rehabilitation of CRIN net work of roads by sand filling the potholes using manual labour.
2. Construction of water platforms at various locations within the Institute.
3. Installation of seven- (7) trial sign posts.
4. Construction of septic tank and its chamber.
5. Refining of window frames.
6. Rescreeding of the concrete cocoa drying slabs at the Fermentary.
7. Rescreeding of the slab rooftop.
8. Refurbishment exercise at the Qrts. PRO2.
9. Construction of drainage gutter at the JS Qrts. Borehole site.

5. Painting/Sign-Writing Section:

1. Repainting of CRIN Main Entrance.
2. Quarters D1, DD1 and JSA 53.

6. Water Works And Plumbing:

1. Replacement of the damaged pipes in the Crop Processing Unit.
2. Extension of the water tanker drawing point at the Borehole site.
3. Installation of overhead reservoir at the Qrts. PRO3.
4. Plumbing installation of new electric pump at the Water Works.
5. Plumbing renovation at the Qrts. D1.
6. General plumbing renovations in Qrts. DD1.
7. Repair of the faulty Borehole pipe.
8. General plumbing renovations in Qrts. PRO4
9. Replacement of the old water delivery hose on the pump attached to the water tanker FG 512 S03.
10. Plumbing installation of electric water transfer pump at Qtr. DD1.
11. Replacement of the damaged 3-inch-A/C pressure pipes supply line from the main water reservoir.

7. Drawing Office:

1. Drawing of graphs for the Crop Processing Unit.
2. Two-page cartography for the Plant Breeding Group.
3. Stenciling of the names of the Institute's Crops for the Agronomy Group.
4. Writing/ drawing on transparencies for the Crop Processing Unit.
5. Writing out of the design of experiments for the Agronomy Group.
6. Two graphs on tracing paper for Plant Breeding Group.
7. Conference presentation for Plant Breeding Group.
8. Drawing and tracing Ajassor layout plan for CRIN sub-station at Ochaja.
9. Drawing and tracing Ibeku layout plan for CRIN sub-station at Ibeku.
10. Drawing on cardboard of CRIN Organization Chart for the Admin. Secretary's office.

8. Transport Office:

1. Driving of vehicles attached to the Institute's executives.
2. Driving of vehicles attached to Programs and Groups.
3. Vehicular movement of personnel and materials to approved locations with vehicles from the pool and staff bus.

4. Staff transportation to and from Ibadan City.
5. Supply of potable water from the Borehole for use by the Institute and members of the Institute's community.

Constraints:

In the course of providing the necessary services by the Division, several constraints were experienced. However, the most severe ones were delays in the supply of funds / materials.

Suggestions To Eliminate/Alleviate Constraints:

The stocking of commonly used spare parts on the "re-order level system" would go a long way at accelerating the "response factor " to fault clearing. We also advocate the provision of working tools and safety wears for all the engineering staff. A list of the items of tools and materials for each section is annexed to this report.

The auto-mechanical workshop requires attention to the leaking roof. Construction of office accommodation is required for the Higher Technical officer, Mechanical Productions. The carpentry's machine shop floor also requires attention to the floor and the roof.

Members of Engineering Group remained committed to contributing the- best to supporting the Institute's achievement of her corporate goals in the ensuing year.

PLANTATION/ESTATE MANAGEMENT, CRIN HEADQUARTERS, IBADAN

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(A) PLANTATION ACTIVITIES

Required cultural operations were appropriately carried out in all the plots. Operations involved are weeding, prunning, supply of missing stands, planting of plantain suckers, removal of mistletoes, felling of over head shade trees and harvesting. The effectiveness of these assignments manifested in the higher farm produce achieved during the year under report. e.g. 557, 960 cocoa pods were harvested in the year 2003 as compared with 236, 986 cocoa pods harvested in the year 2002. Thus increase of 320,974 pods. Likewise kolanuts were marketed officially since the establishment of the Institute and a total revenue of ₦31,675.00 was realised within 3 months period of sales (October to December, 2003).

The cost advantages of the felling of overhead shade trees encouraged increase pod production, apart from the revenue of ₦302,779.00 realised from logging exercise, N50,660.00 from sales of its branches as firewood and N107,200.00 realised from access fee collections. Table I shows details of harvested cocoa pods on monthly basis while Table II and III show details of revenue generated from farm produce Productions on CRIN scheduled crops and Non scheduled crops, respectively.

(B) ESTATE MAINTENANCE

General cleanliness of the Institute's physical environments were effectively carried out. Horticultural and Ornamental plants were produced, planted and properly

nurtured to produce beautiful environments in the Institute. Also required sanitation exercises were given to all deserved areas within and around the Conference Hall and the Office/Laboratory Complex building.

(C) Research Officers were effectively assisted in their various research activities in the field. Supportive assignments carried out included preparation of experimental sites, laying out of experimental plots.

(D) PERSONNEL

Personnel was grossly down sized during the year and this posed a lot of inconveniences on the anticipated higher level of achievements of our expected responsibilities. As at 31st December, 2003, to manage the Institute's 537 hectare of land, there were 102 staff and 95 casuals.

The staff list composed of 3 ACAS, 6 PAS I; 1 PAS II, 12 ACAFO,; 6 SAFO; 1 F.O., 50 AFA I, 3 AFA II, 1 Snr. Typist, 1 Asst. Clerical Officer and 2 Messengers (Table IV).

(E) CONSTRAINTS

(i) The available labour force were grossly inadequate to maintain effectively the 327.67 total hectares of plots in the Institute.

(ii) The slasher and lawn mowers which were supposed to complement the labour force were completely unfunctional throughout the year.

(iii) Chemicals/fungicides, spraying pumps, rain boots, raincoats, cutlasses and iron files were unavailable to workers throughout the year.

(iv) Low wages did not encourage the casual workers to give out their best on any given assignments. An upward review of wages is highly advocated for.

TABLE I: HARVESTED COCOA PODS ON MONTHLY BASIS

MONTHS	YEAR 2003	YEAR 2002	YEAR 2001
JANUARY	71,883	50,392	48,813
FEBRUARY	42,819	12,029	19,822
MARCH	34,718	11,507	14,880
APRIL	47,420	11,103	20,904
MAY	59,388	5,594	16,406
JUNE	20,796	4,803	19,348
JULY	16,812	5,589	12,743
AUGUST	12,756	6,553	11,037
SEPTEMBER	14,128	9,991	20,131
OCTOBER	56,662	38,174	37,009
NOVEMBER	65,331	54,611	69,780
DECEMBER	115,247	26,641	53,954
TOTAL	**557.960**	**236,986**	**344,739**