ANNUAL REPORT

OF THE

COCOA RESEARCH INSTITUTE OF NIGERIA,IBADAN

2006

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PRINCIPAL ADMINISTRATION AND RESEARCH STAFF LIST AS AT 31 DECEMBER 2006

Internal Management Committee Members

1. Executive Director	Prof. G.O. Iremiren	B.Sc., M.Sc., Ph.D
2. Assistant Director (R)	Dr. (Mrs) F.A. Okelana	B.Sc., M.Phil & Ph.D
3. Assistant Director (EUR)	Dr. O. Olubamiwa	B.Sc., M.Sc., Ph. D
4. Assistant Director (EAE)	Dr. E.O. Aigbekaen	B.Sc., M.Sc., Ph.D
5. Assistant Director (PBM & T)	Dr. O.A. Fademi	B.Sc., M.Sc., Ph. D
6. Administrative Secretrary	Mr. J.O. Babafemi	B.Sc.,MBA, MNIM, ACIPM
7. Chief Accountant	Mr. O.S. Adefaka	B.Sc., MBA, ACMA
8. Chief Librarian	Mr. O.O. Fagbami	B.Sc., MLS
9. Internal Audit/Asst. Chief Accountant	Mr. A.S.B. Akanni	OND, HND, MBA, ANAN, AMNM
10. Chief Administrative Officer	Mr.S.E. Osehon	B.Sc., PGD, MPA, MNIM, ACIPM
11. Principal Accountant	Mr. K.M. Fabowale	OND, HND, PGD,ACMA

Plant Pathology

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

Plant Breeding

1.Dr. O.A. Fademi	B.Sc., M.Sc., Ph.D
2.Dr. S.S. Omolaja	B.Sc., M.Sc., M.Phil, Ph.D
3.Dr. O.M. Aliyu	B.Sc., M.Sc. Ph.D
4.P.O. Aikpokpodion	B.Sc., M.Sc.
5.Mrs. A.A. Muyiwa	B.Sc., M.Sc.
6 K.E. Dada	B.Sc.

Agronomists

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

Entomologists

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

Soil and Plant Nutrition Scientists

1.O.S. Ibiremo	B.Sc., M.Sc.
2 .R.R. Ipinmoroti	B.Sc., M.Sc.
3. Mrs. C.I. Iloyanomon	B.Sc., M.Sc.
4 .M.O. Ogunlade	B.Sc., M.Sc.
5.M.A. Daniel	B.Sc., M.Sc.
6 . L.A. Adebowale	B.Sc.

Crop Processing & Utilization Scientists

1.Dr. O. Olubamiwa	B.Sc., M.Sc., Ph.D
2 .Dr. R.A. Hamzat	B.Sc., M.Sc., Ph.D
3.Mrs. C.O. Jayeola	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.M.A.K. Ogunjobi	B.Sc., M.Sc.
8. A.A. Ajao	B.Sc., M.Sc.
9. B. Adebowale	B.Sc., M.Sc.
10.R.O. Igbinadolor	B.Sc., M.Sc.
11. F.C. Mokwunye	B.Sc.

Extension Scientists

1. Dr. E.O. Aigbekaen	B.Sc., Ph.D
2 .S.O. Adeogun	B.Sc., M.Sc.
3. E.O. Uwagboe	B.Sc., M.Sc.
4. E.A. Agbongiarhuoyi	B. Tech., M.Sc.
5. S. Adebiyi	B. Tech.
6. I. Ndagi	B. Agric.

HEAD OF SUBSTATIONS

1.Dr. S.O. Agbeniyi	Ajassor
2.Mr. T.C.N. Ndubuaku	Owena
3.Dr. S.S. Omolaja	Mambilla
4.Dr. O.O. Oduwole	Ochaja
5.Mrs. U.N. Nmeregini	Ibeku
6.Dr. A.O. Famaye	Uhonmora

Year 2006 Fresh Appointment

S/NO	NAMES	DESIGNATION	DEPLOYMENT	DATE OF RESSUMPTION	STATUS
1	Ayeyemi Oyebanjo	Menssenger	Administration	6 -1-06	Temporary

Left the Service year 2006.

S/No	Names	Date of Birth	Post at Retirement	Grade Level	Date of 1st Appt.	Date of Retirement	Length of service
1.	Osehon, S.E.	15/1/58	Chief Admin Off	13	3/5/82	31/12/06	2
2.	Olunloyo, L.	14/11/60	Security Gd II	2	19/12/00	31/12/06	6
3.	Odunmorayo, B.F.	24/10/54	Snr. Cateering Asst.	5	30/4/81	31/12/06	25
4.	Onwudi, F.	27/8/58	Snr. foreman	6	27/3/79	31/12/06	28
5.	Akinyomide, N.	12/1/62	Foreman	5	1/9/96	31/12/06	10
6.	Adio, E.O.	6/3/65	Snr. Crafts man	4	14/9/96	31/12/06	10
7.	Ajulo, M.O.	27/6/62	Works Att.	3	15/5/01	31/12/06	5
8.	Tijani, U.	11/6/73	Works Att.	1	2/5/01	31/12/06	3
9.	Adedeji, E.O.	9/3/54	S.C.A.I	5	1/4/81	31/12/06	25
10.	Nwajei,C.	2/2/49	Chief Draughtman	6	19/3/72	31/12/06	33
11.	Edokpa,S.	16/3/75	Asst. Draughtman	2	25/3/03	31/1206	3
12.	Ojo,M.	12/7/48	Snr. foreman	6	29/4/74	31/12/06	32
13.	Yahaya,Isa.	16/3/50	Snr. foreman	6	24/7/73	31/12/06	33
14.	Alagbe, W.	9/9/69	Snr. Craftsman	4	1/7/98	31/12/06	
15.	Busari, B.	3/9/52	Snr. Foreman	6	5/5/72	31/12/06	34
16.	Salaudeen, J.R.	25/2/74	Craftsman	3	14/6/01	31/12/06	
17.	Salami,Y.	23/1/59	Craftman	3	19/6/01	31/12/06	5
18.	Paul Olusegun	2/9/58	Snr. Foreman	6	3/8/79	31/12/06	27
19.	Raji, S.	14/12/50	Snr. Foreman	6	1/11/74	31/12/06	32
20.	Oladeji, D.	6/8/49	Snr. Foreman	6	10/1/72	31/12/06	34
21.	Ogundere, E	1/1/48	Foreman	5	10/5/91	31/12/06	15
22.	Nwodo, E.	6/6/48	Snr. Foreman	6	6/5/75	31/12/06	31
23.	Balogun, S.	8/3/61	Foreman	5	10/5/91	31/12/06	15
24.	Ogunsola, O.O	27/7/66	Foreman	5	30/7/92	31/12/06	14
25.	Olagoke, S.B	28/12/66	Snr. Foreman	4	14/6/96	31/12/06	10
26.	Amidu Adisa	2/1/74	Snr. Craftsman	4	9/2//00	31/12/06	6
27.	Okanlawon, T.	29/10/62	Craftsman	3	15/6/01	31/12/06	5
28.	Babafemi, Sunday	23/10/73	Craftsman	3	12/6/01	31/12/06	5
29.	Fayinka, S.	14/11/68	Craftsman	3	19/6/01	31/12/06	5
30.	Salami Kazeem	14/5/72	Craftsman	3	13/6/01	31/12/06	5

31.	Mutal, M.	2/12/78	Craftsman	3	18/06/01	31/12/06	5
32.	Akinloye, M.	18/10/60	Snr Craftsman	4	1/12/97	31/12/06	9
33.	Adewoyin, A.	10/3/73	Craftsman	3	13/6/01	31/12/06	5
34.	Sodunke, S.	12/6/77	Craftsman	3	13/6/01	31/12/06	35
35.	Yusuf Adewale	24/12/75	Craftsman	3	14/6/01	31/12/06	5
36.	Tijani Isiak, A.	15/7/50	Chief Mtr Driver	6	4/7/74	31/12/06	32
37.	Ayinde, O.	1/1/50	Chief Mtr Driver	6	3/7/75	31/12/06	31
38.	Ashamu, Y.K	12/5/48	‘’	6	28/10/75	31/12/06	31
39.	Okojie, H.	5/12/53	“	6	22/4/74	31/12/06	32
40.	Oyetunde, G.	2/1/50	"	6	23/8/75	31/12/06	31
41.	Tijani, I.B.	2/6/49	"	6	17/12/76	31/12/06	32
42.	Aligbe, M.Y.	21/5/50	“	6	3/6/77	31/12/06	29
43.	Anikudi, W.T.	25/8/50	“	6	14/8/78	31/12/06	28
44.	Anifowose, G.	1/10/52	“	6	28/10/75	31/12/06	31
45.	Ikoro, I.	9/5/50	“	6	16/6/87	31/12/06	19
46.	Oguntonade Banji	6/7/61	“	6	19/6/87	31/12/06	19
47.	Sowumi, E.I.	1/6/63	“	6	19/6/87	31/12/06	19
48.	Nda, A.	16/5/68	“	8	11/8/99	31/12/06	7
49.	Adaitu, S.	1/1/49	Snr. Lab Tech	5	26/8/74	31/12/06	32
50.	Kpeleye, R.	10/10/52	Chief Agric F.O.	6	23/7/75	31/12/06	31
51.	Alamu, M.	12/12/48	Chief Agric F.O.	6	20/6/72	31/12/06	34
52.	Erugba, S.	24/12/74	“ “ “	4	21/2/96	31/12/06	10
53.	Bakare,. A.	3/12/48	“ “ “	6	2/5/74	31/12/06	32
54.	William, F.	26/12/50	Asst. Chief Agric F.O.	5	4/1/90	31/12/06	16
55.	Gbadamosi, T.	15/12/68	Snr. Agric F.O.	4	3/10/94	31/12/06	12
56.	Alagbe, G.	19/5/98	“	4	6/9/93	31/12/06	13
57.	Amusa Yekeen	25/4/49	“	4	3/10/94	31/12/06	12
58.	Alani, B.	29/7/59	“	4	3/20/94	31/12/06	12
59.	Gsatong, S.N.	12/8/56	Snr. Sec Guard	4	9/9/88	31/12/06	18
60.	Ndubuaku, T.C.	11/1/56	Chief Research Off.	13	12/11/82	31/12/06	24
61.	Omole, J.	27/8/47	Chief Agric F.O.	6	1/4/74	“	32
62.	Okafor, J.	16/4/47	“	6	25/4/74	“	32
63.	Beka, S.E.	1/12/49	“	6	1/8/72	“	34
64.	Udo, M.E.	12/12/48	“	6	1/8/72	“	34
65.	Ojo, A.U.	3/8/50	“	6	1/8/72	“	34
66.	Owor, O.	13/11/50	“	6	1/5/74	“	32
67.	Ononiwu, A.	5/11/48	Asst. C.A.F.O.	6	4/8/73	“	33
68.	Onyuku, K.	28/10/52	Asst. C.A. F.O.	5	1/4/74	“	32
69.	Imoke, J.	18/10/53	Head Security Guard	5	5/8/78	“	28
70.	Ayambi, J.	5/6/54	“	5	5/8/78	“	28
71.	Ufoegbune, P.	5/10/51	Higher Wks Supt.	7	3/5/72	“	34
72.	Olajide, O.A.	28/2/53	Chief Lab. Tech.	13	24/7/74	“	32

Year 2006 Senior Staff Promotion

S/No	Names	Designation and Salary Grade	Date of Present Appt.	Post to which Promotable & Salary Grade	Recommended Effective Date
1	Dr. Omolaja, S.S.	Asst. Chief Res. Officer CONTISS 12	1/2/03	Chief Research Officer CONTISS 13	1/10/06
2	Dr. Agbeniyi, S.O.	Asst. Chief Res.OfficerCONTISS 12	1/2/03	Chief Research Officer CONTISS 13	1/10/06
3	Dr. Famaye, A.O.	Asst. Chief Res.Officer CONTISS 12	1/2/03	Chief Research Officer CONTISS 13	1/10/06
4	Shitu, T.R.	Senior Research Officer CONTISS 9	1/10/02	Prin. Research Officer CONTISS 11	1/10/06
5	Oloyede, A.	Senior Research Officer CONTISS 9	1/1/03	Prin. Research Officer CONTISS 11	1/10/06
6	Obatolu, B.O.	Research Officer 1 CONTISS 8	5/2/02	Snr. Research officer CONTISS 9	1/10/06
7	Mrs. Lawal J.O.	Research Officer 1 CONTISS 8	17/2/02	Senior Research officer CONTISS 9	1/10/06
8	Anikwe, J.C	Research Officer 1 CONTISS 8	18/12/02	Senior Research officer CONTISS 9	1/10/06
9	Orisajo, S.	Research Office 1 CONTISS 8	24/12/02	Senior Research officer CONTISS 9	1/10/06
10	Daniel, M.A.	Research Officer 1 CONTISS 8	1/10/02	Senior Research officer CONTISS 9	1/10/06
11	Ogunsola, J.D.	Asst. Chief Lab. Technologist	1/10/02	Chief Lab. Technologist CONTISS 13	1/10/06
12	Atunramu, R.	Prin. Lab. Tech. CONTISS 11	1/10/02	Asst. Chief Lab. Tech. CONTISS 12	1/10/06
13	Adio, S.O.	Prin. Lab. Tech. CONTISS 11	1/10/02	Asst. Chief Lab. Tech. CONTISS 12	1/10/06
14	Sunmonu, A.L.	Prin. Lab. Tech. CONTISS 11	1/10/02	Asst. Chief Lab. Tech. CONTISS 12	1/10/06
15	Mrs. Alagbe, O.O.	Laboratory Tech. 1 CONTISS 8	1/10/02	Snr. Lab Tech. CONTISS 9	1/10/06
16	Obatoye	Laboratory Tech. 2 CONTISS 7	7/1/02	Lab. Tech. 1 CONTISS 8	1/10/06
17	Mrs. Ejiofor, J.N.	Laboratory Tech. 2 CONTISS 7	28/2/02	Lab. Tech. 1 CONTISS 8	1/10/06
18	Aikpokpodion, P.E	Laboratory Tech. 2 CONTISS 7	27/12/02	Lab. Tech. 1 CONTISS 8	1/10/06
19	Ebulu, S.	Laboratory Tech. 2 CONTISS 7	13/2/03	Lab. Tech. 1 CONTISS 8	1/10/06
20	Mrs. Agge, J.O.	Asst. Chief Agric. Supt. CONTISS 12	1/10/01	Chief Agric. Supt. CONTISS 13	1/10/06
21	Olorunmota ,V.I.	Asst. Chief Agric. Supt. CONTISS 12	1/10/01	Asst. Chief Agric. Supt. CONTISS 13	1/10/06
22	Onilemo, R.O.	Asst. Chief Agric. Supt. CONTISS 12	1/10/01	Asst. Chief Agric. Supt. CONTISS 13	1/10/06
23	Oladoyinbo, S.D.	Asst. Chief Agric. Supt. CONTISS 12	1/10/01	Asst. Chief Agric. Supt. CONTISS 13	1/10/06
24	Akinrowo, S.E.	Asst. Chief Agric. Supt. CONTISS 12	1/10/02	Chief Agric.Supt. CONTISS 13	1/10/06
25	Akintoye, T.B.	Asst. Chief Agric. Supt. CONTISS 12	1/10/02	Chief Agric.Supt. CONTISS 13	1/10/06
26	Okojie, L.	Asst. Chief Agric. Supt. CONTISS 12	1/10/02	Chief Agric.Supt. CONTISS 13	1/10/06
27	Afolarin, S.	Prin. Agric. Supt. I. CONTISS II	1/10/01	Asst. Chief Agric. Supt. CONTISS 12	1/10/06
28	Mrs.Ligali, D.A.	Prin. Agric. Supt. I. CONTISS II	1/10/01	Asst. Chief Agric. Supt. CONTISS 12	1/10/06
29	Azeez, K.	Prin. Agric. Supt. I. CONTISS II	1/10/01	Asst. Chief Agric. Supt. CONTISS 12	1/10/06
30	Akande, M.A.	Prin. Agric. Supt. I. CONTISS II	1/10/02	Asst. Chief Agric. Supt. CONTISS 12	1/10/06

31	Adebambo A.A.	Prin. Agric. Supt. I. CONTISS II	1/10/01	Asst. Chief Agric. Supt. CONTISS 12	1/10/06
32	Oyeniyan J.A.	Prin. Agric. Supt. I. CONTISS II	1/10/01	Asst. Chief Agric. Supt. CONTISS 12	1/10/06
33	Ojeyemi T.	Prin. Agric. Supt. CONTISS 9	1/10/02	Prin. Agric. Supt. I. CONTISS II	1/10/06
34	Adeyemo R.F.(Mrs)	Senior Agric. Supt. CO NTISS 8	1/10/02	Prin. Agric. Supt. II. CONTISS 9	1/10/06
35	Ajayi C.A.	Senior Agric. Supt. CO NTISS 8	1/10/02	Prin. Agric. Supt. II. CONTISS 9	1/10/06
36	Adigun A.B.	Higher Agric. Supt. CONTISS 7	8/2/02	Senior Agric. Supt. CONTISS 8	1/10/06
37	Dada O.	Higher Agric. Supt. CONTISS 7	21/2/02	Senior Agric. Supt. CONTISS 8	1/10/06
38	Idi M.	Higher Agric. Supt. CONTISS 7	2/4/04	Senior Agric. Supt. CONTISS 8	1/10/06
39	Enagu V.	Higher Agric. Supt. CONTISS 7	31/5/02	Senior Agric. Supt. CONTISS 8	1/10/06
40	Chila N.F.	Higher Agric. Supt. CONTISS 7	10/2/02	Senior Agric. Supt. CONTISS 8	1/10/06
41	Patrick P.O.	Higher Agric. Supt. CONTISS 7	1/8/02	Senior Agric. Supt. CONTISS 8	1/10/06
42	Ogunjobi G.A.	Higher Agric. Supt. CONTISS 7	23/8/02	Senior Agric. Supt. CONTISS 8	1/10/06
43	Mboye J.	Higher Agric. Supt. CONTISS 7	23/9/02	Senior Agric .Supt. CONTISS 8	1/10/06
44	Olayiwola A.M	Higher Agric. Supt. CONTISS 7	31/12/02	Senior Agric. .Supt.CONTISS 8	1/10/06
45	Igwe U.N(Miss)	Higher Agric. Supt.CONTISS 7	25/09/03	Senior Agric . Supt. CONTISS 8	1/10/06
46	Okaisabor J.O	Higher Agric . Supt. CONTISS 7	31/03/03	Senior Agric .Supt. CONTISS 8	1/10/06
47	Uloko B.A	Higher Agric. Supt. CONTISS 7	18/9/03	Senior Agric Supt. CONTISS 8	1/10/06
48	Adesina A.	Asst. Chief Agric. F.O.CONTISS 5	1/10/02	Chief Agric. F.Overseer. CONTISS 6	1/06/06
49	Samuel D.E	Asst. Chief Agric. F.O. CONTISS 5	1/10/02	Chief Agric. F. Overseer.CONTISS 6	1/10/06
50	Pelemo A.	Higher Stastistical Officer.CONTISS 7	10//02/03	Snr. Statistical Officer.CONTISS 8	1/10/06
51	OtunoyeT.C(Mrs)	Statistical Office CONTISS 6	1/10/06	Higher Statistical Officer CONTISS 7	1/10/06
52	Ben-Nana, G.A(Mrs)	Asst.Chief Lib. Officer CONTISS 11	1/10/02	Chief Library Officer CONTISS 12	1/10/06
53	Akhidime, S.I	Admin. Officer II CONTISS 7	31/3/03	Admin Officer I CONTISS 8	1/10/06
54	Ukpeoyibo, S. (Miss)	Admin. Officer II CONTISS 7	2/4/03	Admin Officer I CONTISS 8	1/10/06
55	Odunmorayo, J.A.	Prin. Exec. Officer I CONTISS 11	1/10/02	Asst. Chief Exec. Officer CONTISS 9	1/10/06
56	Bakare E.O.	Prin. Exec. Officer II CONTISS 9	1/10/01	Prin. Exec. Officer I CONTISS 11	1/10/06
57	Ogunkua, O.O.	Senior Exec. Officer CONTISS 8	1/10/02	Prin. Exec. Officer 11 CONTISS 9	1/10/06
58	Sorinolu,O.	Senior Exec. Officer CONTISS 8	1/10/02	Prin. Exec. Officer 11 CONTISS 9	1/10/06
59	Olumini,O.M.	Senior Exec. Officer CONTISS 8	1/10/02	Prin. Exec. Officer 11 CONTISS 9	1/10/06
60	Oyeneye, O.O.	Senior Exec. Officer CONTISS 8	1/10/02	Prin. Exec. Officer 11 CONTISS 9	1/10/06
61	Gbadamosi,O.A.	Senior Exec. Officer CONTISS 8	1/10/02	Prin. Exec. Officer 11 CONTISS 9	1/10/06
62	Akinwande, O.O	Senior Exec. Officer CONTISS 8	1/10/02	Prin. Exec. Officer 11 CONTISS 9	1/10/06
63	Yahaya, S.Z.	Senior Exec. Officer CONTISS 8	1/10/02	Prin. Exec. Officer 11 CONTISS 9	1/10/06
64	Odusote, A.A.	Senior Exec. Officer CONTISS 8	1/10/02	Prin. Exec. Officer 11 CONTISS 9	1/10/06
65	Bakare,A.S.	Senior Exec. Officer CONTISS 8	1/10/02	Prin. Exec. Officer 11 CONTISS 9	1/10/06
66	Adeyemi A.R.E(Mrs)	Higher Excecutive Officer	1/10/03	Prin.Exce.Officer CONTISS 9	1/10/06

67	Arutu A.N	Higher Excecutive Officer CONTISS 7	6/3/02	Senior Excecutive Officer CONTISS 8	1/10/06
68	Olayinka S.O	Higher Excecutive Officer. CONTISS 7	10/8/02	Senior Excecutive Officer CONTISS 8	1/10/06
69	Ibiremo O.B. (Mrs)	Higher Excecutive Officer. CONTISS 7	2/9/03	Senior Excecutive Officer CONTISS 8	1/10/06
70	Adekojo S.A.	Assist. Executive Officer. CONTISS 5	7/1/02	Executive Officer CONTISS 6	1/10/06
71	Akinrinola O.A.	Senior Clerical Officer. CONTISS 5	1/10/02	Chief Clerical Officer CONTISS 6	1/10/06
72	Ojua E.O.A. (Mrs)	Senior Clerical Officer. CONTISS 5	1/1/03	Chief Clerical Officer CONTISS 6	1/10/06
73	Akintoye A.M. (Mrs.)	Senior Confi. Secretary. CONTISS 8	1/10/02	Prin. Senior Conf. Sec. CONTISS 9	1/10/06
74	Adeagbo T.Y. (Mrs)	Confidential Secretary.CONTISS 8	28/8/02	Senior Conf. Sec. CONTISS 8	1/10/06
75	Adamu P. (Mrs)	Senior Typist II. CONTISS 6	1/10/02	Senior Typist I CONTISS 7	1/10/06
76	Somuji M.A. (Mrs.)	Typist I. CONTISS 5	1/3/03	Senior Typist II CONTISS 6	1/10/06
77	Kehinde V. (Mrs.)	Typist I. CONTISS 5	28/5/02	Senior Typist II CONTISS 6	1/10/06
78	Oyelami R.A. (Mrs.)	Typist I. CONTISS 5	2/9/02	Senior Typist II CONTISS 6	1/10/06
79	Okanigbuan J.O. (Mrs)	Typist I. CONTISS 5	1/10/01	Senior Typist II CONTISS 6	1/10/06
80	Adenekan C.C.E.	Asst. Chief Matron/A.N.S CONTISS12	1/1/01	C.Matr./Chief Nurs. Supt CONTISS.13	1/10/06
81	Iyang M.P. (Mrs)	Asst. Chief Matron/A.N.S. CONTISS 12	1/1/01	C. Matr./Chief Nurs. Supt CONTISS13	1/10/06
82	Ajila G. (Mrs)	P.M/Princ. Nurs. Supt CONTISS.11	1/10/01	A.C. M./Asst. Nurs. Supt CONTISS. 12	1/10/06
83	Ojeniyi E.M. (Mrs)	P. M/Princ. Nurs.Supt CONTISS11	17/9/03	A. C. M./A. N. S. CONTISS 12	1/10/06
84	Onatunde-Onanuga A.	Nur. Sister/Nursing Supt. CONTISS 7	17/9/03	Snr. Nurs. Sis/Nursing Supt. CONTISS 8	1/10/06
85	Oduola A.O. (Mrs)	Nur. Sist/Nursing Supt. CONTISS 7	18/9/03	Snr. Nurs. Sis/Nursing Supt. CONTISS8	1/10/06
86	Olatunji P. (Mrs)	Nur. Sist/Nursing Supt. CONTISS 7	23/9/03	Snr. Nurs. Sis/Nursing Supt. CONTISS8	1/10/06
87	Baoku H. (Mrs)	Nur. Sist/Nursing Supt. CONTISS 7	1/10/02	Snr. Nurs. Sis/Nursing Supt. CONTISS8	1/10/06
88	Egbedeyi J.A.	Prin. Technical Officer CONTISS 11	1/10/02	Assistant Technical Officer CONTISS 12	1/10/06
89	Adeleke S.A.	Higher Technical Officer CONTISS 7	1/10/02	Senior Technical Officer CONTISS 8	1/10/06
90	Ola S.	Higher Technical Officer CONTISS 7	1/10/02	Senior Technical Officer CONTISS 8	1/10/06
91	Ajiboye O.	Technical Officer CONTISS 6	1/10/02	Higher Technical Officer CONTISS 7	1/10/06
92	Orok M.O.	Prin. Works Supt. CONTISS 9	1/10/02	Asst. Chief Works Supt. CONTISS11	1/10/06
93	Ogundere E.	Foreman CONTISS 5	1/10/02	Senior Foreman CONTISS 6	1/10/06
94	Matthew D.F.	Foreman CONTISS 5	1/10/03	Senior Foreman CONTISS 6	1/10/06
95	Omitoyinbo E.O.	Snr. Motor Driver/Mech. CONTISS 5	1/10/02	Chief driver/Mech. CONTISS 6	1/10/06
96	Muyiwa A.A. (Mrs)	Research Officer I CONTISS 7	30/7/02	Rsearch Officer I CONTISS 8	1/10/06
97	Mari A.	Agric. Supt. CONTISS 6	1/10/03	Higher Agric. Supt. CONTISS 7	1/10/06

Year 2006 Junior Staff Promotion

S/N	. Names	Designation & Salary Grade	Date of Present Appt	Post to which Promotable & Salary Grade	Recomm. Effective Date
1.	Ejakpovi Felix	Snr. F. Agric Attd. CONTISS 4	1/10/03	Asst. Chief. AFO CONTISS 5	1/10/06
2.	Adesina Sarah(Mrs)	Agric.F. Overseer '' 3	1/10/04	Snr. Agric F. Overseer '' 4	1/10/06
3.	Ethapemi Joseph	Agric.F. Overseer '' 3	1/10/04	Snr. Agric F. Overseer '' 4	1/10/06
4.	Asimi O.T	Agric .F. Overseer 1 '' 2	1/10/03	Agric F. Overseer '' 3	1/10/06
5.	Kunnuola wale P.	Agric. F. Overseer 1 '' 2	1/10/03	Agric. F. Overseer '' 3	1/10/06
6.	Adeleke O.A	Agric. F. Overseer 1 '' 2	1/10/03	Agric. F. Overseer '' 3	1/10/06
7.	Okere J. Monday	Agric. F. Overseer 1 '' 2	1/10/03	Agric. F. Overseer '' 3	1/10/06
8.	Oluseye Olaleye	Agric. F. Overseer 1 '' 2	1/10/03	Agric. F. Overseer '' 3	1/10/06
9.	Atanda Tairu	Agric. F. Overseer 1 '' 2	1/10/03	Agric. F. Overseer '' 3	1/10/06
10.	Lukman Fausat (Mrs)	Agric .F. Attendant II '' 1	2/06/02	Agric .F. Attendant '' 2	1/10/06
11.	Ogundare O.R (Mrs)	Agric .F. Attendant II '' 1	2/06/02	Agric .F. Attendant '' 2	1/10/06
12.	Fowosere F.(Miss)	Agric .F. Attendant II '' 1	2/06/02	Agric .F. Attendant '' 2	1/10/06
13.	Ariyibi, E (Mrs)	Agric .F. Attendant II '' 1	2/06/02	Agric .F. Attendant '' 2	1/10/06
14.	Adepoju, O.(Mrs)	Agric .F. Attendant II '' 1	2/06/02	Agric .F. Attendant '' 2	1/10/06
15.	Ijadunola, T (Mrs)	Agric .F. Attendant II '' 1	2/06/02	Agric .F. Attendant '' 2	1/10/06
16.	Adeyanju Segun	Agric .F. Attendant II '' 1	2/06/02	Agric .F. Attendant '' 2	1/10/06
17.	Olayiwola Asimiyu	Agric .F. Attendant II '' 1	2/06/02	Agric .F. Attendant '' 2	1/10/06
18.	Agboluaje Ganiyu	Agric .F. Attendant II '' 1	2/06/02	Agric .F. Attendant '' 2	1/10/06
19.	Okere, F. (Mrs)	Agric .F. Attendant II '' 1	2/06/02	Agric .F. Attendant '' 2	1/10/06
20.	Makinde B. (Mrs)	Agric .F. Attendant II '' 1	2/06/02	Agric .F. Attendant '' 2	1/10/06
21.	Jayeade Abass	Agric .F. Attendant II '' 1	2/06/02	Agric .F. Attendant '' 2	1/10/06
22.	Adeyemi, O. (Mrs	Agric .F. Attendant II '' 1	2/06/02	Agric .F. Attendant '' 2	1/10/06
23.	Olaoye, O (Mrs)	Agric .F. Attendant II '' 1	2/06/02	Agric .F. Attendant '' 2	1/10/06
24.	Ganiyu Janet (Mrs)	Agric .F. Attendant II '' 1	2/06/02	Agric .F. Attendant '' 2	1/10/06
25.	Ojo Bunmi (Mrs)	Agric .F. Attendant II '' 1	2/06/02	Agric .F. Attendant '' 2	1/10/06
26.	Lawal, B (Mrs)	Agric .F. Attendant II '' 1	2/06/02	Agric .F. Attendant '' 2	1/10/06
27.	Emaku M. (Mrs.)	Agric F. Attendant II CONTISS I	2/6/02	Agric F. Attendant CONTISS. 2	1/10/06
28.	Ugwoke Joseph	Agric F. Attendant II CONTISS I	2/6/02	Agric F. Attendant CONTISS. 2	1/10/06
29.	Komolafe K.	Agric F. Attendant II CONTISS I	2/6/02	Agric F. Attendant CONTISS. 2	1/10/06
30.	Alao G. O.	Agric F. Attendant II CONTISS I	2/6/02	Agric F. Attendant CONTISS. 2	1/10/06
31.	Nwaokolo Ruth (Mrs.)	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
32.	Gbadamosi M.	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
33.	Akinrelere Kemi (Miss)	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
34.	Otitoloju S. (Miss)	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
35.	Ajayi Yemisi (Mrs.)	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
36.	Oyinlade F. B. (Mrs.)	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
37.	Oseghe F. (Mrs.)	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
38.	Alalade K. (Mrs.)	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
39.	Ojo Esther (Mrs.)	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
40.	Oloyede Kazeem	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
41.	Taiwo Banke (Mrs.)	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
42.	Garba Idris A.	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
43.	Adetunji Esther (Mrs.)	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06

44.	Gbiye E. (Mrs.)	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
45.	Ojo M.	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
46.	Alabi Mukaila	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
47.	Adebisi Y.	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
48.	Aribido Mary (Mrs.)	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
49.	Ojo Mukaila	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
50.	Adewumi A. (Mrs.)	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
51.	Adekudi F. (Mrs.)	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
52.	Adesida V. (Mrs.)	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
53.	Olatunji C. (Mrs.)	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
54.	Oladokun J.	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
55.	Adetunji T. A.	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
56.	Oladipo J.	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
57.	Akele Oni	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
58.	Abioye Peter	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
59.	Tijani R. (Mrs.)	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
60.	Olawore B. (Mrs.)	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
61.	Olagunju Nurudeen	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant CONTISS. 2	1/10/06
62.	Ojo Moses	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
63.	Akinyomide Oriola	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
64.	Akinwale O.	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
65.	Ilori Oluwole	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
66.	Adeleke Oyebanji	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
67.	Amusa L.	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
68.	Oladoja Olaolu	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
69.	Makinde Kehinde	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
70.	Oladunmoye Oladimeji	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
71.	Igwe F.	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
72.	Akinola A.	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
73.	Toiki O.	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
74.	Adeleke A.	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
75.	James T.	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
76.	Okpaise I. (Mrs.)	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
77.	Umahio N. A.	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
78.	Musa A.	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
79.	Unubi Attah	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
80.	Opalua P.	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
81.	David A.	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
82.	Lawal A. J.	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
83.	Ignatius Ajito	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
84.	Edet R. Akpan	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
85.	Domi M. S. (Mrs.)	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
86.	Olatunji Ganiyu	Agric F. Attendant II CONTISS I	2/6/03	Agric F. Attendant I CONTISS. 2	1/10/06
87.	Oketokun Grace (Mrs.)	Printer CONTISS 4	1/10/03	Snr. Printer CONTISS 5	1/10/06
88.	Okonkwo Tayo (Mrs.)	Printer CONTISS 4	1/10/03	Snr. Printer CONTISS 5	1/10/06
89.	Isong E. B. (Mrs.)	Clerical Officer I CONTISS 4	1/10/03	Snr. Clerical Officer I CONTISS 5	1/10/06
90.	Oyebode F. A. (Mrs.)	Clerical Officer I CONTISS 4	1/10/03	Snr. Clerical Officer I CONTISS 5	1/10/06
91.	Oguntade Gbadebo	Clerical Officer II CONTISS 3	1/10/03	Clerical Officer II CONTISS 4	1/10/06

92.	Olunloyo Lekan O.	Security Guard II CONTISS 2	1/10/03	Security Guard I CONTISS 3	1/10/06
93.	Quadry B. A.	Security Guard II CONTISS 2	1/10/03	Security Guard I CONTISS 3	1/10/06
94.	Oladejo A.	Security Guard II CONTISS 2	1/10/03	Security Guard I CONTISS 3	1/10/06
95.	Adeyemo S. A.	Watchman Gd. I CONTISS I	1/10/03	Security Guard II CONTISS 2	1/10/06
96.	Omitade Oluwaseyi	Watchman Gd. I CONTISS I	2/6/03	Security Guard II CONTISS 2	1/10/06
97.	Bello Saka A.	Watchman Gd. I CONTISS I	2/6/03	Security Guard II CONTISS 2	1/10/06
98.	Adeleye K. R.	Watchman Gd. I CONTISS I	2/6/03	Security Guard II CONTISS 2	1/10/06
99.	Akanji A.	Watchman Gd. I CONTISS I	2/6/03	Security Guard II CONTISS 2	1/10/06
100.	Njaowgali S.	Watchman Gd. I CONTISS I	2/6/03	Security Guard II CONTISS 2	1/10/06
101.	Okonchie J.	Watchman Gd. I CONTISS I	2/6/03	Security Guard II CONTISS 2	1/10/06
102.	Taiwo A. B.	Watchman Gd. I CONTISS I	2/6/03	Security Guard II CONTISS 2	1/10/06
103.	Ikpefua A. E.	Watchman Gd. I CONTISS I	2/6/03	Security Guard II CONTISS 2	1/10/06
104.	Onyema O.	Watchman Gd. I CONTISS I	2/6/03	Security Guard II CONTISS 2	1/10/06
105.	Ehisonome James	Watchman Gd. I CONTISS I	2/6/03	Security Guard II CONTISS 2	1/10/06
106.	Nuki Joseph	Watchman Gd. I CONTISS I	2/6/03	Security Guard II CONTISS 2	1/10/06
107.	Balogun R. O.	Snr. Craftsman CONTISS 4	1/1/03	Foreman CONTISS 5	1/10/06
108.	Adio E. O.	Snr. Craftsman CONTISS 4	1/10/03	Foreman CONTISS 5	1/10/06
109.	Adedoyin J. A.	Snr. Craftsman CONTISS 4	1/10/03	Foreman CONTISS 5	1/10/06
110.	Ajulo Micheal	Craftsman CONTISS 4	1/10/03	Snr. Craftsman CONTISS 4	1/10/06
111.	Togun B. O. (Mrs.)	Craftsman CONTISS 4	1/10/03	Snr. Craftsman CONTISS 4	1/10/06
112.	Salawudeen J.M. (Mrs.)	Craftsman CONTISS 4	1/10/03	Snr. Craftsman CONTISS 4	1/10/06
113.	Oyeniran Sunday	Craftsman CONTISS 4	1/10/03	Snr. Craftsman CONTISS 4	1/10/06
114.	Sodunke S.	Craftsman CONTISS 4	1/10/03	Snr. Craftsman CONTISS 4	1/10/06
115.	Adewoyin A.	Craftsman CONTISS 4	1/10/03	Snr. Craftsman CONTISS 4	1/10/06
116.	Salami Kazeem A.	Craftsman CONTISS 4	1/10/03	Snr. Craftsman CONTISS 4	1/10/06
117.	Yusuf A.	Craftsman CONTISS 4	1/10/03	Snr. Craftsman CONTISS 4	1/10/06
118.	Adeogun M. A.	Craftsman CONTISS 4	1/10/03	Snr. Craftsman CONTISS 4	1/10/06
119.	Oladiti Solomon	Craftsman CONTISS 4	1/10/03	Snr. Craftsman CONTISS 4	1/10/06
120.	Ironua S.	Craftsman CONTISS 4	1/10/03	Snr. Craftsman CONTISS 4	1/10/06
121.	Uwaifo A.	Craftsman CONTISS 4	1/10/03	Snr. Craftsman CONTISS 4	1/10/06
122.	Fayinka Simeon O.	Craftsman CONTISS 4	1/10/03	Snr. Craftsman CONTISS 4	1/10/06
123.	Ibiyemi A. O.	Craftsman CONTISS 4	1/10/03	Snr. Craftsman CONTISS 4	1/10/06
124.	Ojo L. I.	Craftsman CONTISS 4	1/10/03	Snr. Craftsman CONTISS 4	1/10/06
125.	Akinwale A.	Snr. Store-Keeper CONTISS 4	1/10/03	Asst. Chief Store-Keeper CONTISS 5	1/10/06
126.	Musa I. Y.	Snr. Store-Keeper CONTISS 4	1/10/03	Asst. Chief Store-Keeper CONTISS 5	1/10/06
127.	Eno Innocent Eno	Store-Assistant CONTISS 2	28/10/03	Store-Keeper CONTISS 3	1/10/06
128.	Edokpa Sunday	Asst. Draughtsman CONTISS 2	28/2/03	Assistant Draughtsman 3	1/10/06
129.	Oladipupo Kayode	Snr. Motor /Mech. II CONTISS 4	1/10/03	Snr. Motor Driver /Mech. I CONTISS 5	1/10/06
130.	Ajiroba A. T.	Motor Driver/Mech. CONTISS 3	1/10/03	Snr. Motor Driver /Mech. II CONTISS 4	1/10/06
131.	Oguntoyinbo Waidi	Motor Driver/Mech. CONTISS 3	1/10/03	Snr. Motor Driver /Mech. II CONTISS 4	1/10/06
132.	Musa O. Samuel	Motor Driver/Mech. CONTISS 3	3/5/04	Snr. Motor Driver /Mech. II CONTISS 4	1/10/06
133.	Onwunbiko Micheal	Motor Driver/Mech. CONTISS 2	2/6/03	Motor Driver /Mech. II CONTISS 3	1/10/06
134.	Alu Friday	Motor Driver/Mech. CONTISS 2	2/6/03	Snr. Motor Driver /Mech. II CONTISS 3	1/10/06

LIST OF SENIOR STAFF DUE FOR CONFIRMATION AS AT 31ST JANUARY 2006

SN	NAME	POSITION ON 1ST APPT.	CONTTIS	DATE OF 1ST APPT.	DATE DUE FOR CONFIRMATION	PRESENT DESIGNATION	DATE OF PRESENT APPT.	PRESENT LOCATION
1.	Uloko B. A.	Higher Agric. Supt.	07	18/9/03	18/9/05	Higher Agric. Supt.	18/9/03	Uhonmora substation
2.	Ibiremo O. B. (Mrs.)	Higher Exec. Officer	07	2/9/03	2/9/05	Higher Exec. Officer	2/9/03	
3.	. Onatunde-Onanuga (Mrs)	Staff Nurse/Midwife	07	17/9/03	17/9/05	Staff Nurse/Midwife	17/9/03	
4.	Mrs. A.O. Oduola	‘’	07	17/9/03	17/9/05	‘’	17/9/03	
5.	Mrs. P. Olatunji	‘’	07	18/9/03	18/9/05	‘’	18/9/03	
6.	Mrs. H. Baoku	‘’	07	23/9/03	23/9/05	‘’	23/9/03	
7.	Mr. S. O. Adio	Lab. Tech. II	07	6/1/92	6/1/94	‘’	1/10/02	

LIST OF JUNIOR STAFF DUE FOR CONFIRMATION AS AT 31ST JANUARY 2006

S/N	NAME	POSITION ON 1ST APPT.	CONTTIS	DATE OF 1ST APPT.	DATE DUE FOR CONFIRMATION	PRESENT DESIGNATION	DATE OF PRESENT APPT.	PRESENT LOCATION
1.	Sardauna A.Y.	Asst. Clerical Officer	02	2/10/02	2/10/04	Clerical II	1/10/05	Mambilla Substation
2.	Wakaps F.J.	Asst. Craftsman	02	20/09/02	20/9/04	Asst. Craftsman	20/9/02	Mambilla Substation
3.	Lukman F. (Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd. II	2/6/03	PEM
4	Ogundare O.R.A. (Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd. II	2/6/03	PEM
5	Fowosere F. (Miss)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd. II	2/6/03	PEM
6	Ariyibi E. (Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd. II	2/6/03	PEM
7	Otitoloju O.M. (Miss)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd. II	2/6/03	AD (EUR)
8	Ejenobor F.B. (Mrs)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd. II	1/10/05	Administration

9	Imafidon Ruth (Miss)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd. II	2/6/03	PEM
10	Ganiyu A.	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd. II	2/6/03	PEM
11	Oladunmoye O.	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd. II	2/6/03	Poultry
12	Adepoju O.M.	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd. II	2/6/03	PEM
13	Ijadunola T. (Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd. II	2/6/03	PEM
14	Adeyanju S.	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd. II	2/6/03	PEM
15	Olayiwola A.	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd. II	2/6/03	PEM
16.	Okere F. (Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd. II	2/6/03	PEM
17.	Bakare T. (Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Asst. Exec. Officer	1/10/05	Admin. & Supp.
18	Makinde B. (Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
19	Jaiyeade A.	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
20	Adeyemi O. (Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
21	Olaoye A. (Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
22	Ganiyu Janet (Mrs)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
23	Ojo B. (Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
24	Lawal B. (Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
25	Emaku M. (Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
26	Ugwuoke J.	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
27	Komolafe K.	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
28	Ganiyu Agboluaje	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
29	Gbadamosi M.	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
30	Akinrelere K.(Mrs)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
31	Ajayi Y. (Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
32	Oyinlade F.B.(Mrs)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
33	Eseghe F. (Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
34	Alalade L.O. (Mrs)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM

35	Ojo E. (Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
36	Oloyede K.	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
37	Taiwo B. (Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
38	Garba I. A.	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
39.	Adetunji E. (Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/05	PEM
40	Gbiye E.(Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
41	Ojo Moshudi	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
42	Mukaila Alabi	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
43	Aribido M.(Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
44	Adewumi A.(Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
45	Anikudi F.(Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
46	Adesida V.(Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
47	Olatunji C. (Mrs.)	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
48	Oladokun J.	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
49	Adetunji T. A.	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
50								
51	O. Akele	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
52	Abioye Peter	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
53	Mrs. R. Tijani	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
54	Mrs. B. Olawore	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
55	N. Olagunju	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
56	Moses Ojo	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
57	O. Akinyomide	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
58	O. Akinwale	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	Zone 5
59	O. Ilori	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	Zone 1
60	Mrs. B.F. Alade	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	AD (R&S)
61	Oyebamiji Adeleke	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	Fermentary

62	L. Amusa	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	Engineering
63	O. Oladejo	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd	2/6/03	Zone 5
64	K. Makinde	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd	2/6/03	Zone 9
65	F. Igwe	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd	1/10/05	CFC
66	Mrs. A. Akinola	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd	2/6/03	Nursery
67	O. Toiki	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd	2/6/03	Owena
68	A. Adeleke	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd	2/6/03	Owena
69	M. Efunniyi	Agric. Field Attd. II	01	8/10/03	8/10/05	Photographic Asst. II	8/10/03	Lib.&Inf. Doc.
70	T. James	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	Owena
71	Mrs. Idowu Okpaise	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd. II	2/6/03	Uhonmora
72	A. Umuahion	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	Uhonmora
73	N. Oguche	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	Ochaja
74	A. Musa	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	Ochaja
75	Attah Unubi	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	Ochaja
76	P. Opalu	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	Ochaja
77	A. David	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	Mambilla
78	Mrs. A.J. Lawal	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	Mambilla
79	Ajito Ignatius	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	Ajassor Subs.
80	Edet R. Akpan	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	Ajassor Subs.
81	Mrs. M.S. Domi	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd.	5/9/03	SSWA
82	Mrs. E.A. Kayiwedo	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd. II	9/9/03	SSWA
83	Miss M. Onipe	Messenger	01	2/6/03	2/6/05	Asst. Exec. Officer	1/10/05	Exec. Dir. Officer
84	Mrs. R. Oghenegueke	Messenger	01	2/6/03	2/6/05	Messenger	5/6/03	GMESS
85	Mrs. B. Ogunleye	Messenger	01	2/6/03	2/6/05	Messenger	2/6/03	SPN
86	S. Abass	Messenger	01	2/6/03	2/6/05	Messenger	2/6/03	AD (r&s)
87	Mrs. B. Ogbechie	Messenger	01	2/6/03	2/6/05	Messenger	2/6/03	AGRONOM

								Y
88	Mrs. B. Kuforiji	Messenger	01	2/6/03	2/6/05	Messenger	2/6/03	CPU
89	Mrs. B. Akinyode	Messenger	01	2/6/03	2/6/05	Typist Gd. II	1/10/05	Admin &Supplies
90	Mrs. O. Rafiu	Messenger	01	2/6/03	2/6/05	Messenger	2/6/03	P/Patho
91	Mrs. E. Ojo	Messenger	01	2/6/03	2/6/05	Messenger	2/6/03	P/Breeding
92	T. Modebei	Messenger	01	2/6/03	2/6/05	High Exec. Officer	1/10/05	Finance & Acct
93	T. Oluwayomi	Messenger	01	2/6/03	2/6/05	High Exec. Officer	1/10/05	PEM
94	Mrs. B. Ganiyu	Messenger	01	2/6/03	2/6/05	High Exec. Officer	2/6/03	AD (EUR)
95	A. Akinrinola	Messenger	01	2/6/03	2/6/05	High Exec. Officer	2/6/03	Finance &Acct
96	Mrs. A.O. Kuforiji	Messenger	01	4/6/03	4/6/03	High Exec. Officer	1/10/05	Finance & Acct
97	Mrs. M. Bakare	Messenger	01	4/6/03	4/6/03	Messenger	4/6/05	PEM
98	Akinlade Akinyemi	Messenger	01	9/6/03	9/6/03	Messenger	4/6/05	Extension
99	Miss S.O. Olajumoke	Messenger	01	24/7/03	24/7/03	Messenger	24/7/03	Health Centre
100	S. Alli	Messenger	01	9/06/03	9/06/03	Messenger	9/6/03	Econs &Stat.
101	Y. Adebisi	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd. II	1/10/05	PEM
102	Mukaila Ojo	Agric. Field Attd. II	01	2/6/03	2/6/05	Agric. Field Attd. II	2/6/03	Zone 6
103	Mrs. A. Olutade	Asst. Clerical Officer	01	10/9/03	10/9/05	Asst. Clerical Officer	10/9/03	Finance & Acct
104	Adepoju O.	Snr. Steward	01	2/6/03	2/6/05	Snr. Steward	2/6/03	SS Club House
105	S. Adeyemo	Watchman Grd. I	01	2/6/03	2/6/05	Watchman Grd. I	2/6/03	Security Unit
106	S. Omitade	Watchman Grd. I	01	2/6/03	2/6/05	Watchman Grd. I	2/6/03	Security Unit
107	S. Bello	Watchman Grd. I	01	2/6/03	2/6/05	Watchman Grd. I	2/6/03	Security Unit
108	Miss K. Adeleye	Watchman Grd. I	01	2/6/03	2/6/05	Watchman Grd. I	2/6/03	Security Unit
109	Akanji Azeez	Watchman Grd. I	01	2/6/03	2/6/05	Watchman Grd. I	2/6/03	Security Unit
110	S. Njaogwali	Watchman Grd. I	01	2/6/03	2/6/05	Watchman Grd. I	2/6/03	Security Unit
111	J. Okonchie	Watchman Grd. I	01	2/6/03	2/6/05	Watchman Grd. I	2/6/03	Security Unit

112	Abiodun Taiwo	Watchman Grd. I	01	2/6/03	2/6/05	Watchman Grd. I	2/6/03	Security Unit
113	A. Ikpefua	Watchman Grd. I	01	2/6/03	2/6/05	Watchman Grd. I	2/6/03	Security Unit
114	Owasi Onyema	Watchman Grd. I	01	2/6/03	2/6/05	Watchman Grd. I	2/6/03	Ibeku Subs.
115	J. Ehisonomen	Watchman Grd. I	01	2/6/03	2/6/05	Watchman Grd. I	2/6/03	Uhonmora Subs
116	Nuki Joseph	Watchman Grd. I	01	2/6/03	2/6/05	Watchman Grd. I	2/6/03	Mambilla Subs
117	A. Adekanbi	Works Attendant	01	2/6/03	2/6/05	Works Attendant	2/6/03	Engineering
118	A. Adesina	Works Attendant	01	2/6/03	2/6/05	Works Attendant	2/6/03	Engineering
119	M. Oyawale	Works Attendant	01	2/6/03	2/6/05	Works Attendant	2/6/03	Engineering
120	K. Adeboye	Works Attendant	01	2/6/03	2/6/05	Works Attendant	2/6/03	Engineering
121	Usman Tijani	Works Attendant	01	2/6/03	2/6/05	Works Attendant	2/6/03	Engineering
122	Okoi James	Works Attendant	01	2/6/03	2/6/05	Agric. Field Attd.	1/10/05	PEM
123	Eno Innocent Eno	Store Assistant	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
124	Musa O. Samuel	Motor Driver	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
125	Onwubiko Michael	Motor Driver	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
126	Alu Friday	Motor Driver	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
127	Mrs. S. Rabiu	Health Attendant	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
128	Mrs. L.E.D. Samuel	Health Attendant	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM
129	Mrs. F.A. Oyebode	Clerical Officer I	01	2/6/03	2/6/05	Agric. Field Attd.	1/10/05	PEM
130	Atanda Oluwasina	Asst. Clerical Officer	01	2/6/03	2/6/05	Agric. Field Attd.	2/6/03	PEM

COCOA PROGRAMME

Experimental Title: Assessment of genetic diversity in Nigerian Cacao *Theobroma Cacao* (L) collections using simple sequence markers (Aikpokpodion, P.O., Kolesnikova-Allien Maria (IITA) and R.J. Schnell (USDA,Miami, Florida).

Justification and Objectives:

Although the bulk of the world's cocoa (more than 70%) is produced in West Africa, the non native cacao tree species was introduced to the region in the 19th century. Initial base material was of the amelonado population but since the 1920s there have been several subsequent introductions of materials from other populations. A large-scale variety replacement with introduced upper Amazon materials in the early 1940s, as a result of efforts to control the attack of cocoa swollen shoot virus disease (CSSCD), led to the build-up of genetic variability in cocoa materials available in West Africa, the extent of which until now, was unknown. A rational and efficient use of the available germplasm collection depends largely on the knowledge of the nature and relationships of the genetic diversity present in the collections. This can help guide the breeding plans and exploitation of genetic variation available in the genebank. The use of molecular markers provides the most efficient means of assessing the extent of genetic diversity in germplasm collections. The simple sequence repeat (SSRs) markers has been found to give greater resolution of population genetic structure than other types of markers and have been wildely used in many crops (1,2). This study was thus carried out to determine, the genetic diversity in Nigeria's cocoa collection using simple sequence repeats (SSRs).

Materials and Methods

DNA was extracted from young leaves according to (3) from 600 clones and accessions, classified into 11 populations collected from both field genebank and farmers fields across the three cocoa growing agroecological zones of Nigeria. Ideal cocoa climate (130 accessions), ideal cocoa soil (158 accessions) and breeder's genebanks collections (158). 13 cacao microsatellite markers (4) were used for this study. PCR Amplification was performed in a MJ Research PTC 200 thermal cycler, in 5 µl total volume of reaction mixture containing 0.5µl of cacao DNA (-2.5ng),0.5 µl of 10x PCR buffer (10mM Tris-HCI (Ph 8.3), 50mM KCI), 0.5 µl of 25mM $MgCl_2$, 0.125µl each of forward and reverse primer (10mM), 0.1 µl of 10mM dNTPs (dATP, dCTP, dGTP and dTTP), 0.05 µl of 5 U of Taq polymerase (Bioline, UK). The PCR cycle consisted of initial denaturation at 94°C for 40min., followed by 32 repeat of the following cycle: 94° C for 30s, 46°C or 51°C (annealing temperature depending on prima) for 1min and 72°C for 1min. This was followed by further primer extension at 72°C for 7 min. Capillary electrophoresis was performed on ABI PRISM® 3100 Genetic Analyzer. Genetic diversity indices were estimated within and among loci and populations using the software package CERVUS, GENETIX 4.0.2 and FSTAT ver. 2.9.3.

Result and Discussion

Total of 288 alleles were detected with the mean number of alleles per locus (22.2) and ranged from 11 for MTcCIR6 marker to 33 for MTcCIR19 marker. Expected heterozygosity (H_E) was generally high and ranged from 0.552 for local parent stock (Amelonado) to 0.791 for F1 hybrid population with a mean of 0.701. It ranged from 0.725 in Farmer populations, 0.748 in parent stock to 0.762 in breeders genebank population otherwise comparison of F_{ST} (theta) revealed significant differentiation between Upper Amazon and local population (0.169), Trinitario parent stock (0.093). Genebank Progenies (0.092) and farmers populations (0.059 – 0.084). The presence of significant heterozygote deficit in all three classes (F_{IS} = 0.336, 0.210 and 0.029 in parent stock, breeders' genebank and farmers collections, respectively) suggests the presence of post structure due to Wahlund effect. The F_{IS} among the 11 populations ranged from 0.095 for Trinitario parent to 0.457for local parent stocks. The excess homozygosity in the local parent stock was attributed to significant in breeding and consanguinity predicated on the self compatibility mating system of the local amelonado population, while the low value for Trinitario was suggested to be due to its variable but largely self incompatible mating system. The presence of unique alleles in farmers' population showed the wealth of correspondence (figure 1) showed significant spatial differentiation in farmers' population from the different cocoa ecological zones, which indicated geographic differentiation that may have implications for niche adaptation. Figure 2 showed the relationship of parent stocks, genebank collections and farmer

populations. The unrelatedness of several materials in farmers fields to field genebank materials and may be as a result of founder's effects, spontaneous recombination, or speciation, due to genetic drift, in some genes. This result also has implications for the effectiveness of the research institute and producing state government's improved variety delivery systems and impact on farmers.

Experimental Title: Development of early bearing cocoa varieties with high yield disease tolerance and quality potentials. (P.O Aikpokpodion, Cocoa Breeder & Molecular Geneticist)

Justification and Objectives

The cacao tree has a long generation time with the juvenile state usually as long as three to four years before first fruit production in the Upper Amazon derived materials. Fruit production continues steadily for more than 20 years after attaining economic yield production at about 6 to 8 years of field establishment. The selection for genotypes which combine shorter juvenile age (precocity) with other outstanding traits is an important breeding objective at the Cocoa Research Institute of Nigeria. Some 27 individual genotypes from 12 progeny families which produced flowers at 18-24 months (1½ -2 years) of field planting and gave a first harvest of between 0ne and19 pods per tree at 24-30months (2-2½ years) of field planting were selected by Badaru and Aikpokpodion (2004). In view of the emerging trend of the market competitiveness and land pressure from alternative arable crops, there is need to use high yielding cacao genotypes with short juvenile stage to make cacao production competitive and attract greater investment.

Materials and methods

During the reporting year, the 27 selected genotypes were evaluated for pod production, fresh and dry bean weights, pod index and dry bean yield for the first five years of harvest. This was used to determine the juvenile productivity of the selected genotypes.

Results and Discussion

Evaluation of these individuals (Table 1, pg 134) showed a mean annual pod production which ranged from 3.4pods/tree to 45.0 pods/tree in the first five years of harvest. The cumulative yield in the first five years of harvest also ranged from 17 pods in B1/17-9 to 225pods in B4/15-3. However, a cumulative yield of between 102-225 pods/tree over the first five years of production was observed in 13 of the 27 genotypes identified. Potentials annual dry bean yield for the first three years ranged from 130kg/ha to 1, 757kg/ha. Eight of the 27 genotypes showed a potential dry bean yield of more than 1.0 t/ha annually in the first five years and are classified into Group 1. Progeny crosses of T65/7 x T101/15, P7 x PA150, T86/2 x T9/15, P7 x T60/887, T86/2 x T22/28 and T53/5 x N38 showed outstanding juvenile productivity and precocity among the crosses evaluated. Individuals in Group 2 has an annual dry bean yield ranging from 726 kg/ha – 947 kg/ha. Individuals in Group 4 have the least range from 130 kg/ha to 479 kg/ha dry bean yield. The expression of precocity was mainly observed in crosses which involved cacao clones from different genetic background, that is, Nanay, Parinari and Iquitos Mixed Callabacillo in Upper Amazon materials as in T65/7 x T101/15, P7 x PA150 and P7 x T60/887; and Upper Amazon x Trinitario or Amelonado as in T86/2 x T22/28 and T53/5 x N38. This showed that precocity is an expression of hybrid vigour observed in progenies.

Observation of fruit production (Figure 1, pg 135) showed incremental pod production from the first harvest, showing that expression of precocity had no adverse effect on tree's subsequent fruit production.

Conclusion

Results from this study have shown that selection for precocity can be efficient and has no adverse effect on the tree's subsequent fruit production. It also showed the promise of selecting for precocity as a stable trait expression and the possibility of advancing this trait in advanced generations.

Outlook

These individuals are being further investigated with the aim of developing a "Precocity variety".

Experimental Title: Selecting cocoa clones that are drought tolerant. **(**S.S. Omolaja & P. Aikpokpodion.)

Objective: To identify cacao genotype that is tolerant to drought.

Justification: There is an increasing demand for cacao clones that can thrive in the drier areas of Nigeria. Moreover with the global weather change places that originally had favourable soil moisture regime for optimal cocoa growth are getting drier.
This dry weather has being affecting cacao cultivation through high seedling mortality during establishment, poor plant growth and low yield. Identifying drought tolerant genotypes with good yield potential suitable for environments with unpredictable rainfall is therefore a major objective in Nigeria cacao breeding programme.

Materials and Methods
In an experimental plot in Mayol Selbe, one hundred cocoa trees were randomly selected and code named Mambilla 1 to 100 i.e M1 to M100. The trees were established in 1998 on a plot. At the beginning of fruiting season, which is October in Taraba state, data taken on each tree were: number of young pods (2 months old), number of damaged pods. At the time of harvest in December, data taken were numbers of black pods and pods harvested.

Results:

Range of pods.	List of trees	No of trees.
0 - 30		71
31-60		21
61-90	M76, M68, M1	3
91- 120	M93, M21	2
121-150	M23, M86,M41	3

Of the one hundred cocoa trees, only eight produced quantity of cocoa pods that can ensure good returns on investment for the farmer.

Discussion
The location of experiment is in the dry savannah region of Nigeria where the average annual rainfall is low. Rain starts in May and ends in October, in other words the major pod production of cocoa is in the dry season between December and January of every year. This implies that cocoa genotype must be tolerant to drought, to produce good yield.

Since the risk of drought stress is frequently towards the end of a growth cycle, it is likely to affect the crucial partitioning of assimilates to the economic portions of the crop and can drastically affect economic yield (Fuller & Jelling, 2000). Mild stress from soil moisture inadequacy can provoke a drought response, which lowers productivity of crop. Since there is different genotypic response by plant to drought; this explains why some trees produced heavily even during drought while some other tree did not produce much. It is probable among trees with low yield that stomata closed to conserve moisture under drought stress and at the same time restrict carbon dioxide uptake into the leaf which depress photosynthesis.

Conclusion:
It is observed that there is variation in the genotypic response of cocoa trees at Mayol Selbe to drought, hence it provides good opportunity for selection of trees with drought adaptability mechanism that can thrive in marginal cocoa growing areas of Nigeria.

Outlook: It is desirable to establish the physiological basis for the reaction of the different cocoa trees to drought.

Experimental Title: Flowering and pollen studies in cocoa (*Theobroma Cacao L.*) **(**S.S. Omolaja, P. Aikpokpodion, S. Adedeji & D.E.Vwioko).

Objectives: To determine:

(a) the influence of rainfall and temperature on flowering intensity of selected clones of Upper Amazon cocoa, and,
(b) pollen fertility among selected clones of Upper Amazon cocoa.

Justification:
Flowering behaviour
Studies on the influence of season on flowering pattern of cocoa (*Theobroma cacao*) in various cocoa growing countries showed that flower production is primarily controlled, either directly or indirectly by climatic factors (Alvim 1984; Mohr and Schopfer, 1994). It has however been observed that excessively dry or

relatively cold period may completely inhibit flowering in regions where seasonal variability in rainfall and temperature persist (Alvim 1966; Asomaning et al., 1971). An adult cocoa plant can produce several thousand flowers per year, sometimes more than 50,000 of which only a small proportion (usually less than 5 per cent) are pollinated and an even smaller proportion (0.5 – 2.0 per cent) (Alvim, 1984) produce fruit set.

Pollen fertility

Production of non-functional pollen by plants reduces effectiveness of pollination. One of the first steps in assessing effectiveness of pollination in a clonal pollination is a test of pollen fertility. This will give an indication of the amount of fertile pollen available for pollination by each clone with a seed orchard or plantation

Materials and Methods:

The field study was carried out at the Cocoa Research Institute of Nigeria Headquarters, Idi-Ayunre, Ibadan (Lat. 7^o 26'N Long. 3^o 54' E, and 122 m above the sea level). The experimental materials consist of eight clones of T. cacao clones of Upper Amazon origin. The materials were planted in 1971 in a polyclonal orchard at N4/4A experimental plot. The clones were T17/11, T7/12, T12/5, T86/45, C23, C64, C77 and Pa24. The trees were planted at a spacing of 3.1 m by 3.1 m.

Description of materials: The codes used for the materials were based on the accepted codes by Cocoa Research Institutes worldwide, as explained below.

T: The code was used by Posnette for seedling materials taken from Trinidad to Ghana in 1944, parts of which were introduced into Nigeria.

C: Code used to describe F_2 Amazon selection.

Pa: Parinari type of Upper Amazon cocoa. This type of cocoa was discovered from river Parinari in Peru.

T12/5: The pod shape is elliptic with an acute apex it has intermediate basal construction and the pod size is usually large usually about 18 cm long.

T7/12: The pod shape is obovate with an obtuse apex. The basal construction is intermediate and possess a medium pod size usually 15 – 17 cm long.

T17/11: The pod shape is obovate with an indented apex. There is no basal constriction and the pod size is usually large about 18 cm.

T86/45: The pod shape is elliptic with an obtuse apex and slight basal constriction small – medium pod size usually 12 – 14 cm long.

C23: Elliptic pod, acute pod apex with an intermediate basal constriction. The pod size is usually to medium – large (15 – 17 cm long).

C64: Elliptic pod, with an obtuse apex and a slight basal constriction. It posses large pods usually greater than 17 cm long.

C77: The pod shape is elliptic with an acute apex. The basal constriction is strong. The pod size is large (above 17 cm long).

Pa: The pod shape is oblong with an acute apex and a slight basal constriction. The pod size is large (above 12 cm long).

Flowering behaviour

For the flowering experiment, five trees were randomly selected for each clone. The trees were tagged with labels indicating their clonal type. The main trunk and three branches were selected. Flowers were counted on the main trunk (T) between 2 and 4 feet above ground level and on the first branch (B_1), second branch (B_2) and third branch ($B_{2\pm}$), as well as from the dorsal (D) and ventral (V) regions. The data was taken for two weeks in dry spell of January and two weeks in rainy month of May. The floral structure and patterns of floral initiation were observed. The average monthly

temperature (^{o}C) and rainfall (mm) figure at Idi – Ayunre, Ibadan were recorded for six months between January and June. The experimental design used was the completely randomized design with five replications. The data collected was subjected to analysis of variance (ANOVA). The means were separated using Duncan' Multiple Range Test.

Pollen Stainability

Anthers were collected from healthy flowers of the clones of T. cacao. These flowers were stored in a fixative of aceto-ethanol 1:3 v/v in bottles. Then the anthers were mounted on slides to which two drops of acetocamine were added. The acetocamine was prepared by adding 0.5g of carmine to 55ml of distilled water to which 45ml of glacial acetic acid was added. The mixture was heated until boiling and the preparation was cooled and filtered. The anthers were squashed in the acetocarine stain using the base of dissecting needle after which the tapetal materials were squeezed out using a pair of forceps. The slides were examined under a slight microscope. Morphological characters like shape, diameter and stainability of the pollen of each clone were studied. Well-stained pollen was considered "fertile" while those that were un-stainable were considered "sterile". The percentage stainability (fertile) was calculated by expressing the number of stained pollen grains in terms of the total number of pollen grains (both stained and unstained) in each field. The diameter of 10 pollen grains were measured at X400 magnification in three random fields of view on three slides mounted for each clone using the ocular micrometer. The means, standard deviation, and ranges of pollen measurement taken were determined for each of the clone. Coefficient of variation for the pollen diameter was computed.

Results:

Variation in floral behaviour

The result showed that floral initiation varied among the eight clones of Upper Amazon cocoa populations sampled. Rainfall and temperature were observed to play a significant role in floral initiation. Though, January and May were warm, 28.4^{o}C and 28^{o}C respectively, the increase floral initiation in May was due mainly to increased rainfall from 1.0mm in January to 86.9mm in May (Table 1). The mean number of flowers produced on the ventral surface (V) of the cacao clones was significantly higher ($p< 0.05$) than from the dorsal region (Table 2). The average number of flowers produced by the various clones Upper Amazon cocoa (T. cacao L.) ranged between 128 for clone C 23 and 415 for lone T86/45 in January and May (Table 3). The percentage increase in mean numbers of flowers produced by all the clones was higher than 100%.

Length of style (pistil)

Clonal differences in styles length were significant ($p> 0.05$). The style length varied from 2.71 mm to 7.21 mm (Table 4). The mean values for individual clones ranged from 3.41+ 0.38 mm and 6.02 mm +0.85 mm, and was separated using Duncan's Multiple Range Test. The style length of clones T17/11 (3.41 + 0.38mm) and T7/12 (3.71 + 0.74 mm) were shorter, while clone Pa 24 recorded the highest mean style length of 6.02 +0.854 mm. The coefficient of variation for style length was 20.96, suggesting significant level variability for stylar length among the selected clones.

Pollen Stainability

The diameter and shapes of the pollen grain observed in T. cacao clones vary: the shapes were monosculate, bisculate, tricolpate, spherical or globose, rectangular and polycolpate. It was observed that unfertile pollen grains did not stained darkly with acetocarmine. The pollen grain diameters of clones T17/11 and T86/45 has the highest C.V of 40.10% and 42.03 respectively (Table 5). Clones C77 and T86/45 had the highest mean pollen diameter of 19.00 ± 4.21 um and 15.14 ±6.36 um respectively. Clones T12/5 and T7/12 were observed to show the lowest mean pollen diameter and C.V of 13.7417 + 2.6938 and 19.60% respectively.

Generally, the most prevalent shapes of pollen grain in T. cacao were globose (52.54%) and monosculate (30.33%) (Table 6). Polycolpate pollen grains were absent in clones T86/45 (92.11%) was observed to be higher than other clones. The lowest percentage in clone T12/5 (81.06%).

Discussion

The study showed that the highest number of flowers produced among the clones of T. cacao was in May. This observation agreed with earlier reports that flowering intensity is greatest between April and June (Gordon, 1976). The increase in rainfall in May prompted flowering intensity than that observed in

January, though both months were warm. This observation agreed with earlier reports that flowering intensity is strongly affected by rainfall and temperature (Alvin, 1996). Warm climate and increased rainfall promote flushing and flower initiation in Theobroma cacao L.

From the study, flowering intensity in T.cacao though regulated by environment factors, such as rainfall and temperature, also varies among the eight clones. Mohr and Schopfer (1994 observed that flower initiation though dependent on the environment, their shape and morphogenesis is regulated endogenously and varies among cultivars. Pollen stainability percentage was highest for clones T86/45, C64 and C77 which implies that their pollen grains are fertile. Clones T12/5, which showed the lowest percentage pollen fertility (81.06%).

Conclusion:

In conclusion, increased rainfall and favourable temperature promoted flowering intensity in cacao. Moreover, there are differences in pollen viability among clones of upper Amazon cacao.

Table1: Rainfall and Temperature Records at the Cocoa Research Institute of Nigeria Headquarters Idi-Ayunre, Ibadan from January to June 2006.

Months	Rainfall (mm)	Temperature (oC)
January	1.0	28.4
February	0.0	29.5
March	74.9	29.7
April	104.4	29.7
May	66.9	28.0
June	244.5	28.0

Table 2: Mean numbers of flowers produced by the eight clones of T.cacao in January and May

Clones	January	May	%Increase
T17/11	88.0	204.0	131.0
T7/12	124.0	262.0	111.0
T12/5	103.0	253.0	145.0
T86/45	199.0	508.0	155.0
C23	45.0	130.0	188.0
C64	117.0	347.0	196.0
C77	109.0	277.0	143.0
Pa24	57.0	225.0	294.0
Mean	105.0	27.5	

Table 3: Mean numbers of Flowers produced on the dorsal and ventral regions of the eight clones of T.cacao

Clones	Dorsal	Ventral	Total
T17/11	92.0	102.0	194.0
T7/12	155.0	165.0	280.8
T12/5	108.0	148.0	256.2
T86/45	208.0	207.0	415.2
C23	35.0	93.0	128.5
C64	174.0	155.0	329.7
C77	188.0	210.0	398.6
Pa24	128.0	178.0	306.4
Mean	145.0	176.0	

Table 4: Pistil length in eight clones of *Theobroma cacao L*

	Style length		
Clones	Range (mm)	Mean + S.D (mm)	Coeff. of variation
T17/11	2.88-3.58	3.41 ± 0.38^{a}	11.26
T7/12	2.71-4.49	3.71 ± 0.74^{ac}	20.10
T12/5	4.64-6.49	4.12 ± 0.93^{ace}	22.64
T86/45	3.07-5.28	5.92 ± 0.54^{bdeh}	9.14
C23	3.78-5.66	4.40 ± 0.78^{bcfg}	17.71
C64	3.49-5.14	4.19 ± 0.63^{acfg}	15.18
C77	4.14-5.28	4.72 ± 0.50^{bdfg}	10.60
Pa24	4.92-7.21	6.02 ± 0.85^{bdfg}	14.21

Mean with the same superscripted letters are not significant different at $p>0.05$ according to Duncan's Multiple Range Test.

Table 5: Pollen diameter in eight clones of Theobrama cacao L.

Clones	Pollen diameter Range (um)	Mean+S.D (um)	Coeff.of variation
T17/11	5.25-24.50	12.25±4.91 ^{acc}	40.10
T7/12	7.00-19.25	11.10±3.84 ^{ac}	29.84
T12/5	7.00-21.00	10.77±2.81 ^{a}	26.09
T86/45	8.05-35.00	15.14±6.36 ^{bdeg}	42.03
C23	10.50-24.50	14.96±4.46 ^{bdeg}	29.84
C64	7.00-17.50	12.73±2.75 ^{aceg}	21.64
C77	14.00-25.20	19.00±4.21 ^{bdfh}	22.17
Pa24	10.50-21.00	14.06±3.67 ^{bceg}	26.11

Mean with the same letters are not significant different at p=0.05 according to Duncan's Multiple Range Test.

Table 6: Percentage distribution of pollen types and pollen viability fertility in eight clones of Theobroma cacao L.

Clones	Pollen types (%)			Pollen viability			
	a	b	c	d	e	f	%
T17/11	26.21	13.17	10.36	44.26	2.52	4.48	87.11
T7/12	22.14	9.16	4.58	59.29	2.80	2.03	86.01
T12/5	28.30	13.43	8.15	45.08	1.44	3.60	81.06
T86/45	40.79	4.93	3.29	49.01	1.97	0.00	92.11
C23	54.33	7.27	3.80	31.49	0.69	2.42	86.51
C64	23.08	3.55	1.38	71.20	0.79	0.00	90.34
C77	27.95	7.68	2.56	59.45	0.98	1.38	90.25
Pa24	20.80	10.67	5.07	60.53	2.40	0.53	90.55
Mean	30.33	8.71	4.90	52.54	1.70	1.81	-

Monosulcate; (b) bisulcate; (c) tricolpate; (d) globose; (e) rectangular and
(f) polycolpate.

Experimental Title: Effect of pod size and bean position on germination and seedling growth of cocoa *Theobroma cacao* (Iremiren, G.O., Famaye, A.O. and Oloyede, A.A.).

Justification:

The vigour of cocoa seedlings at the nursery stage can be influenced by varieties (Adenikinju, 1969) and the maturity of the bean at the time of sowing (Adenikinju, 1972, 1974 and 1975). There has been a huge demand for cocoa pods for nursery establishment in Nigeria in recent years. The preference is for the supply of big pods by the Cocoa Research Institute of Nigeria (CRIN) as the belief by farmers is that these will produce bigger nursery seedlings compared to small pods. Also, unpublished data obtained at CRIN indicate that cocoa beans positioned in the middle of the pod are heavier than those from other locations of the pod relative to he fruit stalk. The objective of this study is to evaluate the effect of pod sizes and position of the beans in the pod on seed germination and growth of cocoa nursery seedlings.

Materials and methods

The experiment was carried out at the nursery of the Cocoa Research Institute of Nigeria, Ibadan ($7^{o}10^{1}$N, longitude $3^{o}52^{1}$E), Nigeria, in 2005 and 2006 respectively. The experiment was a 3x3 factorial scheme in complete randomized design (CRD) with three replications. The two factors were beans from cocoa pod sizes – big (Pb) (590.9g), medium (Pm) (414.7g), and small (Ps)(181.6g) – and bean positions being positions on the pod relative to the fruit stalk – distal (Bd), middle (Bm), and anterior (Ba), the three positions being of equal length. These lengths were 6.6cm, 5.2cm and 3.6cm respectively for big, medium and small cocoa pods. The pod size categorization was based on the average of 30 pods each year and the big medium and small pods contained mean number of 49.6, 45.2 and 23.8 beans respectively. The mean fresh weight of cocoa bean in the distal middle and anterior positions of the pods were 1.7g, 2.02g, and 1.91g respectively.

Beans of matured pods of F3 Amazon Cocoa were sown in black polybags (30 x 12.5cm size, 0.013cm gauge) filled with nursery top soil in mind April 2005 and 2006 respectively. One bean was sown in a polybag and each plot contained 20 experimental polybag seedlings. The polybags were arranged side by side under nursery shade of 50% light intensity and regular nursery practices of watering, weeding etc were carried out throughout the nursery period. Observations were made for percentage bean germination at 14 and 28 days after sowing (d.a.s) respectively and vegetative growth characters (plant height and girth, leaf number/plant, was terminated each year at 6 months after sowing and the mean values over the sampling periods were determined for the vegetative growth characters. The data obtained were subjected to analysis of variance and LSD was used to separate the means that were significant.

Results

Germination of beans: The average percentage bean germination over the two years showed that sight differences due to either pod sizes or bean positions on pod occurred at 14.d.a.s (Tables 1 and 2). Although treatment differences for germination percentage were not significant at 28 d.a.s. higher values were obtained respectively for bigger pods and bean positions on the pod at the distal position.

Seedling growth

In 2005, pod sizes had not effect on the vegetative growth of cocoa nursery seedlings excepting for significantly lower leaf number/plant obtained with small pods (Table 3). In contrast, significant differences occurred in all the vegetative growth characters in 2006, the highest values being obtained virtually for all with the medium sized pod sowings and the lowest values occurred with the small size pod sowings (table 3).In 2005, the vegetative characters (excepting plant height) were similar in seedlings that arose from beans in the middle and anterior positions of cocoa pods (Table 4). Seedlings from beans in distal position of the pods had significantly lower values for most of the parameters. Bean position on pod significantly influenced the height, leaf number/plant and leaf area/plant in 2006 (Table 4). The highest values for most of the parameters were obtained with beans in the position of pod. Growth values of seedlings from beans in the middle position o f the pod were mostly intermediate between those from the anterior and distal positions of the pod.

Interaction effects

Significant interactions between pod sizes and bean positions on pod occurred for germination percentage of cocoa beans at 28 d.a.s and all the seedling growth characters measured each year expecting for plant girth in 2006. Treatment combinations of medium sized pod with beans in the middle position of pod and small – sized pod with beans in the distal position of pod resulted in 100% bean germination at 28 d.a.s (Table 5). In contrast, the lowest germination percentages were obtained in treatment combinations of medium-sized pod with beans in distal position of pod and small-sized pods with beans in the middle position of pod. Irrespective of the pod size used, beans in the anterior position of the pod consistently gave a high germination percentage of 93.3, which was not significantly different from treatment combinations that gave 100% germination (Table 5).

Treatment combinations involving small pods with either distal or anterior bean position in pods resulted in the highest values obtained for seedling height, girth, leaf number/plant, and leaf area/plant respectively in 2005 while the least values for these growth characters were obtained mostly with the treatment combination of big pod with beans in distal position of pod (Table 6). The trend of the interaction was different in 2006 (Table 6), and although treatment combinations of small pod with distal or anterior bean position in pod gave the highest value for seedling height and leaf number/plant respectively, the least values for these growth characters were obtained respectively with treatment combinations of small pod and beans in anterior position of pod, and large pods and beans in distal position of pod. For leaf area/plant, a treatment combination of medium pod and beans in distal position of pod gave the highest value while a treatment combination of small pod with beans in distal position of pod gave the least value (Table 6).

Discussion

The variation obtained for pod size of the F3 Amazon cocoa used in this study agrees with earlier observations by Mossu (1992). Who further reported that the average weight of cocoa pod ranged from 400g to 500g. Similarly, the variation in the number of beans in the pod categories in this study agrees with the average of 20 to 40 beans per pod reported by Are and Gwyne – Jones (1974).

The germination percentages beans at 28 days after sowing were relatively high irrespective of pod sizes and bean positions on pod (Table 1 and 2) and were similar to those obtained by Mossu (1992) who reported up to 90% germination. Adenikinju (1969) had indicated that mature beans of F3 Amazon from small-sized pods were as viable as those from bigger-sized pods and also, that it was bean maturity that really affected bean viability (Adenikinju, 1975). Although our results support these, the data suggest that bigger-sized pods and, to a greater extent, the nearness of the bean position in the pod to the fruit stalk enhanced the capacity of f cocoa beans to germinate. This advantage could have been derived from the large endosperm which facilitated a better germination respectively in beans of big pods and anterior and middle positions of pod.

Although Adenikinju (1975) attributed cocoa seedling vigour to bean maturity rather than pod are, this present study shows that medium, big and small pods in a decreasing order, enhanced the vegetative characters for cocoa vigour during the nursery period in both years (Table 3). Also, the beans in the anterior and middle positions of the pod consistently enhanced cocoa seedling vigour compared to those in the distal position (Table 4). The enhancement of seedling vigour arising from these treatments could be attributed to the initial advantage of larger endosperm in their beans which resulted in better germination and growth that was maintained throughout the nursery period. However in oil palm, Iremiren (1984) found that the growth advantage due to larger seeds was temporary as seedlings derived from different seed sizes eventually attained transplantable size during the nursery stage.

When the treatment factors of pod sizes and bean positions in pod were considered separately, bigger pods and bean positions nearer the fruit stalk respectively enhanced the growth of cocoa seedlings. However their interactions, which were mostly significant, did not reflect this trend. Bean germination was favoured mostly by the use of beans in distal position of either medium or small pods while seedling growth was favored mostly in 2005 and, to a lesser extent in 2006, by the use of either distal or interior position of small pods. While it is easy to physically select for different pods sizes for pod supply for cocoa nursery establishment either at the research center or farmer's farm, it will not be easy for the farmer to select beans for planting based on their positions in pods on receiving his supply of cocoa pods. The usage of either big or medium pods for nursery seedlings by cocoa farmers will remedy this situation as our study has shown that vigorous seedlings will result from them (Table 4). Small pods could then be available for processing into dry beans for industrial uses, and this would be complemented by surplus big and medium pods that would not be needed for nursery establishment. The other alternative is to seed specifically for small pods with the intrinsic characters of beans in either the anterior or distal position of pod for nursery seedling production.

Table 1: Effect of pod sizes on the cumulative percentage germination of cocoa beans for years 2005 and 2006

	Days after sowing	
*Treatments	14	28
Pb	43.5	88.9
Pm	40.0	86.7
Ps	57.7	84.9
LSD (P=0.05)	16.9	3.69

*Key to treatments: Pb, big pod, Pm. Medium pod, Ps, small pod

Table 2: Effect of bean positions in pod on cumulative percentage germination of cocoa beans for years 2005 and 2006

Days after sowing		
*Treatments	14	28
sBd	51.1	84.5
Bm	53.3	86.7
Ba	48.9	93.3
LSD (P=0.05)	4.04	8.43

*Key to treatments: Bd, distal bean position, Bm, middle bean position, Ba, anterior bean position

Table 3: effect of pods sizes on seedling growth

*Treatments	Height (cm)	Girth (cm)	Leaf no/Plant	Leaf area/plant (cm2)
		2005		
Pb	17.8	0.54	9.7	90.6
Pm	17.3	0.64	9.9	92.5
Ps	18.0	0.51	9.4	80.1
LSD (P=0.05)	NS	NS	0.4	NS
		2006		
Pb	26.3	0.54	7.4	101.6
Pm	27.5	0.55	8.1	101.5
Ps	26.1	0.52	7.8	97.6
LSD (P=0.05)	1.1	0.02	0.5	3.4

Table 4: Effect of bean positions in pod on seedling growth

*Treatments	Height (cm)	Girth (cm)	Leaf no./Plant	Leaf area/plant (cm^2)
		2005		
Pb	17.2	0.50	8.5	83.7
Pm	18.1	0.54	10.2	90.3
Ba	17.0	0.53	10.3	89.2
LSD (P=0.05)	0.9	3.69	1.5	5.3
		2006		
Bd	27.7	0.54	7.7	105.3
Bm	25.6	0.54	7.8	89.5
Ba	26.6	0.53	8.1	106.0
LSD (p=0.05)	1.6	NS	0.3	14.0

Table 5: Cumulative germination percentage of cocoa beans at 28 days after sowing for years 2005 and 2006

*Treatments	Germination (%)
PbBd	86.7
PbBm	86.7
PbBa	93.3
PmBd	66.7
PmBm	100.0
PmBa	93.3
PsBd	100.0
PsBm	73.3
PsBa	93.3
LSD (P=0.05)	12.1

*Key to treatments: pb, pm, and ps, as in Table 1 combined respectively with Bd, Bm, and Ba as in Table 2.

Table 6: Effect of interactions between pods sizes and bean positions in pod on seedling growth of cocoa.

	2005				2006		
*Treatments	Height (cm)	Girth (cm)	Leaf no/plant	Leaf area/plant (cm^2)	Heights (cm)	Leaf no/plant	Leaf area/plant (cm^2)
PbBd	15.2	0.41	6.1	80.7	27.5	7.8	103.5
PbBm	19.9	0.52	10.2	98.1	25.8	7.8	99.0
PbBa	17.4	0.56	12.8	93.0	25.7	6.8	102.3
PmBm	16.1	0.53	9.3	81.7	27.9	8.9	100.2
PmBm	17.4	0.54	10.1	95.0	26.3	7.8	82.3
PmBa	18.3	0.56	9.8	101.0	28.2	7.6	122.1
PsBd	20.2	0.56	10.0	88.8	24.4	7.7	114.2
PsBm	17.0	0.50	9.7	77.7	24.6	6.8	87.2
PsBa	16.8	0.46	12.9	103.2	29.2	8.9	61.5
LSD (P=0.05)	1.1	0.03	1.3	6.1	1.2	0.5	12.8

*Key to treatments: pb, pm, and ps as in Table 1 combined respectively with Bd, Bm, and Ba as in Table 2.

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Experimental Title: Studies on nutrient release of neem fortified cocoa pod husk fertilizer in an alfisol (Ogunlade M. O[1] and Adeoye G. O[2]).

Justification and Objectives:

The incorporation of organic residues in the soil has many attractive features including improved soil organic matter and nutrient element recycling. About 60% (wet basis) of cocoa (Theobroma cocoa) pod is made up of husk. Biochemical studies shows that these husk contain sizeable amount of useful organic constituents (Ogutuga. 1975). Similarly Egunjobi (1975) reported that the husk contains substantial amount of inorganic nutrients. However, cocoa pod husks have generally low nitrogen content. Thus, the burying of such residues in the soil can affect mineral nitrogen availability, hence the need to fortify CPH with neem leaves and neem seed powder with higher Nitrogen contents.

(i) Study the effects of CPH on N, P and K release and soil reaction (PH) during laboratory incubation.

(ii) To compare their effects with CPH fortified with neem leaf and neem seed powders with higher Nitrogen content.

Objectives

The objectives are to study the effects of CPH on N, P,and K release and soil reaction (PH) during laboratory incubation. And to compare their effects with CPH fortified with neem leaf and neem seed powders with higher nitrogen content.

Materials and Methods

The soils used in this study was exhausted soils collected under depleted old cocoa plantation at the cocoa Research Institute of Nigeria (CRIN) Headquarters Ibadan. It was air dried and sieved (2mm). the soil sample was analyzed for their nutrient contents.

The PH, sand, silt and clay,N, P, K and Ca contents of the soil were also determined. The cocoa pod husks (CPH) were collected at the fermentary unit of CRIN, Ibadan during the dry season. There were sun dried and miled into powder to pass through 4mm sieve. Neem leaves (NL) and neem seed (NS) were collected from the polytechnic of Ibadan campus, Ibadan, dried and miled into powder separately. Samples of the organic materials – CPH, NL, and NS were analyzed for their N, P, K and Ca contents.

The organic fertilizer materials used for this experiment include the following CPH, NL, NS, CPH + NL (90:10), CPH + NL (80:20), CPH + NS (90:10) and CPH + NS (80:20). The seven listed organic materials plus a control without organic material addition thus given eight treatments were replicated three times to give 24 experimental units arranged in a completely randomized design. In all, 144 plastic cups (i.e 24 experimental units 6 incubation periods) were used for this experiment. 50g of soil sieved through 2mm sieve was weighed into each of the plastic cups used and each of the organic materials was separately applied to the soil in plastic cups at the rate of 100kg N/ha. Water was applied to each of the cups at 70% field capacity. Watering was done twice weekly. The nutrient (N, P, K) release pattern was checked at two weeks interval for the first one month and at 1 month interval for another four months to give 6 sampling/incubation periods. Three plastic cups were withdrawn per treatment at he end of each incubation period. Total Nitrogen was determined by Micro Kjeldah method. Mineralized p was extracted from the incubated samples using bray p method and p in the filterate was determined calorimetrically by the molybdenum blue method. Exchangeable K was extracted with IN ammonium acetate and K in the filterate was determined by flame photometer. The PH was also determined in 1:2 soil : water suspension using PH meter. The data obtained were subjected to analysis of variance (ANOVA). Means found significant were separated by the use of Duncan Multiple Range Test. (DMRT).

Results and Discussion

Some physical and chemical properties of the soil used for the study are shown in Table 1.

Table 1: Some Properties of soil and organic fertilizer materials

Properties	Soil	Organic		Materials
	CPH(%)	NL (%)	NS (%)	
Total N g/kg	0.56	1.12	2.67	2.50
Available phosphorus mg/kg	4.11	0.14	0.19	0.12
Exchangeable K Cmol/kg 0.22	3.86	2.4	2.1	
Exchangeable Ca Cmol/kg 4.45	0.31	0.18	0.17	
pH Soil: water ratio 1:2	6.0			
Sand (g/kg)	600			
Silt (g/kg)	240			
Clay (g/kg)	160			
Textural class	Sandy loam			

The N, P, K and Ca contents of the organic materials used are also shown in the same table. The various organic fertilizer materials had a significant effect ($P<0.05$) on total Nitrogen release.

Table 2: Effects of organic fertilizers on Nitrogen release pattern

Treatment	2	4	8	12	16	20
	Weeks after incubation (WAI)					
CPH	0.27^{d}	0.33^{c}	0.47^{c}	0.23^{bc}	0.5^{abc}	0.17^{bc}
NL	0.7^{a}	0.67^{ab}	0.77^{ab}	0.27^{b}	0.5^{abc}	0.27^{ab}
NS	0.6^{ab}	0.67^{ab}	0.67^{ab}	0.3^{ab}	0.57^{ab}	0.17^{bc}
CPH+NL (90:10)	0.43^{c}	0.67^{ab}	0.73^{ab}	0.3^{ab}	0.43^{bc}	0.17^{bc}
CPH+NL (80:20)	0.47^{bc}	0.76^{a}	0.7^{ab}	0.4^{a}	0.6^{a}	0.33^{a}
CPH+NS (90:10)	0.5^{c}	0.7^{a}	0.63^{b}	0.3^{ab}	0.4^{c}	0.27^{ab}
CPH+SN (80:20)	0.5^{c}	0.73^{a}	0.8^{a}	0.43^{a}	0.47^{abc}	0.3^{ab}
Control	0.57^{abc}	0.53^{b}	0.33^{c}	0.13^{c}	0.23^{d}	0.1^{c}

Means followed by the same alphabets in the same column are not significantly different at 5% level of probability using DMRT.

Two weeks after incubation (WAI), CPH Significantly reduced soil Nitrogen mineralization in comparism with control. The quantity of Nitrogen released in soil treated with a CPH at each period of incubation greatly exceeded to control as from the 4 WAI up till 20 WAI.

The neem leaf, neem seed and neem fortified CPH with either neem leaf of neem seed powders significantly enhanced N mineralization than non-fortified CPH during the first eight weeks of incubation with a sharp reduction 12WAI, CPH + NL (80:20) significantly enhanced Nitrogen mineralization in comparism with control, CPH, NS and CPH + NL (90:10). Several investigations have reported that the burying in soil of low nitrogen crop residues immobilize nitrogen, but high nitrogen containing residues improve N mineralization (Ladd, 1981; Azam et al; 1985; Smith and Sharpley 1990). The results obtained in this study support this trend. The CPH containing a low concentration of Nitrogen reduced soil N-mineralization through immobilizing of nitrogen released from soil organic matter. In fact, to supply the need of soil microbes during crop residues decomposition, minimum residue N contents of 1.5 to 1.7% (C/N ratios of 25 to 30) have been suggested. (Allison, 1973; Smith and Eliott, 1990). The higher nitrogen release in soil treated with CPH as from eight weeks after incubation compared with the control suggests remineralisation of nitrogen immobilized at the start of incubation which has been retained in organic forms of N biomass and liberated thereafter when decomposition progressed.

All the fertilizer materials enhanced phosphorus release better than the control across the incubation periods (Table 3).

Table 3: Effect of organic fertilizers on P release Pattern

Fertilizer	2	4	8	12	16	20
	Weeks after incubation					
CPH	4.9^{b}	4.12^{b}	6.05^{c}	5.82^{a-c}	5.71^{ab}	6.38^{a}
NL	7.28^{a}	5.37^{a}	7.15^{a}	6.28^{a}	6.19^{a}	6.17^{b}
NS	5.16^{b}	3.13^{d}	4.99^{d}	5.96^{ab}	5.79^{ab}	4.84^{d}
PH+NL (90:10)	4.66^{b}	2.90^{d}	6.79^{ab}	6.14^{a}	5.99^{a}	5.87^{c}
CPH+NL (80:20)	5.27^{b}	3.85^{bc}	6.91^{ab}	6.30^{a}	6.16^{a}	6.39^{a}
CPH+NS (90:10)	4.83^{b}	3.89^{bc}	6.22^{bc}	5.61^{bc}	5.43^{bc}	4.36^{e}
CPH+NS (80:20)	5.02^{b}	3.38^{cd}	3.90^{e}	5.35^{c}	5.21^{c}	3.31^{f}
Control	3.89^{b}	2.84^{d}	3.32^{e}	4.83^{d}	4.52^{d}	3.08^{g}

Means followed by the same alphabets in the same column are not significantly different at 5% level of probability using DMRT.

At 2 and 4 WAI, Neem leaf treated soil significantly enhanced phosphorous release better than all other treatments including control, CPH fortified with NL significantly gave higher P release than CPH fortified with NS as from 12 WAI up till 20 WAI.

All the organic fertilizer materials improved K – release better than control (Table 4). CPH alone and neem fortified CPH significantly enhanced K release better than Neem leaf and neem seed powder applied separately. CPH +NL (90;10) significantly improved K – release better than all the fertilizer treatments at 20 WAI (Table 4).

Table 4: Effects of organic fertilizers on K release Pattern

Weeks after incubation (WAI)

Fertilizer	2	4	8	12	16	
CPH	0.30^{b}	0.25^{c}	0.36^{b}	0.33^{a}	0.40^{a}	0.31^{d}
NL	0.24^{c}	0.16^{d}	0.29^{c}	0.26^{b}	0.32^{b}	0.30^{d}
NS	0.20^{d}	0.10^{a}	0.24^{d}	0.21^{c}	0.26^{c}	0.22^{e}
PH+NL (90:10)	0.32^{b}	0.34^{a}	0.49^{a}	0.35^{a}	0.41^{a}	0.49^{a}
CPH+NL (80:20)	0.38^{a}	0.32^{ab}	0.36^{b}	0.26^{b}	0.42^{a}	0.45^{b}
CPH+NS (90:10)	0.30^{e}	0.27^{c}	0.33^{bc}	0.32^{a}	0.40^{a}	0.32^{cd}
CPH+NS (80:20)	0.34^{c}	0.31^{b}	0.30^{b}	0.32^{bc}	0.34^{a}	0.39^{a}
Control	0.13^{e}	0.12^{e}	0.15^{e}	0.28^{b}	0.19^{d}	0.14^{f}

Means followed by the same alphabets in the same column are not significantly different at 5% level of probability using DMRT.

The higher K release observed in soils treated with CPH and neem fortified CPH might be due to higher K contents of CPH. All the organic fertilizer materials at 2,4,8,16 and 20 WAI significantly (0.05%) enhanced PH of the soil (Table 5)

Table 5: Effect of organic fertilizers on pH of the soil
Weeks after incubation (WAI)

Fertilizer	2	4	8	12	16	20
CPH	6.30^{a}	6.14^{c}	6.32^{c}	6.26^{d}	6.26^{c}	5.88^{c}
NL	6.15^{c}	6.15^{c}	6.26^{e}	6.32^{c}	6.32^{bc}	5.90^{c}
NS	5.66^{e}	5.95^{f}	6.32^{c}	6.0^{e}	6.13^{d}	5.73^{a}
PH+NL (90:10)	6.52^{a}	6.26^{e}	6.51^{d}	6.40^{b}	6.41^{b}	6.02^{a}
CPH+NL (80:20)	6.51^{a}	6.46^{b}	6.60^{b}	6.41^{b}	6.40^{b}	6.02^{a}
CPH+NS (90:10)	6.23^{bc}	6.50^{a}	6.65^{a}	6.54^{a}	6.55^{a}	5.88^{c}
CPH+NS (80:20)	6.18^{d}	6.22^{d}	6.29^{f}	6.26^{d}	6.25^{c}	5.98^{b}
Control	5.85^{d}	5.72^{h}	5.61^{g}	5.99^{e}	5.94^{c}	5.55^{c}

Means followed by the same alphabets in the same column are not significantly different at 5% level of probability using DMRT.

The higher soil PH of the amended soil was probably due to the supply of basic cations into the soil system by the mineralization of the organic materials.

Conclusion

Fortification of CPH with neem is a release precursor for Nitrogen and correction of soil acidification which are critical factors in soil fertility evaluation in low activity clay.

Constraint; Irregular power supply made the work a bit tedious.

Experimental Title: Available phosphorus and some micronutrient content of cocoa soils in three cocoa growing ecological zones of nigeria (Ogunlade, M.O and Aikpokpondion, P.O).

Justification

In Nigeria most of the cocoa plantations are old and less productive Ayoola(2000). There is dearth of Virgin forest that could be opened up for new establishment of cocoa plantation hence most of the of the cocoa farmers are left with the option of solely depending on the

output of the old unproductive plantations. Cocoa is exceptionally demanding in its soil requirement (Smyth 1975). Wessel (1971) showed the steady decline in almost all the nutrients with length of cultivation. Omotoso (1975) reported that a crop of 100kg dry cocoa beans removed about 20kg N, 41kg P and 10kg K from the soils and where the method of harvesting (as in Nigeria) involves the removal of pod husks from the fields, the amount of K removed is increase more than five folds. Phosphate is the most important nutrient limiting cocoa production. Wessel (1971) reported that although the total amount of P in then soil may be rather high, the quantities held in easily available form (Available P) are generally so low that even the low P requirements of cocoa trees cannot be met. Response to applied N also depends on P nutrient. Zinc deficiency and copper toxicity had also been reported several years back. Majority of the cocoa farmers (more than 95%) in Nigeria do not use fertilizers on their cocoa farms (more than 95%) in Nigeria do not use fertilizers on their cocoa farms inspite of the annual meaning of soil nutrients as a result of cocoa pod harvests. This will, no doubt impact on the fertility status of the soil thus leading to declining productivity of cocoa. The objective of the study is to assess the available Phosphorus and micronutrients (Fe, Mn, Zn and Cu) status of cocoa soils of Nigeria.

Materials and Method

The soil samples used for this study were collected from cocoa plantations across the three cocoa ecological zone of Nigeria. Ideal cocoa climate (Ondo, Ekiti, and Edo States), idea cocoa soil (Abia and Cross river states) and marginal climate (Oyo, Ogun, and Kwara States). In all the locations visited, soil samples were taken by the use of soil anger at 0-20 cm depth. Core soil samples were taken from different points about 5-10 metres apart and bulked into bags. Ten core samples constituted a composite sample. Twenty-eight composite samples collected were air dried, crushed, thoroughly mixed and passed through 2mm sieve in readiness for analysis. Soil were analyzed for particle size by the Boyocous hydrometer method, soil P^H was measured in 1.2 soil\water suspension. Organic carbon was determined by the Walkley-Black method, available P by Bray method, and total Nitrogen by microkjeidah. Extractable micronutrients (Fe, Mn, Cu and Zn) were determined after extraction of the soil sample with 0.1N HCL and the filtrate read on Perkin-Elmer Atomic Absorption Spectro-photometer (AAS).

Results and Discussion

Data summarizing soil properties across the three cocoa growing ecological zones of Nigeria indicating other nutrients along with available Phosphorus, Fe, Mn, Cu and Zn are presented in Table1. As indicated in table 2, the soil differed in their contents of available Phosphorus and micronutrients. Available P ranged between 4.78 and 14.8mg/kg with a mean value of 8.05mg/kg in ideal cocoa soil ecology and a mean value of 4.69 and 3.56 mg/kg soil in ideal cocoa climate and marginal cocoa climate respectively. Available P values including that of ideal cocoa soil were grossly lower than the critical value (12.0 mg/kg soil) recommended for cocoa (Wessel 1971). Though not adequate, available P was highest in ideal cocoa soil of Cross River and Abia States compared with the other two ecologies.

The extractable Fe and Mn contents of the soil were highest in ideal soil ecology (Cross River and Abia States) with mean values of 75. 59 and 220.20mg/kg soil respectively. The lowest mean value of Fe content (53. 20mg/kg soil) was obtained in ideal cocoa climate ecology (Ondo, Ekiti, Edo State) while the lowest mean value of Mn contents (128.97mg/kg soil was obtained in marginal climate ecology). These values compared favourably with values reported by Ayanlaja (1983) for cocoa soils in Southwestern Nigeria. Relationships of Fe and Mn values to the low values of organic Carbon and Nitrogen showed the presence of nutrient imbalance.

The mean Copper content was highest in ideal soil ecology (6.70mg/kg soil) and lowestin marginal climate ecology (4.81mg/kg soil). Chude, (1985) Copper disturbed growth of cocoa seedlings while copper value of 3.80mg/kg soil did not. The high soil copper content

was highest in ideal soil ecology (6.70mg/kg soil) and lowest in marginal climate ecology (4.81mg/kg soil). Chude, (1985) indicated that 7.90mg/kg Copper disturbed growth of cocoa seedlings while copper value of 3.80mg/kg soil did not. The high soil copper content is likely due to accumulation of Copper in the soil as a result of Copper Suphate spraying to control phytophthora pod rot of cocoa. The higher rainfall and humidity in Cross River and Abia States (ideal cocoa soil ecology) makes phtophtora pod rot ore prevalent therefore farmers in that ecology sprayed Copper Sulphate more regularly. This might be the reason for the highest value of soil copper observed in Cross River/Abia States compared to other locations.The mean extractable Zinc values were 6.09, 7.26 and 6.02mg/kg soil for ideal cocoa soil, ideal cocoa climate and marginal cocoa climate ecologies respectively. These values were higher than the range of 2.9-3. 9mg/kg soils established to support successful cocoa product Chude, (1983).

Conclusion

It is evident from the study that available Phosphorus in Nigeria cocoa soils is low and considered inadequate for good growth and production of cocoa. Nutrient imbalance also exists. Low yield of cocoa in Nigeria can be attributed to soil fertility problems among others as clearly shown by this study hence guided fertilizer recommendation and application suggests itself. Therefore organized efforts should be made to educate, encourage and assist Nigerian cocoa farmers to urgently consider the option of guided fertilizer usage to boost the productivity of cocoa on their farms.

Table 1: Ranges and mean values of cocoa soil properties across the 3 cocoa growing ecological zones of Nigeria

Parameter	Range	Mean
Sand (gkg-1)	160-800	514
Silt	100-680	297
Clay	80-480	189
PH_{H20}	4.7-6.2	5.6
O.C (gkg-1)	8.4 - 29.9	15.9
Avail. P(mgkg-1)	1.76-14.71	10.9
Total N (gkg-1)	0.3-7.1	2.7
Exch.Ca cmolkg-1	0.83-23.30	3.2
Exch.Mg cmolkg-1	0.56-4.65	4.52
Exch.Kmolkg-1	0.07-0.38	1.55
Av.Fe mhkg-1	39.56-118.68	66.73
Mn	15.16-357.50	173.19
Cu	1.82-9.47	5.89
Zn	2.72-8.95	6.36

Table 2: Range and mean values of available P and micronutrients in cocoa soils of 3 cocoa growing ecological zones in Nigeria

Parameter	Cross River /Abia Range			Ondo/Ekiti/Edo Range			Osun, Oyo, Ogun, Kwara Range		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Available Pmg/kgsoil	4.78	14.8	8.05	1.76	6.61	4.69	2.32	5.55	3.56
Extractable Fe mg/kg	46.47	118.68	75.59	39.56	65.70	53.20	53.32	78.10	65.43
Extractable Mg/kg soil	15.16	357.50	220.22	83.56	190.69	149.42	71.80	188.92	128.97
Extractable Mg/kg soil	2.93	9.47	6.70	4.49	7.58	5.9	1.82	8.81	4.81
Extractable Zn mg/kg soil	2.72	8.95	6.09	5.23	8.87	7.26.	2.92	8.14	6.02

Experimetal Title: Laboratory evaluation of Endofalm 500 Ec. Endofan 500EC and Thionex 50EC for routine protection of cocoa farms against the brown cocoa mirid – Sahlbergella Singularis in Nigeria (Asogwa E.U; JC. Anikwe; I.U. Mokwunye, TCN. Ndubuaku & F.A. Okelana)

Objective and Justification

In Nigeria, the brown cocoa mirid Sahlbergella singularis is responsible for over 30% yield loss in cocoa. The feeding activities on the insect predispose such tissue to secondary infection by rot organism. Insecticides still remain a very important component among the strategies for effective control mirids and other major insect pest of cocoa in Nigeria. The cocoa Research Institute (CRIN) has the national mandate to evaluate and recommend insecticides from various groups (Organophosphate, Carbamate, Pyrethroid, and

other Biorational insecticides with novel mode of activity) so that replacement could be made easily if pest biotype develops resistance to them or in a situation where they become unavailable in the local market.

The evaluation of the efficacy of endofalm 500 EC, endofan 500 EC and Thionex 50 EC for routine protection of cocoa farms against the mired, an economically important pest of cocoa in Nigeria, was conducted at three locations, Ibadan, Owena and Ikom. Endofalm 500EC, endofan 500EC and Thionex 50 EC are an emulcifiable concentration (EC) insecticide formulation. The laboratory tests on the efficacy of the insecticide for routine protection of cocoa farms against the insect pest were carried out at the peak of the mirid season in October 2004.

Methodology

The efficacy of endofalm 500 EC, endofan 500 EC and Thionex 50 EC under laboratory conditions of $27+3^0$C and 60+ -10%RH was tested at three concentrations of 0.125% (T1), 0.25% (T2) and 0.5% (T3). Additional treatments were standard miricide (T4) and the control (T5). A mixture of nymphs (3-5th instars) and adults of S. *singularis* collected from cocoa plots at CRIN Headquarters, Ibadan in October 2004 and 2005, were exposed to filter papers impregnated with various concentrations of the insecticide inside micro-cages of transparent plastic petri- dishes with perforated lids. Ten mirids were placed in each cage. A standard miricide was used for comparison while distilled water was used as control. The experimental design was completely randomized design with 5 replications per treatment. Mortality of the mirids was recorded at ten minutes intervals until 100% mortality was achieved in one of the cages.

Results and Discussion:

The effect of Endofalm 500 EC Endofan 500 EC and Thionex 50 EC on a mirid mortality at all the four concentrations tested in the laboratory bioassay is given in Table 1. Mortality increased with period of exposure and no mortalities were recorded in control cages throughout the exposure period.

The mortality rates of Endofalm and the Standardmiricide gave a 200% kill of mirids in the laboratory at the 40th minute (Table 1).

The mortality rates of Endofan 500EC and the standard miricide were similar at 0.25% concentration as both Endofalm and the standard miricide gave a 100% kill of mirids in the laboratory at the 40th minute (Table 2)

The mortality rates of Thionex 50 EC and the standard miricide were similar at 0.25% concentration as both Thionex and the standard miricide gave a 100% kill of mirids in the laboratory at the 40th minute (Table 3)

Conclusion

Endofalm 500 EC, Endofan 500 EC and Thonex 50 EC when exposed to the mirid in the laboratory against the cocoa mirid, at concentration of 0.25% was found to be efficacious as other standard insecticide approved for routine protection of cocoa in Nigeria. The insecticide is therefore recommended to progress to field stages of the screening exercise starting from the next mirid season.

Table 1. Laboratory toxicity of Endofalm 500 EC to the brown mired, Salbergella singularis in Nigeria

Exposure periods (minutes)											
10	20	30	40	50	60	70	80	90	100	110	120
% mirid Mortality											
10	10	30	40	50	50	50	60	60	70	80	80
10	20	40	50	60	90	100	100	100	100	100	100
20	40	60	80	100	100	100	100	100	100	100	100
20	30	50	90	100	100	100	100	100	100	100	100
0	0	0	0	0	0	0	0	0	0	0	0

*Each value represents mean of five replicates.

Table 2. Laboratory toxicity of Endofan 500 EC to the brown mirid, Salbergella singularis in Nigeria

Exposure periods (minutes)											
10	20	30	40	50	60	70	80	90	100	110	120
% mirid Mortality											
10	10	20	20	30	50	50	60	60	60	70	80
10	30	30	40	50	60	80	100	100	100	100	100
20	40	60	80	100	100	100	100	100	100	100	100
20	30	50	90	100	100	100	100	100	100	100	100
0	0	0	0	0	0	0	0	0	0	0	0

*Each value represents mean of five replicates.

Experimental Title: Laboratory evaluation of potential insecticides (Endocel 35 EC, Endocap 625 EC and Endocot 500 EC) for routine protection of cocoa farms against the brown cocoa Mirid - Salbergella Singularis in Nigeria (Asogwa E.U; JC. Anikwe; I.U. Mokwunye, TCN. Ndubuaku & F.A. Okelana)

Objective and Justification:

In Nigeria, the brown cocoa mirid Sahlbergella singularis is responsible for over 30% yield loss in cocoa. The feeding activities on the insect directly predispose such tissue to secondary infection by rot organisms. Insecticides still remain a very important component among the strategies for effective control mirids and other major insect pest of cocoa in Nigeria. The Cocoa Research Institute (CRIN) has the national mandate to evaluate and recommend insecticides from various groups (Organophosphate, Carbamate, Pyrethroids, and other Biorational insecticides with novel mode of activity) so that replacement could be made easily in a situation where they become unavailable in the local market or to combat resistance problems that may arise as a result of over-dependence on a particular class of insecticides.

The evaluation of the efficacy of endocel 35 EC, endocarp 625 EC and Endocot 500 EC for routine protection of cocoa farms against the mirid, an economically important pest of cocoa in Nigeria, was conducted at the Cocoa Research Institute(CRIN), Ibadan. The laboratory and small-scale field test on the efficacy of the insecticide for routine protection of cocoa farms against the insect pest were carried out at the peak of the mirid season 2004 and 2005.

Methodology

The efficacy of Endocel 35 EC, Endocap 625 EC and Endocot 500 EC under laboratory conditions of $27+3^0$C and 60+ -10%RH was tested at three concentrations of 0.125%, 0.25% and 0.5%. A mixture of nymphs (3-5th instars) and adults of S. *singularis* collected from cocoa plots at CRIN Headquarters, Ibadan in September 2004 and 2005, were exposed to filter papers impregnated with various concentrations of the insecticide inside micro-cages of transparent plastic petri- dishes with perforated lids. Ten mirids were placed in each cage. A standard miricide was used for comparison while distilled water was used as control. The experimental design was completely randomized design with 10 replications per treatment. Mortality of the mirids was recorded at ten minutes intervals until 100% mortality was achieved in one of the cages.

Results and Discussion:

The effect of Endocel 35 EC, Endocap 625 EC and Endocot 500 EC on mirid mortality at all the three concentrations tested in the laboratory bioassay is given in Table 1, 2 and 3. Mortality increased with period of exposure and no mortalities were recorded in control cages throughout the exposure period.

The mortality rates of Endocel 35 EC and the Standard miricide were similar at 0.25% concentration as both Endocel 35 EC and the standard miricide gave a 100% kill of mirids in the laboratory at the 50th minute (Table 1).

The mortality rates of Endocap 625 EC and the standard miricide were similar at 0.25% concentration as both Endocap 625 EC and the standard miricide gave a 100% kill of mirids in the laboratory at the 40th minute (Table 2).

The mortality rates of Endocot 500 EC and the standard miricide were similar at 0.25% concentration as both endocot 500 EC and the standard miricide gave a 100% kill of mirids in the laboratory at the 40th minute (Table 3).

Conclusion

Endocel 35 EC, Endocap 625 EC and Endocot 500 EC when exposed to mirids in the laboratory, at concentration of 0.25% was found to be efficacious as the standard insecticide approved for routine protection of cocoa in Nigeria. The insecticide were therefore recommended to progress to the filed stages of the screening exercise starting from the next mirid season.

Table 1. Laboratory toxicity of potential insecticide endocel 35 EC to the brown mirid, Salbergella *singularis* in Nigeria

	Exposure periods (minutes) % mirid Mortality (x Values)*											
% Conc.	10^1	20^1	30^1	40^1	50^1	60^1	70^1	80^1	90^1	100^1	110^1	120^1
0.125	20	20	20	40	60	100	100	100	100	100	100	100
0.25	20	60	80	80	100	100	100	100	100	100	100	100
0.5	60	80	100	100	100	100	100	100	100	100	100	100
Std	20	40	80	80	100	100	100	100	100	100	100	100
Cont.	0	0	0	0	0	0	0	0	0	0	0	0

*Each value represents mean of ten replicates.

Table 1. Laboratory toxicity of potential insecticide endocap 625 EC to the brown mirid, Salbergella *singularis* in Nigeria

	Exposure periods (minutes) % mirid Mortality (x Values)*											
% Conc.	10^1	20^1	30^1	40^1	50^1	60^1	70^1	80^1	90^1	100^1	110^1	120^1
0.125	40	60	80	80	80	100	100	100	100	100	100	100
0.25	20	60	60	100	100	100	100	100	100	100	100	100
0.5	80	100	100	100	100	100	100	100	100	100	100	100
Std	20	40	80	80	100	100	100	100	100	100	100	100
Cont.	0	0	0	0	0	0	0	0	0	0	0	0

*Each value represents mean of ten replicates.

Table 3: Laboratory toxicity of potential insecticide endocot 500 EC to the brown mirid, Salbergella *singularis* in Nigeria

	Exposure periods (minutes) % mirid Mortality (x Values)*											
% Conc.	10^1	20^1	30^1	40^1	50^1	60^1	70^1	80^1	90^1	100^1	110^1	120^1
0.125	10	30	50	70	80	80	90	100	100	100	100	100
0.25	20	30	60	90	100	100	100	100	100	100	100	100
0.5	40	60	80	100	100	100	100	100	100	100	100	100
Std	20	40	80	80	100	100	100	100	100	100	100	100
Cont.	0	0	0	0	0	0	0	0	0	0	0	0

*Each value represents mean of ten replicates.

Experimental Title: Effect of some plant extracts against root-knot nematode on cocoa seedlings (Orisajo, S.B., Fademi, O.A., Dongo, L.N. & Okeniyi, M.O)

Objective: To determine the effect of leaf extracts on root-knot nematode in cocoa seedlings

Justification

Nematodes such as Dolichodorus and Meloidogyne species, especially M. incognita and M. javanica, have caused losses in cocoa around the world including yield

decrease, sudden death of trees and growth retardation of seedlings in the nursery (Campos et al, 1990). In Nigeria, the root-knot nematode, Meloidogyne incognita has been implicated as being pathogenic on cocoa seedlings resulting in failure of seedlings to establish on the field (Caveness, 1967, Afolami, 1981a; Afolami & Caveness, 1983). The damage could be die-back, wilt, chlorotic symptoms, stunted shoot, galling of the root or complete death of the seedlings (Asare-Nyako & Owusu, 1979; Afolami & Ojo, 1984). Evidence exists that fresh cocoa plot can be contaminated with phytonematodes from the nursery (Afolami, 1981b).Plant extracts have shown to be an alternative to the use of chemical in effective management of these nematodes resulting in plant health (Akhtar & Alam, 1990; Dias et al., 2000; Mojumder et al., 2002; Salgado & Campos, 2003). This trial is designed to experiment this growing and promising method of disease control which hitherto has not been tried on cocoa in Nigeria.

Materials and Methods

Fresh leaves of C. papaya, O. gratissimum, A. inidica, V. amygdalina and B. orellana were thoroughly washed under running tap water and sterile distilled water. Leaf extracts of different concentrations of 10, 25, 50 and 100% were prepared, Sandy-loam, top soil normally used for raising cocoa seedlings was taken in bulk from the field for steam sterilization in an autoclave at a pressure of 15lbs/inch^2 (1.05kg/cm^2) for 15 minutes. The soil was subsequently left to rest for 2 weeks before planting to restore stability. The sterile soil was then distributed into 2-litre black polyethylene bags used as pots – the usual one of raising cacao seedlings commercially.All pots were planted each with three seeds of Theobroma cacao cv F_3 Amazon. The seedlings were thinned to one per pot a week after emergence and these were inoculated with 5,000 eggs of *Meloidogyne incognita* extract from, a culture maintained on *Celosia argentea* L. using sodium hypochlorite method (NaOCI) of Hussey and Barker (1973). Each pot received 40ml of the leaf extracts at different concentrations a week after inoculation. Uninfected and untreated seedlings served as control. The treatments were completely randomized with six replications pretreatment and were kept moist by watering thrice per week.

The growth parameters viz, plant height, stem, girth, number of leaves and leaf areas were recovered fortnightly throughout the experiment. The experiment was terminated 26 weeks after planting. The roots were carefully freed of soil, washed under a gentle stream of tap water, mooped and assessed under a stereomicroscope for galls. Eggs were extracted fromm10g sub sample roots and estimated using Hussey and Barker (1973) sodium hypochloride method.

An aliquot of 250g from each pot was assayed for juveniles of M. incognita using Whitehead and Hemming (1965) tray modification of the Baermann technique – the pie pan method. Nematode suspensions were concentrated to a 25ml sample using the setting – siphon method of Caveness (1995), transferred to a counting dish (Doncaster, 1962) and counted with the aid of a stereomicroscope. Analyses of variance were carried out on the data obtained and means compared using the GENSTAT statistical package.

Results and Discussion

A general trend of increased nematicidal activity was noticed with a *corresponding* increase in concentrations of the water extract of all the plants (Table 136), Nematode populations were reduced by the application of the extracts in a descending order of A. indica, C. papaya, B. orella, O. gratissimum and V. amygdalina, A. substantial reduction in the incidence of root galling by M. incognita was consistently manifested in this experiment with leaf extracts. Reproduction of M.incognita on cocoa seedlings was clearly affected by the addition of the leaf extracts as indicated by the nematode populations, which was significantly reduced ($p = 0.05$) compared to the control.

Outlook

More research will be carried out on the use of other indigenous leaf extracts.

KOLA PROGRAMME
AG. PROGRAMME LEADER A.R. ADEDEJI
KOLA PATHOLOGY

Experimental Title : Evaluation of selected plant extracts for the control of the storage rot diseases of kolanuts (Otunoye, A ,H. and Adedeji , AR.)

Introduction:

Cola acuminita (pal de Beauv) schott &Endl and *cola, nitida* (vent) schott and Endl are indigenous to the evergreen forest of west Africa(Hutchinson and Dalzial ,1928). These two species are of economic importance to Nigeria (Quarcoo,1969). Akinbode , (1982) reported that Nigeria produces 88% of world's crop amounting to 130,000 tones with actual earning of N28million in 1970. Despite the importance of kola in Nigeria revenue drive, its yield and product storage for local consumptions and export is beset with several problems of which attack on the kola nuts by storage mould fungi is paramount . In combating this menace of post harvest storage rot of kola, Agbeniyi and Fawole, (1999) reported on the efficacy of curing time and dip treatments of kolanuts in 1% sodium hypochlorite providing the best level of control. Otunoye *et al.* (2000) also reported the reduction of mycelia growth of *Bortryodiplodia thebromae* (the casual organism of storage rot of kolanuts,) in culture by 2.0mls concentration of *Azadirachta indica.*

Agbeniyi , *et al.*,(2000) reported also on the importance of observing phytosanitary measures during the processing stage of the kola nuts and the importance of reducing water content of nuts in storage to about 60%.The pre-storage wash treatments with mild chemicals or mixed with wood ash to reduce storage rot have also been reported (Agbeniyi). Though, Adedeji, et al (2006) reported the efficacy of *Ocimum gratissimum* extract in preventing storage rot of kola nut, the use medicinal plant (botanicals) have not been adequately explored. This investigation therefore seeks to evaluate the efficacy of some botanicals in the management of storage rot of kola nuts,(*cola acuminita and cola nitida*) in storage, caused by *Lasiodiplodia theobromae and Fusarium sp.* This is one of effort towards developing integrated pest management (IPM) package for the control of kola diseases.

Objective: To determine the efficacy of plant extracts in preserving kolanuts from storage rot diseases and their safety for consumption by human beings.

Materials and Methods

Fresh leaves of (*Azadracter indica* (Neem) and *Aleo vera* were harvested and rinsed in warm sterile water. Using modified Pandi *et. al.,* 1983) of extraction of botanicals 60g weight of the fresh leaves were weighed out and with aid of Philip blender, the leaves sample were blended in 100mls of sterile water. The blend leaves sample were then filtered through muslin cloth in four folds. The volumes of the resultant aqueous extract of the botanicals representing the stock solution were noted. Various volumes of the stock solution (0mls,5mls, 10mls, 25mls,and35mls) representing different concentration were taking and calculated to standard solution, ($1dm^3$). 1ml aliquot of aqueous extract of various concentrations of the botanicals obtained by modified Pandey *et .al* (1983) method were used to poison 10mls of molten potato Dextrose Agar (PDA) at 40^oc to 45^oc and poured into 9cm diameter sterile petri dishes. The medium was amended with 10% lactic acid to check bacteria contaminants. Then 5mm diameter agar discs of 10days old culture of the fungi (*Lasiodiploda theobromae and fusarium spp.*) were placed at the centre of the petri dishes containing the treated medium. Complete randomize design (CRD) was used in the experiment. The inoculated petri dishes were incubated in a gall encamp incubator at a temperature of $25^oC+ 2^0C$ in darkness. Measurements of the radial growth of fungi in the various inoculated plastic petri dishes including the control were taken daily until the fungi radial growth in the control petri dishes filled the plates. The data obtained were analyzed using SAS statistical package.

Results and Discussion

Table 1. Mean Radial growth and percentage inhibition of L . theobromae in PDA Neem amended culture medium.

Neem leave concentrations	Radial Growth	%Inhibition
0.00g	5.53a	
0.01g	1.77b	67.99
0.02g	1.33b	75.95
0.03g	1.43b	74.14
0.04g	1.12b	79.75
0.05g	0.90b	83.73

Analysis of the mean of radial inhabition of L. Theobroma fungus un PDA mean amended culture medium was done with SAS statistical package. Table 1. The result obtained showed that there were significant differences between the treatments at ($P<0.05$). Mean separation was done with Duncan Multiple Range. Test (DMRT) as in Table 2.

Table 2: Mean separation Using Duncan Multiple Range Test (DMRT)

Neem Leave Concentrations	Value of radial inhibition of fungus
0.00g	5.53a
0.01g	1.77b
0.02g	1.33b
0.03g	1.43b
0.04g	1.12b
0.05g	0.90b

DMRT at 5%; Means followed by the same letter are not significantly different

Table 2, shows that all the treatments were significantly ($P=0.05$) better than the control. However, despite the various low treatment means of neem leave concentrations, statistically, they did not differ significantly in their inhibition of radial development of *Lasiodiplodia theobromae fungus.*

Work is in progress to assay other medicinal botanicals in the control of kola storage mould fungus. *Lasiodiplodia theobromae and fusarium Pallidoreseum.*

Experimental Title: Growth and nutrient uptake of Cola Nitida Var. Labochi seedlings and ramets under different nutrient element deficiences (K.O. Ayegboyin)

Introduction

Study on the application of fertilizer on kola had shown that it responds to additional nutrient element only if it is deficient in such element. During growth, apart from Leaf (Plant). Analysis which is a destructive sampling method, the only feasible method to know that this crop is deficient in certain elements is through Deficiency Symptoms of such particular nutrient elements. However, Ayodele (1990) investigated the effect of each of N, p and K on the seedlings of kola, , work has not been extensively reported on the effect of other macro nutrient elements like Mg and Ca as well as the combined effect of these nutrient elements on both kola seedlings and ramets (cuttings). Consequently, the study was initiated to investigate the individual and combined effect of N,P,K, Mg and Ca on the kola seedlings and their cuttings through a system known as missing element technique.

Objective:

To evaluate the survival and biomass production of *Cola nitida* var. Labochi seedlings and ramets under different individual and combined nutrients elements deficiencies of N,P,K, Mg and Ca in the nursery. This is to enable proper solution to be proffered to such problem if encountered by the farmers.

Materials and Method

Two propagule of *Cola nitida* were used. These were seedlings (plant raised through the seeds) and ramets (plant raised through cutting of their branches/stems).

For Seedlings: the seeds were first cured for a week and ten pre-germinated for two months in the nursery. During pre-germination, the already cured kola nuts were planted in the saw dust at the spacing of 20cm interval under a shade of about 25% light intensity. Watering of the planted seeds were carried out every other day (2 days interval). These pre-germinated seedlings were to be transferred to the Culture Solutions prepared with a Missing Element Technique for usual observation for their survival and growth. However, that was not to be as some logistics problems that existed then, prevented this aim from being achieved.

For ramets (cuttings): The kola flushes of between 2 and 4 months of age were taken very early in the morning from zone 1, CRIN, where the Labochi variety to be used could be found. The cuttings were initially cut with secateurs and the fresh point of separation (i.e. where it was cut) were dipped inside water immediately after separation from their mother plant. The whole separated branches, both the separated stems and their leaves, were covered with white nylon to reduce transpiration. They were transferred from zone 1 to the CRIN Central Nursery where they were re-set and sowed into top soil inside the black polythene bags of size 25cm by 35cm. The soil had been watered a day before setting of the cuttings. This was to prevent wounding of the cutting through contact with dry hard soil. Immediately after setting (planting) the pots were re-watered and then covered with the nylon sheets to provide humidified environments best for the germination and growth of the cuttings. The environment was under the shade intensity of about 30%. These cuttings were to stay in this condition for 3months before being finally transferred to the culture solution prepared with Missing Element Technique.

Result and Discussion

The germination rate for the seedlings was 66% while that of ramets (cuttings) was 9%. The percentage germination for the ramets was so low due to the methodology adopted in conveying these cuttings from the points of collection to the point of planting. The distance between zone 1, where the cuttings were collected, and Central Nursery, where they were raised, was about 3km and due to some logistics problems, the cuttings would not get to the Nursery until about 9am everyday due to some hours of trekking. Consequently, it was observed that poor performance of these cuttings might be due to stress conditions they were subjected to even before planting. For seedlings, though the germination percentage was high, the seedlings could not be transferred to the culture solution as planned due to some financial constraints.

Conclusion

This study will be repeated this year 2007 with all experience of last year taking into consideration.

Reference

Ayodele, E.A (1990). Mineral Nutrition of Kola. Improvement of kola production and propagation *Annual Report Cocoa Res. Inst. of Nigeria.*

Experimental Title: Evaluation of selected botanical insecticides for the control of the kolanut weevil, Balonogastris Kolae storage (Anikwe, J.C., Asogwa,E.U., Mokwunye I., F.A. Okelana and A. A. Oloyede)

Introduction:

Kolanuts are processed and eaten without cooking, the use of ethno-botanicals in controlling the weevil which carries out its feeding and developmental activities within the nuts will be desirable for protecting the little harvest often obtained and improving the quality of nut production.

Objective: To evaluate botanicals with known insecticidal properties for their efficacy in protecting kolanuts against the kola weevils in storage.

Materials and Methods:

Plant materials used for this work were collected from natural forest at the Cocoa Research Institute Of Nigeria Headquarters, Ibadan. The materials were dried under shade at the Entomology Department for 3 days and thereafter ground. Three concentrations of aqueous extract of each plant 500g/lt. 125g/lt were prepared after soaking overnight 0.1ml of each concentration was bioassayed on the dorsal thoracic cavity of the weevils (n=10) in order to screen botanicals for toxicity to the weevils. Mortality record was taken every 30 minutes for 4 hours and then 24HAT. Botanicals with promising results will be further evaluated as nut protectants.

Result and Discussion:

While the work is still on-going, preliminary result of toxicity of selected botanicals at only one concentration (500g/lt) is presented in Table1.

Table 1: Contact Toxicity of some selected botanicals to the kolanut weevils, *Balongastris kolae* in the Laboratory applied at (1:2%w/v)

Botanical	Plant parts Used	Exposure Periods (Minutes) Mirid Mortality (%)							
		30	60	90	120	150	180	210	240
24HAT									
Azadirachta	Leaf	0	10	30	40	40	40	50	50	100
Carica papaya	Leaf	0	0	20	20	20	20	20	20	100
Petiveria alliaceae	Leaf	10	20	30	30	30	50	70	80	100
Tetrapleura tetraptera	Leaf	0	10	20	30	50	70	90	90	100
Tetrapleura tetraptera	Fruit	10	30	50	50	50	50	60	70	100
Chromolaena odorata	Leaf	0	10	60	70	70	70	70	70	100
Jatropha curcas	*Leaf*	0	0	0	10	10	10	20	20	100
Jatropha gossypifolia	*Leaf*	80	80	90	90	100	100	100	100	100
Morida lucida	Leaf	0	10	40	50	60	70	80	80	80
Thevvetia erifolia	Leaf	0	0	40	50	50	60	70	90	90

Constraints: Major constraints was the non-availability of sufficient number of weevils to run bioassays.

Conclusion:
All the extracts bioassayed gave promising result at 1:20% w/v concentration after 24hours of treatment. *Jatropha gossypifolia* Leaf extract was observed to be fast-acting giving a total kill of 80% of he weevils within the first 10 minutes. More botanicals will be evaluated for their efficacies in protecting kolanut against the kola weevils in storage.

COFFEE PROGRAMME

AG. PROGRAMME LEADER : O.S. IBIREMO

Experimental Title: Effect of amended growth media on the production of coffea canephora seedlings in the nursery **(**Adeyemi, E.A. and Daniel M.A.)

Objectives:

i. To evaluate alternate growing medium for raising coffee seedlings in the nursery
ii. To protect productive soils from becoming marginal.

Justification:

The raising of coffee seedlings with topsoil has always pose problems in terms of costs, bulkiness. Continual scrapping of the topsoil for such purpose has rendered some lands marginal in soil fertility level. Sawdust is a waste product in the sawmill industries posing problem of disposal. It however has potential for agricultural purpose of properly cured. The need to reduce disposal in raising coffee seedlings and to utilize sawdust productively forms the justification of this work.

Materials and Methods:

Two materials: Topsoil and Sawdust were used singly and in equal combination without and with fertilizer amendment at two levels. The sawdust was cured for six months before use. The five growth media investigated were therefore topsoil (TS), sawdust (SD), combination of the topsoil and sawdust in 1:1 ratio (TSSD), addition of N.P.K. fertilizer to the mixture at 60:30:50 (TSSD1) and 30:15:15kg/ha (TSSD2). All the growth media were analyzed for their nutrient content prior use. Two leaf stage of *C.canophora* seedling that were pre-germinated in conventional sand medium were transplanted bare rooted into two kilogram of each growth medium in polythene pot. NPK 60:30: and 30:15:15 at 108g and 54g respectively were dissolved each in 40mls of water and applied in two splits at two and six weeks after transplanting. Agronomic data on plant height, number of leaves, leaf area and stem diameter were taken bi-monthly from two to six months. Data obtained were analyzed using analysis of variance (ANOVA) and means were separated with Duncan"s Multiple Range Test (DMRT).

Result and Discussion

At two months after transplanting (MAT), the combination of topsoil, sawdust and NPK fertilizer at 60:30:30kg/ha (TSSD1) produced coffee seedling with highest plant height value of 7.93cm which was only significantly different (P<0,05) from pure sawdust medium (Table2). Leaf area of seedling raised in TSSD1 was significantly different from all other treatments. The better performance in plant height and leaf area could be an added advantage to the seedlings in the production and assimilation of photosynthate materials which could result in a vigorous seedling. The mixture of topsoil and sawdust (TSSD) medium produced seedling with stem diameter 0.33mm which was significantly (P<0.05) different from topsoil (TS) and the combination of topsoil, sawdust and NPK fertilizer at 30:15:15 (TSSD2).

The mean growth performance of coffee seedling at 4 MAT was not significantly different in all the growth media investigated. Six months after transplanting TSSD medium produced seedling of highest value (10.58) in plant height and stem diameter (3.03mm) which was significantly different (P<0.05) from seedling raised in SD and TSSD2 growth media (Table 2) but compared favourably with the conventional topsoil medium for coffee seedling production. This finding agrees with earlier findings of Adeyemi (2000) who reported that coffea seedlings raised in combination of topsoil and sawdust n 1:1 ratio was not significantly different from seedling raised in topsoil medium. The poor performance of coffea seedling in pure sawdust medium could be as a result of wide C:N ratio of 1.46 which must have impeded the growth of the seedlings (Brady 1999) Table 1.

Conclusion: The mixture of topsoil and sawdust (cured(at 1:1 ratio without fertilizer amendment could be recommended in place of pure topsoil in the raising of *coffee canephora* seedling in Nigeria.

Reference:

Adeyemi E.A. (2000). Evaluation of different growing media for raising coffea canephora (piere Ex-froehner L.) seedlings in the nursery – preliminary.

Experimental Title: Evaluation of different germination media in pre-germination and performance of selected clones of *Coffea Canephora* (Adeyemi E.A. and Ipinmoroti R.R.)

Objectives:

(i) To access the suitability of other sowing media for pre-germination of coffee
(ii) To access the effect of these media on the health of emerging seedling.

Justification:
Coffee is a slow grower crop that undergoes pre-nursery stage for pre-germination before potting in topsoil medium. Conventionally, pre-germination is done in river-bed sand. Pertinently, river sand is bulky and not readily available all year round. Therefore the need to investigate into an alternate medium for pre-germination justifies this study.

Materials and Methods:
Five growth media (river sand, topsoil, sawdust, sand + sawdust and topsoil + sawdust) were prepared into beds in the nursery at 75cm x 30cm x 15cm dimension. The sand + sawdust and topsoil + sawdust mixtures were at 1:1 ratio and the sawdust was cured for 6 months before usage. Coffee berries were harvested from 5 clones (C36,C116, C90 (Quillou variety), T1049 (Java) and M10 (Naolli) in the germplasm plot. The fruits were depulped in water by hand immediately after harvesting and parchment seeds were air dried for 7 days on racks in the laboratory room. All malformed, small and damaged seeds were removed. The seeds were sown at 2.5cm x 2.5cm at 2.5cm depth and 25 seeds were sow per clone per medium in 3 replicates. Watering was done thrice weekly at morning hours of the day. Seedling emergence and disease counts were carried out and seedling vigour was based on plant dimater values taken with vernier caliper in mm at the soil surface level at 11 and 13 weeks after sowing (WAS). Data obtained were analysed using analysis of variance (ANOVA) and mean differences were separated using Duncan Multiple range test (DMRT) at $P<0.05$).

Results and Discussion:
Seeding emergence was highest in the sawdust medium (Table 1) with 58.4% at 11 WAS and 63:3% at 13 WAS, while it was least in topsoil medium with 34.4% at 11 WAS and 36.8% at 13 WAS. Coffee seedlings raised with sawdust had the highest vigour at both 11 and 13 WAS and least in the topsoil medium. Disease incidence was more on coffee seedlings raised with topsoil compared to other growth media.

Table 1: Effect of pre-germination media on performance of coffee seedlings at 11 and 13 weeks after sowing (WAS)

Growth	Emergence (%)		Disease incidence (%)		Plant diameter (mm)	
Media	11WAS	13WAS	11WAS	13WAS	11WAS	13WAS
Sand	44.3_{ab}	49.3_{b}	0.07_{b}	0.07_{c}	5.0_{ab}	8.7
Topsoil	34.4_{b}	36.8_{c}	0.47_{a}	1.27_{a}	3.5_{c}	6.0_{c}
Sawdust	58.4_{ab}	63.2_{a}	0.07_{b}	0.07_{c}	5.8_{ab}	10.1_{a}
Sand+sawdust	38.9_{ab}	42.4_{bc}	0.00_{b}	0.27_{b}	4.0_{bc}	7.7_{bc}
Topsoil+sawdust	45.1_{ab}	42.4_{bc}	0.07_{b}	0.07_{c}	5.0_{ab}	7.3_{bc}

Means within the same column followed with same letters are not significantly different from each other at 5% level of significant (Duncan'a Multiple Range Test).

The highest percentage seedling emergence was in clone M10 (Table 2). The value was 48.0% at 11 WAS and 53.7% at 13WAS. The value was least for clone C90 (Quillou) with 41.3% at 11WAS and 42.7% at 13WAS. The seedling vigour was similarly best in clone M10 (Niaolli) at both 11 and 13WAS least in clone T1049 at both 11 and 13 WAS but least in clone C36 at 11WAS and on clone C90.

Table 2: Clonal effect on seedling performance at 11 and 13WAS

Coffee Clone	Emergence (%)		Disease incidence (%)		Plant diameter (mm)	
	11WAS	13WAS	11WAS	13WAS	11WAS	13WAS
C36	43.2$_a$	47.2$_a$	0.07$_a$	0.67$_a$	4.8$_{ab}$	7.5$_a$
C111	46.1$_a$	47.2$_a$	0.13$_a$	0.67$_a$	4.3$_{ab}$	8.1$_a$
C90	41.3$_a$	42.7$_a$	0.13$_a$	0.60$_a$	5.3$_a$	7.9$_a$
T1049	36.0$_a$	44.8$_a$	0.20$_a$	1.07$_a$	3.1$_a$	7.0$_a$
M10	48.0$_a$	53.7$_a$	0.13$_a$	0.67$_a$	5.9$_a$	8.9$_a$

Means within the same column followed with same letters are not significantly different from each other at 5% level of significant (Duncan'a Multiple Range Test).

The sawdust growth medium resulted in significantly ($p<0.05$) higher coffee seedling emergence compared to the top soil but not over other media. The better seedling emergence in the sawdust medium may be due to its loose, light and friable nature, while other media were heavy and compacted. The physical properties of sawdust must have allowed better aeration and adsorption of water sufficient for good germination of the coffee seeds. Sand is loose but heavy and do not possess the ability to retain water adequately for optimum germination and emergence (Bissonnais and Arrouays, 1997). Topsoil could retain sufficient water but it is heavy and compacted and could not allow adequate aeration needed for germination of coffee seeds. Since coffee requires growth medium with light, loose and friable properties for optimum germination and growth, sawdust with these properties was therefore optimum.

Disease incidence was significantly ($p<0.05$) higher on coffee seedlings raised in topsoil medium compared to other growth media at both 11 and 13 WAS. Topsoil is reported to be high in various kind of soil micro organisms (Zhon and Everts,2004), some of which are pathogenic in nature. The high organic matter contents of topsoil provide suitable environment and support for myriads of biochemical activities and good multiplication of soil micro organisms.

Conclusion

The better pre- germination performance of coffee in the sawdust growth medium, with less disease incidence compared to other growth media, suggests the need to recommend sawdust for the pre-germination of coffee seeds in the pre-nursery stage of coffee propagation from seeds in the nursery.

Constraints: Fund.

Experimental Title: Effect of organic fertilizers on the nutrient uptake of *Coffea Canephora Seedlings* (Daniel, M.A. and Obi, A.O.)

Objectives and Justification:

Evaluation of ways to increase production of organic coffee through the use of sustainable farming techniques using organic manures and waste as fertilizers.

Materials and Methods:

A green house studies was carried in the year under review in Ibadan using three organic material namely*Chromileana odorata (Siam weed) Pennisetum puream* (napier grass) and cowding. These materials were collected Fred sun dried and milled. Bulked soil samples were collected at the dept of 0.30cm air-drial crushed and sieve to pass through 2mm mesh. Ripe coffee berries from nature *coffee canephora* Quillo variety were harvested at the research plot during the 2005/2006 season de-pulped and pre-nused. Five kg of air dried soil were weighed into each 5-litre size plastic pots. The three rates 0.5 and 10 tha-1 of each of the organic materials corresponding to 0.11, 16 and 22.32g/5kg soil was applied in various combinations.

Twenty-seven treatments were obtained from factorial combination of the organic fertilizers and replicated four times. Bare roots methods of transplanting were used. Growth parameters were measured every two weeks on plant height, leaf number, and leaf area and stem diameter. Total sampling was carried out at the end of study. The harvest plant samples were enveloped and oven dried at 68c. The dry matter were taken before the samples were milled using stainless steel hammer mill and analyzed. Results obtain are

subjected to ANOVA and nutrient up-take determined according Enzman 1977.

Result and Discussion:
Application of each of the organic fertilizers and their combination at 5tha -1 improved the nutrient uptake of coffee seedlings (Table 1). There were significant difference in the uptake of NPK Ca and Mg by coffee seedling in all the treatment applied. The highest p-uptake was obtained where all the three organic fertilizers were combined at the first rate 5 t ha where as uptake was highest where D was applied 57.74 maples alone this may not be in related to the K content of the materials. Similarly Ca and Mg uptake followed a similar trend.
Table 1. Application of the organic fertilizer in two fold (10tha) did not double the nutrient uptake but showed a considerable increase above that of 5ha of NPK uptake especially where the three organic material were combined in the ratio of 1.1.1. However, the organic fertilizer in all their combinations significantly ($P<0.05$) improved the soil nutrient and uptake which reflected in the growth parameters and dry matter yield of the Coffee Seedlings.

Conclusion
A significant correlation was observed between the soil N and N content of Coffee seedlings. Apart from P, the entire nutrient considered showed a significant correlation. The study showed that both soil nutrient and uptake by coffee seedling were significantly enhanced with the addition of organic fertilizer.

Outlook: Future outlook of this work aims at establishing Coffee seedlings using organic fertilizer for the field. With the advent of organic coffee production this will maintained up to harvesting. And the harvest monitored so as to established organic pilot plot.

Experimental Title: Pathogenecity of coffee seedlings attacked by the root-knot nematoe Meloidogyne Incognita (Orisajo, S.B, Fademi, O.A., Okeniyi, M.O., Omolaja S.S. and Dada K)

Objective:
To determine the effect of root-knot nematode, *meloidogyne incognita on coffee*

Justification:
Coffee is an important worldwide cash drop that is cultivated on over 3million farm units, most of which are small agricultural enterprises. Root-knot nematodes, *Meloidogyne* species, are one of the most widespread pests limiting world agricultural productivity (*Tailyor et al., 1982, Sasser et al., 1984).* 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). In South American countries including Trinidad-Tobago but excluding Brazil, losses due to Meloidogyne species infestation are estimated at US$600million to US$700million per year. Losses due to Meloidogyne species in Brazil are estimated at 15% of that country's production (1.8 million metric tones in 1983-1984) (Feldmesser et al 1971; Lordello, 1984). There is the need to look at the effect of this nematode on coffee in Nigeria.

Materials and Methods
Top soil used in the experiment was obtained from CRIN Headquarters and was steam sterilized Approximately 2Kg of the soil was weighed into each of the polyethylene bags used as pots for the experiment. One coffee seedling per pot was transplanted. Two weeks after transplanting , the pots were inoculated with 5000M. *incognita* eggs obtained from the culture on the roots of *celosia argentea* used Hussey and Barker (1973) sodium hypochlorite (NaOCl) method. Uninoculated units served as control. Normal watering of seedlings as obtains in coffee nurseries was carried out. Fortnightly, growth records were taken which involves plant height, number of leaves and stem girth. The experiment was terminated 26 weeks after transplanting. Watering was stopped one week prior to the termination of the experiment. Thereafter, soil in each of the seedlings pot was turned in to dry bowl; root system carefully excised and placed in a labeled polythene bag, the galling effect was recorded. The soil in each bag was thoroughly mixed and a 250ml aliquot sample was taken for nematode assay (Whitehead and Hemming, 1965).

Results and Discussion

The above ground parts of the inoculated seedlings showed chlorosis and stunted shoot. Small galls typical of M. incognita were seen on the inoculated roots with an increase in the nematode juveniles, showing the reproduction potential of the pest on coffee seedlings (Table 1)

Table 1: Effect of root-knot nematode infestation on coffee seedlings

Coffee Seedlings	Plant height (cm)	No of leaves (count)	Stem girth (cm)	Reproduction (pf/pi)	Factor
Inoculated	41.8b	15a	0.65b	15.1	
Uninoculated	52.2a	16a	0.78a		

Means followed by the same letter in the same column are not significantly different (p=0.05). pf = final nematode population, pi = initial nematode population.

Conclusion and Outlook

There is a need for survey of major coffee producing states to determine the susceptibility or resistance of coffee seedlings to nematodes. This will help in the assessment of economic loss due to this pest and breeding for resistance varieties.

Experimental Title: Further screening of selected robusta coffee varieties for resistance to the economic insect pest of Coffee canephora. (Anikwe J.C. and F.A. Okelana)

Objective

To study the nutritional ecology using Epicampoptera strandi as a test insect pest.

Justification

Coffee yield is not yet at its optimal level because of insect pest infestation and damage. Okelana (1989) reported the Epicampoptera species as a major insect pest of robusta coffee in Nigeria.The two species recorded are Epicacampoptera strandi Bryk. Sub sp. Glauca and Epicampoptera andersoni Tams. Sub sp.glauca.

Materials and Methods

Day-old first instar larvae were used for this study. A fresh young laef of C. canephora(4^{th} or 5^{TH} from a branch apex) was neatly plucked, placed in a plastic cage laid with absorbent cotton wool and fed to one larvae of E. strandi in twenty replicates. The leaf in each cage was changed daily and weighed alongside the larvae using a precision electronic balance (0.01 to 200g) before and after feeding. The fresh weight of food consumed was corrected based on a 24-hour variation of a parallel control. Consumption index was calculated as C.I = F/TA; Growth rate G.I = G/TA while the efficiency of conversion of ingested food (ECI) was G.R/C.I. where F = fresh weight of food eaten, T = duration of feeding period (days). A =Mean fresh weight of animal during the feeding period, G = fresh weight gain of animal during the feeding period. Analysis of variance was based on results of 20 replicates and, where significant, was separated by the Turkey test.

Damage Assessment Studies: Ten day-old larvae of *E. strandi* were introduced separately onto freshly plucked leaves of robusta coffee, which were changed daily in the laboratory. Leaf Area Damage was assessed via the use of a leaf Area Meter (model C1 - 202). Plucked coffee leaves were scanned with the Area Meter before being fed to the insects and 24 hours after being fed to the insects. The area of leaf defoliated was estimated as the difference between the areas of leaves before and after feeding . The equivalent damaged area of the leaf was finally expressed as a percentage leaf Area Consumed = $\frac{\text{Mean damage leaf Area}}{\text{Mean whole leaf Area}} \times \frac{100}{1}$

Result and Discussion

The result of this experiment is summarized in Table 1

Table 1: Consumption, Utilization Efficiencies and Growth rate in the immature stages of *E.strandi* feeding on *C. canephora*

Larva	duration	Food Consumption		Insect	Growth	ECI (%)	Leaf Area	Consumed
		Stage	of stage	consumed	weight gain	Index		rate
(%)	(days)	(cm2) (mg)	(mg)					
1	4 13.8a	4.1a	0.3	0.05	16.7	3.78	1.41	
2	3	177.2b	65.0b	2.5	0.63	25.2		12.10
4.35								
3	3	461.6c	173.3c	2.8	0.75	26.8		18.67
25.60								
4	4	778.1d	325.2d	2.2	0.82	37.3		24.74
63.20								
5	4	849.2e	442.1e	2.0	0.79	39.5		32.50
88.40								

Means followed by the same letter in the same column are not significantly different ($p<0.05$)
Turkey's Honestly Significant Difference (HSD)

Conclusion:
The mean developmental time from larval emergence to the last day of the fifty instar was 18days and during this period, the larvae consumed a total of 22709.9mg of leaves of *C. canephora* with a total of 91.79cm2 area of leaf being damaged. The fifth instar larva was the most destructive with 88.4% of leaf area consumed in a day. The gross efficiency of conversion of ingested food increased with the age of the insect. And since the feeding stages are exposed on the leaves most of the time, control with the use of natural pesticides that have contact and or anti-feedant properties should be explored along with natural enemies of this pest.

Constraint: Fund.

Experimental Title: Yield assessment of selected coffee clones in the seed garden (Adeyemi, E.A. , Dada, K.E., Omolaja, S.S. and Ibiremo, S.O.)

Justification and Objective:
The use of proven planting materials is crucial to successful establishment and good productivity of *Coffea* plantation. The need to make such planting materials available to farmers justifies this study. The objective of the work is to understudy the yield attributes of rooted cuttings of selected clones of *Coffea*.

Materials and Methods:
Three clones of *Coffea canephora* namely; C36,C111 (Crillio variety) and T1049 (Java variety) were obtained from coffee germplasm at CRIN headquarters in Ibadan. Rooted stem cuttings were prepared from these clones and used in the establishment of seed garden in year 2003 using Sigmund design. In year 2005 initial flowering was observed but berries could not harvested. Appreciable flowering and fruiting were recorded in year 2006 and the result is reflected below:

Result and Discussion:
In all, 40% of the establishment bears berried with an average weight of 1.2kg/tree. Clone C36 yield is the highest followed by C111 and T1049. The yield was highest in C36 followed by C111 and T1049 in that order.

Table 1:

	No. of tree yielded	Weight	Average Weight/Tree
C36	13	15.6	1.2kg/tree
C111	10	11.0	1.1kg/tree
C1049	9	10.8	0.9kg/tree

Constraints: Inadequate labour to carry out necessary operations as at when due.

Outlook: The project will be continued in year 2007.

CASHEW PROGRAMME
AG. PROGRAMME LEADER: L. A. HAMMED

Experimental Title: Establishment of cashew germplasm plot (Aliyu,O.M., Hammed, L.A., Adeyemi, E.A., Ibiremo, O.S., Asogwa, E.U., Ogunlade, M.O. Adedeji,A.R., Mokwunye, I.O., Wale Kunnuola, S.A. Adejumo, Enagu, V. Adebambo and Wale Hassan.)

Introduction:
The importance of the collection and establishment of cashew germplasm plot to CRIN can not be overemphasized. Such gene pools especially within easy-to-reach locations provide consolidated foundations for all cashew improvement programmes. In the past, some scientists from CRIN had made a number of cashew germplasm collections (Sanwo, 1972 and Sanwo et. al., 1972) which were established at CRIN Headquarters, Ochaja and Uhonmora Substations.
The cashew germplasm base of the Institute was increased, between 1999 and 2003, with the establishment of the exotic Brazilian accessions collected from a private farm in Kwara State. These materials were established at the Headquarters, Owena, Ochaja, Uhonmora, Ikom and Mambilla substations(ayodele, et. Al., 2001). With the exception of the Ochaja plot, hardly can others be located due to logistic problems.
Re-establishment of the cashew germplasm plot at the Headquarters started in 2005. The genetic base of the plot was expanded to include different nut-sizes and locations giving eight plots (Table1). Each plot represents a cashew gene pool.

Objective: To establish 2.5ha of cashew germplasm plot planted to Brazilian accessions for future selection and improvement works on cashew in Nigeria.

Materials and Methods:
The plot was laid out and planting made as contained in 2005 annual reports of CRIN, In 2006, re-establishment was made due to serious loss of the transplants as a result of the logistic problems.

Cultural Operations:
Weeding: Hitherto, weeding was manually carried out by slashing with cutlasses. Towards the end of 2006, herbicides wee sprayed (touchdown-qlyphosate and gramozone-paraquat). This was as a result of the predonderance of *comelina spp* on the plot. This weed *spp* happens to be the second most stubborn weeds in the world.

Watering: Watering was carried out in form of water supplementation. This was carried out early in the morning before the sun rises. Borehole water was used throughout.

Mulching: Dried plant stubbles were used as dead mulch at 15cm away from the young plants.
Protection from grass-cutters: the plastic (paint) containers were used to cover each plant. Meanwhile, the base of the containers had been cut.

Protection from fire: Fire-traces of about 5m away from the plot were made.

Data Collection: Data were collected on the survival percentage. This was carried out on plot basis.

Results
The survival percentage of these germplasm as at December 2006 was very poor. This was as a result of non-availability of adequate labour supply as and when due. This paved way for serious weed infestation and destructive activities of the grass-cutters.

The provision of herbicides (touchdown and gramozone) for weed (*comelina spp)* control, the procurement of the protective plastic (paint) containers and regular provision of water supplementation enabled the obtainment of the few germplasms that survived.

The supply of the dead germplasms is expected to be carried out in 2007 planting season and improved plot management put in place.

Outlook: To have cashew gene pools in designated locations in Nigeria for improvement programmes of the crop.

Constraints: (1) Inadequate funding for cashew research programme.
(2) Shortage of manpower

(3) Non-availability of modern research equipment

Table 1: The survival percentage of cashew germplasm at the germplasm plot of the crop as at September 2006, CRIN Headquarters.

Block	Accession/Pedigree	Nut-size	Survival %
Block 1	Brazilian jumbo	16g plus	0.0
Block 2	Brazillian extral large-Oro selections	13-15.99g	5.0
Block 3	Brazilian large-Oro-selections	10-12.99g	5.0
Block4	Brazilian medium-Oro-selections	7-9.99g	12.5
Block 5	Brazilian small-Oro-selections	3-6.99g	32.5
Block 6	Brazilian madra-Ochaja	2g below	17.5
Block 7	Indian medium local WNDC-Iwo	7-9.99	50.0
Block 8	Brazilian large-Oro-selections	3-6.99g	67.5

Experimental Title: Management of cashew plot ravaged with twig die-back at CRIN Ochaja Substation (L.A. Hammed, A.R. Adedeji and T.C.N. Ndubuaku)

Introduction:
Floral and shoot die-back is a serious disease caused by *Lasiodiplodia Theobroma* (Pat) Griffon and Maubl. The disease was first reported over three decades ago. Since then a series of efforts had been made to control the disease (Olunloyo and Esuruoso, 1975). However, little attention had been given to twig die-back, an equally or a more important disease caused by the same organism. Twig die-back has remained one of the major delimiting factors to cashew production for decades, especially in newly established plots of cashew. This study was a continuation of the earlier studies conducted at the headquarters.

Objective: The study was set up to determine the incidence of twig die-back on young cashew plots and its control using a combination of a fungicide and an insecticide.

Materials and Methods:
The study was carried out at Ochaja substation of CRIN located in Kogi state. The cashew plot used for the study was established in 2003 and these cashew plants attained anthesis in 2005. These cashew plants were seriously ravaged by the twig die-back. The plot was sub-divided into three sub-plots. Eight visibly infected cashew plants, out of which two served as control, were selected for the study. The means of the plants were computed and recorded.
Prior to spraying, the percentage infection, on each of these cashew plants was taken. The two chemicals were mixed together in accordance with the recommendations of Olunloyo and Esuruoso (1975) as amended by Hammed and Adedeji (2005). The spraying of the chemicals was carried out monthly after the collection of data on the percentage infection which was monthly too.

Results and Discussion
The data collected, prior to chemical spraying, and analyzed revealed that the cashew plants in the plot were between 60% and 100% ravaged with twig-die-back infection (Table 1). The percentage incidence was reduced to as low as between 17.97% and 44.71% at one month after spraying (1MASp). The reduction in percent incidence of the control from 68.43% to 59.07% during the same period was indicative of the slow recovery ability of the crop. This was also reported by Hammed and Adedeji (2005). They further reported that the fruit bearing of the unspraying cashew plants fell at the off-season, thus a loss, because no harvest was made from these plants. The data collection continued.

Conclusion:
The mixture of a fungicide and an insecticide seems to be effective. Repeated trials are needed in order to be able to make recommendations.

Constraints:
Inadequate funding for the programme, shortage of manpower and non-availability of project vehicle and modern research equipment.

Table 1: Incidence and control of Cashew twig-die-back infection using a mixture of insecticide and fungicide

Cashew Plant	Percent infection Before Spraying		
		After Spraying	
		1 MASP	2 MASP
Plot 1	100	44.71	35.7
Plot 2	60.83	43.59	34.9
Plot 3	88.09	17.97	15.2
Control	68.43	59.07	61.5

Cashew Plant Percent infection Before Spraying

Note: Each value is a mean of 8 cashew plants

References:

Hammed, L.A. and Adedeji, A.R. 2005 (In press), Incidence and control of twig die-back in young cashew in Ibadan (Southwestern Nigeria). The Annual Report, CRIN.

Olunloyo, O.A. and Esuruoso, O.F. 1975. *Lasiodiplodia* floral shoot die-back disease of cashew in Nigeria. Plant Disease Reprint 59: 176-179

Experimental Title: Evaluation of Cashew nut shell liquid (Cnsl) as a potential natural insecticide against termites (Solidiers and Workers Castle) (Asogwa, E.U., Monkwuye,I., Yahaya, L.E., Ajao, A.A., Olutade O. and Ashimi)

Introduction:

In the past much emphasis was placed on Chlordane, Aldrin and Dieldrin for the control of termites because of their persistent effects in the soil (Harris, 1971). The persistence nature of organochlorine insecticides (ALdrin, Dieldrin, Aldres T. DDT) created potential environmental problems. These chemicals could enter the food chain and finally reach humans (Pearce, 1997). Consequently, the public began to become aware of the long-term effect of organochlorine insecticides and the need to look for alternatives. Often new or alternative pesticides are expensive, so famers and pest control officers, especially in developing countries could not afford them. Therefore, alternative termite control strategies that are environmentally friendly and affordable to farmers are needed. The necessity to develop non-toxic safe and biodegradable alternatives to synthetic insecticides has in recent years led to concerted international efforts to developing new sources from the vast store of chemical substance in plants (Olaifa et al 1987).

Objective: The experiment was conducted to evaluate cashew nut shell liquid (CNSL) as a potential natural insecticide against termites (soldier and workers castes).

Materials and Methods

Extraction of CNSL: Cashew nuts were harvested from the Cocoa Research Institute of Nigeria (CRIN), Ibadan cashew plots. The nut were cracked to remove the kernel. The shell, which contains the shell liquid was extracted using the soxhlet extraction method. The shell was introduced into the soxhlet apparatus with N-hexane as the extraction solvent. The extraction was carried out for a minimum of 6 hours, after which the resulting extracts was dissolventized using a rotary evaporator. The extract was made into serial dilutions of 1%, 2%, 4%, 6%, 8% and 10% using 5% alcohol and stored away in the refrigerator till time of use.

Laboratory Test: The efficacy of Cashew Shell Nut Liquid (CNSL) under laboratory conditions of 27 + 3^{o}C and 60 + - 10%RH was tested at six concentrations of 1% , 2%, 4%, 6%, 8% and 10%. Termites (soldiers and workers castes) collected from cashew plots at CRIN Headquarters, Ibadan in November/December 2006, were exposed to filter papers impregnated with 0.5ml of the various concentrations of the extract inside micro-cage of transparent plastic petri-dishes with perforated lids. Ten termites were placed in each cage. A standard termiticide was used for comparison while distilled water was used as control. The experiment design was completely randomized design with 10 replications per treatment. Mortality of the mirids was recorded at ten minutes intervals until 100% mortality

was achieved in one of the cages. A termite was regarded as dead if it showed no sign of movement when touched lightly with a soft camel hair brush or when it lies flat on its back with no sign of movement.

Results/Discussion

Results obtained showed that virtually all the concentrations of CNSL were efficacious on the termites (soldier and worker castes) in the laboratory bioassay (Table 1 & 2). The termite mortality increased with the period of exposure. The mortality rates of CNSL at 6%, 8%, & 10% compares effectively with the standard termiticide (Chloropyrifos) as they all gave 100% kill of soldier termites castes in the laboratory at the 90th minute and 60th minute for the worker termite caste. No mortalities were recorded in the control cages throughout the exposure period.

Some derivatives from cashew nuts, kernels and leaves are known to have many industrial uses. The tannin from the testa is used in leather industry, while the gum from the bark is used for bookbinding and the sap as wood preservatives. The Cashew Nut Shell Liquid (CNSL) is used for wood and fabric preservatives, paints, plastics, printing ink, germicides, insecticides, water-proofing compounds, synthetic resins, dyes and anti-fade agents in brake lining and clutch facing. A yellow dye extracted from the leaves is used for dyeing fishing nets in sengal (Irvine, 1961, Pillai et al, 1990,Walker and Silans, 1961, Bouquet, 1969, Dastur, 1952). Therefore the high mortality recorded in this study is just a confirmation of such industrial/commercial values of cashew.

Table 1. laboratory toxicity of potential natural insecticide (CNSL) to the soldier termite castes

	Exposure period (minutes)											
	10	20	30	40	50	60	70	80	90	100	110	120
%Conc	%mortality											
1	13	20	53	53	53	67	67	67	73	73	73	73
2	13	20	40	53	53	60	67	67	73	80	80	87
4	20	47	60	60	67	67	73	80	87	87	87	87
6	20	40	73	80	87	87	87	93	100	100	100	100
8	20	47	67	73	80	80	80	93	100	100	100	100
10	27	53	73	73	80	87	87	100	100	100	100	100
Std.	40	73	80	93	100	100	100	100	100	100	100	100
Control 0	0	0	0	0	0	0	0	0	0	0	0	0

*Each value represents mean of ten replicates.

Table 2. Laboratory toxicity of potential natural insecticide (CNSL) to the worker termite castes

	Exposure period (minutes)											
	10	20	30	40	50	60	70	80	90	100	110	120
%Conc	%mortality											
1	13	20	53	53	53	67	67	67	73	73	73	73
2	13	20	40	53	53	60	67	67	73	80	80	87
4	20	47	60	60	67	67	73	80	87	87	87	87
6	20	40	73	80	87	87	87	93	100	100	100	100
8	20	47	67	73	80	80	80	93	100	100	100	100
10	27	53	73	73	80	87	87	100	100	100	100	100
Std.	40	73	80	93	100	100	100	100	100	100	100	100
Control 0	0	0	0	0	0	0	0	0	0	0	0	0

*each value represents mean of ten replicates.

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Experimental Title: Effect of moisture regime and frequency on germination and seedling performance of cashew (Yabagi, A.A., Adebowale, L.A., Hammed, L.A. and Ogunlade, M.O. and Mrs. Adeyemo)

Introduction:

Cashew is native to central and South America but its high adaptability made it possible to be grown in almost all climatic and soil conditions except frost. Cashew is a hardy and drought tolerant crop probably because it root system penetrate not only vertically to a consideration depth but also laterally to almost twice the canopy spread. Awopetu, (2001).

The problem of non uniform emergence and germination has been reported upon Rio. (1957a). However, investigations were carried out to address this problem. Nut viability, Nut sizes, methods of sowing and moisture stress were some of the possible suggestions identified. Whereas much work has been done on some of the solutions proffered except moisture stress that is yet to receive a concentrated research effort, hence this work.

Objectives:

1. To determine the frequency of moisture application of cashew nuts during germination period.
2. To determine moisture rate that will support emergence and germination.

Materials and methods:

Soil samples were collected randomly from cashew plantation at CRIN Headquarters at 0.30cm depth, air dried and sieved through 2mm mesh. This representative samples collected from the processed soil would be analyzed for mechanical and chemical test.

Thus nuts to be planted were tested for viability by immersing them in sugar solution (0.68kg sugar in 4.5 litres of water) to identify and pick viable and high density nuts for the study. These nuts were planted in pots and placed in the green house.It was 3x3x3 factorial experimental lay out in a split plot design, replicated three times. The factors considered were: nut size, jumbo, medium and madras at moisture regimes of 75%, 50% and 30% field capacity. Frequency was at: One, twice and thrice weekly. Data will be taken on germination and growth parameters. Data generated will be subjected to ANOVA and means found significant will be separated using DMRT.

Results: The experiment is on-going and Data collected is also in progress.

Constraints: Delay in the release of fund.

References:

Awopetu, J.A. (2001): Farmers guide to Cocoa and Cashew production pg.29.

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Experimental Title: Growth of cashew under Arbuscular Mycorrhizal, inoculation, organic and phosphate fertilizers In Ibadan and Uhonmora, Nigeria (Greenhouse Study) **(**Ibiremo, S.O., Dada and G. Ogunjobi)

Introduction:

Cashew is an important commodity crop with the great potentials as foreign exchange earner and source of industrial raw materials with prospect of becoming a major commercial tree crop in Nigeria. Cashew as a result of its wide adaptation is often grown in very poor soils and this has affected its survival and establishment in most fields.

The use of inorganic fertilizers for cashew nutrition had been established (Lefe bvre, 1970, and Owaiye and Olunloyo, 1990). Phosphorous plays an indispensable role as a universal fuel for all biochemical work in living all and in particular root development which is important to crop establishment in the field (SMA, 1982). Application of p-chemical fertilizers on a long-term basis leads to reduction in pH and exchangeable bases and thus reduces crop productivity.The use of organic fertilizer to grow tree crops has been reported (Aisueni et al., 2000) application of compost improved the biological activity of the soil and has a direct impact on the sustainability of soil health. (Nagaraj et al., 2000). In many cocoa producing states in Nigeria, cocoa pod husk (CPH) is a major farm waste and it constitutes more than 60% of fresh pod (Oguntuga, 1975). Arbuscular mycorrhizal fungi (AMF) are ubiquitous beneficial soil micro-organism associated with roots of most plants (Howeler, et a., 1982). The potential of AMF to enhance crop production is well recognized (Fagbola et a., 2001).Therefore, the objective of this study is to determine the effect of arbuscular mycorrhizal inoculation (AMF) inoculation organic and phosphate fertilizers on the growth of cashew.

Materials and Methods:

The experiment was conducted using soils from both Ibadan and Uhonmora. Top soils (0.30cm) were collected, air-dried and sieved. Five kilogrames of sieved soils were placed in 5-litre plastic pots and watered to field capacity before the nuts were planted.

All pots were planted with two large nuts of cashew but after a month, the seedlings were thinned to one seedling per bucket. Twelve treatment combinations were formed comprising two levels of CPH (0 and 2.5 toners ha^{-1}), three sources of phosphorous fertilizers (0 and 30kg $P_20_5ha^{-1}$ as equivalent to 13.2kg Pha^{-1} SSP and SRP) and two levels of mycorrhizal inoculations (with or without).

Parameters assessed included height, (cm), stem diameter (cm), stem, root and leaf dry weight and nutrient uptake of plant tissue using standard methods. The influence of the fertilizer treatments on soil chemical characteristics was also determined.

Results and Discussions:

Application of organic fertilizer and phosphate fertilizers to AM inoculated cashew seedlings was not significant on the height of cashew seedlings at 1 to 4 MAP in both Ibadan and Uhonmora (Table 1). Application for 2.5t/ha of organic fertilizer to AM inoculated cashew seedling under SRP application significantly ($P<0.05$) increased height of cashew seedlings in Uhonmora compared to its counter part without AM inoculation at 2 MAP and cashew seedlings with organic fertilizer and SSP application at 3 MAP. However, there was no particular trend of the affect of organic and phosphate fertilizers application to AM inoculated cashew seedlings height at 2 to 4 MAP in Ibadan (Table 1).

In addition, application of organic and phosphate fertilizers to AM inoculated cashew seedlings did not significantly enhanced the stem diameter of cashew seedlings in Uhonmora at 1 to 4 MAP and 1 to 3 MAP Ibadan site (Table 2). This may be due to the native fertility of soils which were not critically deficient when the nutrients were applied. Aisueni (2000) found similar lack of response to organic fertilizer application in oil palm. However, application of organic fertilizer to AM inoculated cashew seedlings under no P application significantly ($P<0.05$) increased the stem diameter of cashew seedlings by 41.2% compared to cashew seedlings in which organic fertilizer and SSP or SRP were applied to AM inoculated cashew seedlings at 4 MAP in Ibadan soil. Organic fertilizer and SSP with or without AM inoculation improved the dry matter accumulation in Uhonmora at 2 MAP than other treatments. Similarly, at 2 MAP, AM-inoculated cashew seedlings without organic fertilizer application with addition of SSP increased the dry matter by 139.7% that is significantly ($P<0.05$) higher than its counterpart without AM inoculation.

Conclusions:

SRP had comparable influence with SSP on the growth of cashew. Hence, when SSP is not available, Nigerian Sokoto rock phosphate is a viable opinion for cashew production. Inoculation of cashew with exotic AM may

not be necessary because cashew easily forms association with native mycorrhiza in the soil making the external addition of AM to increase the cost of input to cashew production. Organic fertilizer amended with phosphate fertilizer and AM inoculation had positive influence on the growth of cashew.

Table 1: Cashew height (cm) as influenced by organic fertilizer, phosphate fertilizers and AM inoculation in soils from two locations under greenhouse conditions

		Months after Planting				
		Uhonmora				
P-Source	Rate t/ha-1	Mycorrhiza Inoculation	1	2	3	4
Control	0	M	12.67a	19.08b	20.18c	20.93c
	0	NM	14.43	25.37	27.33ab	31.80ab
SRP	0	M	15.01	22.91ab	26.02abc	30.70ab
	0	NM	15.14a	24.73a	27.27ab	32.87a
SSP	0	M	13.97a	20.19ab	21.95abc	25.80abc
	0	NM	12.76a	22.37ab	23.55abc	23.03bc
Control	2.5	M	12.96a	20.09ab	21.58abc	25.73abc
	2.5	NM	11.73a	21.87ab	24.12abc	26.63abc
SRP	2.5	M	14.39a	24.81a	28.32a	33.23a
	2.5	NM	14.28a	19.03a	24.23abc	28.73ab
SSP	2.5	M	13.20a	22.39ab	21.08bc	28.30abc
	2.5	NM	13.55a	20.34ab	21.00bc	25.50abc
		Ibadan				
P-Source	Rate t/ha-1	Mycorrhiza Inoculation	1	2	3	4
Control	0	M	13.17abc	17.60a	20.28a	23.20a
	0	NM	11.19bcd	17.58a	21.51a	24.66a
SRP	0	M	13.71ab	18.25a	24.33a	27.23a
	0	NM	9.18d	17.53a	21.26	29.20a
SSP	0	M	12.17abcd	19.70a	21.40a	29.13a
	0	NM	9.04d	17.43a	21.83	23.86a
Control	2.5	M	15.59a	20.43a	25.43a	24.10a
	2.5	NM	11.25a	18.24a	22.83a	27.13a
SRP	2.5	M	12.25a	20.21a	24.04a	29.96a
	2.5	NM	10.76bcd	16.71a	22.70a	25.26a
SSP	2.5	M	10.09cd	16.56a	18.33a	22.37a
	2.5	NM	12.17abcd	19.53a	24.83a	30.93a

For each location means in columns followed by the same letter(s) are not significantly different according to Duncan's Multiple Range Test at ($p < 0.05$). M = with mycorrhiza inoculation, NM = without mycorrhiza inoculation, * = significant at 5%, ns = not significant.

Table 2: Cashew stem diameter (cm) as influenced by organic fertilizer, phosphate fertilizers and AM inoculation in soils from two locations under greenhouse conditions

		Month after planting				
		Uhonmora				
p-source	Rate t/ha^{-1}	Mycorrhiza Inoculation	1	2	3	4
Control	0	M	0.49b	0.69b	0.86bc	0.87b
	0	NM	0.49b	0.80ab	0.95abc	1.14a
SRP	0	M	0.49b	0.81ab	0.91abc	1.08ab
	0	NM	0.49b	0.82ab	1.03abc	1.11ab
SSP	0	M	0.50b	0.72ab	0.90bc	1.03ab
	0	NM	2.16b	0.78ab	1.01abc	1.03ab
Control	2.5	M	0.49b	0.72ab	0.82c	0.94ab
	2.5	NM	0.49b	0.78ab	0.94abc	0.97ab
SRP	2.5	M	0.49b	0.86a	1.06ab	1.16a
	2.5	NM	0.50b	0.77ab	1.02abc	1.15a
SSP	2.5	M	0.50b	0.82ab	1.13a	1.13a
	2.5	NM	0.49b	0.81ab	0.94abc	1.09ab
		Ibadan				
P-source	Rate t/ha-1	Mycorrhiza Inoculation	1	2	3	4
Control	0	M	0.49bc	0.73abc	0.83a	1.04ab
	0	NM	0.49c	0.63c	0.87a	1.08ab
SRP	0	M	0.52ab	0.76ab	0.93a	1.03ab
	0	NM	051abc	0.67bc	0.91a	1.05ab
SSP	0	M	0.50abc	0.68abc	0.86a	1.93ab
	0	NM	0.49bc	0.65bc	0.89a	0.97ab
Control	2.5	M	0.51abc	0.70abc	0.99a	1.13a
	2.5	NM	0.51abc	0.78a	0.94a	0.96ab
SRP	2.5	M	0.53abc	0.75ab	0.88a	1.03ab
	2.5	NM	0.51abc	0.69abc	0.89a	1.04ab
SSP	2.5	M	0.51ab	0.73abc	0.92a	0.80b
	2.5	NM	0.50abc	0.73abc	0.95a	0.96ab

For each location means in columns followed by the same letter (s) are not significantly different according to Duncan's Multiple Range Test at($P<0.05$). M=with mycorrhiza, NM= without mycorrhiza inoculation,*, = significant at 5%, ns = not significant.

Table 3: Cashew dry matter as influenced by organic fertilizer, phosphate fertilizers and AM inoculation in soils from two locations under greenhouse conditions at 4 MAP

p-source	Rate t/ha^{-1}	Mycorrhiza Inoculation	Month after planting (mg/plant)	
			2	4
		Uhonmora		
Control	0	M	3.02a	7.30c
	0	NM	5.04a	10.32abc
SRP	0	M	5.17a	9.97abc
	0	NM	4.45a	10.03abc
SSP	0	M	4.18a	7.90bc
	0	NM	3.02a	10.33abc
Control	2.5	M	4.46a	7.67bc
	2.5	NM	4.74a	8.77abc
SRP	2.5	M	5.56a	11.50a
	2.5	NM	3.85a	10.73ab
SSP	2.5	M	5.55a	10.27abc
	2.5	NM	5.24a	10.37abc
		Ibadan		
Control	0	M	3.51a	4.56a
	0	NM	2.46ab	3.33a
SRP	0	M	2.72ab	3.61a
	0	NM	1.99b	2.95a
SSP	0	M	3.50a	3.70a
	0	NM	1.46b	2.36a
Control	2.5	M	3.42ab	3.31a
	2.5	NM	2.89ab	3.72a
SRP	2.5	M	2.43ab	3.30a
	2.5	NM	1.56b	2.56a
SSP	2.5	M	2.78ab	3.73a
	2.5	NM	1.78b	2.60a

For each location means in columns followed by the same letter(s) are not significantly different according to Duncan's Multiple Range Test at ($P<0.05$). M = with mycorrhiza inoculation. NM = without mycorrhiza inoculation,*, = significant at 5%. Ns = not significant.

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Experimental Title: Effect of nut size and forms on seedling emergence and performance of cashew in the nursery (Adeyemi, E.A., Hammed, L.A., Adebambo, A.A., Ligali, Wale Kunnuola, Adeniyi, S.A. and Wale Hassan).

Introduction:

Cashew (Anacardium occidentale L.) is usually propagated by its nut (seed) Hitherto the viability of nut has been tested by flotation to produce floater and sinker nuts. Floaters are usually discarded. Adeyemi and Hammed (2003) have reported that floaters of medium size are as good as sinkers.

Additional flour nut sizes of cashew were tested by floatation. Floaters were advised to be planted at two nuts per pot to guide against low seedling emergence (Adeyemi and Hammed 2005). The need to validate this finding called for further investigation in year 2006.

Materials and Methods:

Five nut sizes of cashew namely, extra large (>12 <16g), large (>8<12g) medium (>6<8g), small (>2<6g) and madras (<2g) obtained from CRIN cashew plantations were used for the study. Each nut size was

floated in water to obtain floater and sinker nuts. It was two factors experiment. Factor A was nut sizes at five levels, factor B was nut forms at two levels (floaters and sinkers) to give ten treatment combinations. The treatments were laid out in a Randomized Complete Block Design replicated three times. One nut per pot was sown in
polythene pot filled with topsoil. Three pots were sown per treatment out of which two were selected for data record. Data were collected on emergence and grown parameters of seedlings. The data were analyzed using descriptive statistics.

Result and Discussion:

Madras sized nuts generally resulted to 0-22% emergence. These values were lowered compared to other nut sizes irrespective of floatation. This could be due to little food reserve in the cotyledons. The general poor germination percentage indicated that madras nut sized is best utilized as consumables. Large sized nut gave between 55.6% and 100% emergence. This was highest (100%) in extra large sized sinker nuts and lower (55.6%) in both medium sized sinkers and small sized floaters (Table 1).

Extra large sized floater gave 88.8% emergence while both large and small sized sinkers resulted to 77.8% emergence. Large and medium sized floaters produced 66.7% emergence. This indicated that extra large sized (sinkers and floaters) large and small sized sinkers with high germination percent are good planting materials that could be sown at the rate of one nut per nursery pot. On the other hand all other nut sizes and forms with less than 70% germination could be sown at 2 nuts per nursery pot to prevent low seedling emergence.

Growth parameters at 6 and 8WAS followed similar trend (Tables 2 and 3). The growth parameters after 8WAS (weeks after sowing) indicated that plant height ranged between 11.5 and 38.7cm (Table 3). It was least in madras sized sinker and highest in extra large sized sinker. Similar heights were observed for extra large and large sized nuts.

The number of leaves and girth followed similar trend with the plant height. Leaf area values of extra large sized nuts were higher compared to other nut sizes. The value was lowest for madras sized nuts. Shoot performance was highest in extra large size sinker followed by large sized sinkers and medium sized floater. The values were similar for other nuts sizes.

Summary and Conclusion:

Extra large sized nuts gave better emergence and growth performance and could therefore be recommended as planting materials while floaters of madras size nut produced poor seedling emergence and growth performance. They are good as consumables. Medium sized nut gave a divergence performance compared with previous report (Adeyemi and Hammed 2005). Therefore there is the need for further investigation.

Table 1: Percent emergence of cashew nut of difference sizes and forms

Cashew nut sizes and forms	3 WAS	4WAS
Extra large floater	55.6	88.8
Extra large sinker	100.0	100.0
Large floater	44.4	66.7
Large sinker	77.8	77.8
Medium floater	55.6	66.7
Medium sinker	44.4	55.6
Small floater	44.4	55.6
Small sinker	77.8	77.8
Madras floater	0.0	0. 0
Madras sinker	33.3	22.2

Table 2: Morphological Parameters of cashew seedlings from different nut sizes and forms at 6 WAS

Cashew nut sizes and forms	Plant Height (cm)	Number of Leaf	Girth	Leaf Area	Number of shoot
Extra large floater	32	8	0.51	48.0	1
Extra large sinker	34.9	9.5	0.54	56.4	1
Large floater	30	8.3	0.48	38.2	1
Large sinker	33.9	9	0.49	40.7	1
Medium floater	21.5	8.2	0.46	33.4	1
Medium sinker	29.0	8.7	0.44	40.3	1
Small floater	24.0	7	0.45	10.9	1
Small sinker	30.1	7.6	0.38	28.1	1
Madras floater	NO emergence				
Madras sinker	13	7	0.26	11.3	1

Table 3: Morphological Parameters of cashew seedlings from different nut sizes and forms at 8 WAS

Cashew nut sizes and forms	Plant Height (cm)	Number of Leaf	Girth	Leaf Area	Number of shoot
Extra large floater	33.9	9.3	0.54	52	1
Extra large sinker	38.7	11.8	0.58	52	1.8
Large floater	33.7	10.3	0.51	33.9	1.2
Large sinker	36.5	9.8	0.54	39.1	1.5
Medium floater	23.5	9	0.48	27.5	1.5
Medium sinker	27.9	9	0.49	32.1	1
Small floater	24	6	0.45	22.6	1
Small sinker	34.2	9.6	0.43	28.8	1
Madras floater	No emergence				
Madras sinker	6.3	6.3	0.29	11.1	1

Reference:

Adeyemi, E.A. and Hammed, L.A (2003). Assessment of floatation test as a criterion for germ ability of cashew nut.

Adeyemi, E.A and Hammed, L.A.(2005). CRIN Annual Report in Press.

Experimental Title: Ecology of the cashew leaf miner, Acrocercops Synagramma Meyricki (Lepidoptera; Lithocolletidae). (Okelana, F.A., J.C. Anikwe, M.A. Akande (Mrs), and M. Ashimi)

Objectives:

1. To monitor the occurrence of the cashew leaf miner, A. synagramma on cashew atCRIN Headquarters.
2. To study aspects of biology and morphometrics of the cashew leaf miner.

Methodology:

1. 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.
2. Body lengths and widths of the larva, pupa and adult stages were taken and the developmental stages described. A total number of 40 actively mined leaves were collected from the field and teased into 9cm-sized petri dishes in the laboratory. The larva collected from each mine was individually knocked off in a kilner jar containing cotton wool impregnated with ethyl acetate. The body length and width measurements were taken for each of the larva. On another occasion, forty freshly mined leaves were separately covered with muslin cloth (10cm x 30cm) per shoot on the field. The muslin cloth was held in place to the shoot by means of twines. Each larva was monitored within the mine till pupation occurred. Pupation took place inside the muslin cloth. The pupa, which glued itself to the inner surface of the muslin cloth, was singly removed and length and width sloth till the adults emerged. The adult moths that emerged from these pupae were monitored within the muslin cloth till death occurred in order to ascertain the longevity of the adults. The duration of the pupa stage was also recorded. Body length and width were measured. A strip of millimeter graph paper was used to take measurements *in situ* to the nearest millimeter.

Results:

The cashew leaf miner, *A. synagramma* occurred all through the twelve months of the year at both locations (Table 1). A peak population of the pest was recorded in June around the Office Complex and 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 following the trend of previous years. Tender cashew leaves were more susceptible to the miner's attack than the old leaves. Studies on the population dynamics of the pest will continue while other aspects of studies on the pest will be embarked upon in 2007.

The summary of the morphometrics and duration of the developmental stages of *A. synagramma* on cashew is presented in Table 2. A larva was always found within leaf mine and only on very rare occasion that two larva were found within mine. The reason for this could probably be due to the fact that larvae emerging from singly deposited eggs by the adults female on a leaf intercepted in the course of their mining activities. The larva is worm-like and whitish but turned reddish-brown when fully grown with a mean body length of 4.95mm and body width of 0.49mm. The eggs were laid inside the leaf tissues of cashew and so were difficult to find. And because the date of exclusion was not known, it was difficult to accurately determine the larva duration. The larva created an exit hole on the leaf and moved out of the leaf tissue when it was about to pupate. Pupation took place just outside the mined area of leaf or inside the muslin cloth. Pupation took place just outside the mined and covered with leaf debris. The pupa was covered with a cream colored substance, which glued the pupa to the muslin surface. An average pupa length of 3.07mm with a mean width of 0.52mm were recorded and the mean pupation period was 8.8days. The adult moth is tiny with a silvery grey coloration and a very active flier early in the morning. The mean body length of the adult was 4.03mm with a mean body width of 0.8mm.

Table1: 2006 Incidence of the cashew leaf miner *A. syngramma* on cashew at two locations at CRIN Headquarters, Ibadan.

Months	Mean weekly number of leaves with fresh mines	
	Office Complex	North Plot
January	3.5	1.75
February	1.3	3.0
March	2.3	0.0
April	3.3	2.5
May	10.5	4.4
June	38.2	24.5
July	33.0	22.3
August	12.4	12.5
September	15.1	8.7
October	1.8	2.4
November	1.0	0.5
December	5.5	4.2

Table 2: Body morphometrics and duration of the developmental stages of *A.synagramma* on *A. occidenrale*

		Means + S.E.		
Growth stage	Sample size	Length (mm)	width (mm)	Duration of stages (days)
Larva	20	4.95±0.27	0.49±0.14	-
Pupa	20	3.07±0.15	0.52±0.02	8.80±0.19
Adult	20	4.03±0.12	0.80±0.15	2.15±0.12

Experimental Title: The integrated management of an emerging insect pest of cashew : A case study of the root and stem borer, *Plocaederus Ferrugineus* In Ibadan Negeria (Anikwe, J.C. Asogwa, E.U., Okelana, F.A., Olunloye, H.A., Hammed, L.A., O. M. Aliy and M. Ashimi)

Objective: To evaluate the various control strategies for the cashew root and stem borer

Methodology:
Removal of alternate host: At the germplasm plot, dead stumps of *Spondias mominm* were found scattered all over. It was observed that *Spondias mombin* was not only alternate host but also a preferred host. All leftover stumps of *Spondias mombin* were dug up and removed from the cashew plantation within a period of two weeks. The eggs, developmental stages and adults of the pest were excavated from the host tissues and counted at the Entomology, Laboratory CRIN, Ibadan.
Prophylactic treatment: In order to arrest further spread of infestation by *P.ferrugineus* to healthy cashew stands in zone 1, 24 healthy cashew stands were treated with coal tar and kerosene mixture ratio 1:2. The coal tar: kerosene mixture was applied around the trunk of treated cashew stands from the base to a height of 50cm with the aid of paint brush. Few cashew trees were treated in order to observe any phyto-toxic side effects of the treatment on the cashew plants.

Therapeutic treatment: This was carried out on the 5ha cashew germplasm plantation. The plantation was halved and a part was treated using chemical measure while the other part was treated with physical means.

Chemical control: Unden 20 EC (a.i. Propoxur) belonging to the insecticide group carbamate was applied at the rate of 0.25% a.i. into the trunks of the infested cashew trees at the point of infestation with the aid of a *syringe*. 10 mis of the insecticide was injected into each plant and a total of 57 trees were treated this way.

Physical control: This was achieved by carefully removing the gum cemented with frass from the entrance of infestation with the aid of a wire spoke. Most times, after removal of the gum and dead tissues, the stem borers were exposed, collected and killed. Borers that were deeply buried in the tissue of the cashew stems were poked several times and killed with the wire spoke. A total of 66 cashew stands were treated this way.

Results

Table 1 shows the number of life stages of *P. ferruginues* excavated from the trunk and root of *spondias mombin.* 259 stumps of *S. mombin* were found scattered all over the 5ha cashew germplasm plot. Observations revealed that S. mombin was not only an alternate host of the pest but was a preferred host plant. The 259 *Spondias* trees on the plot recorded an infestation rate of 85.5% (Table 1) whereas the root and stem borer from the 5-ha cashew plantation affected only 123 stands of cashew. Table 2 shows that the 24 stands of cashew treated remained secured even after six months of treatment (100% protection). There was no trace of any phyto-toxic side effects of the coal tar – kerosene mixture on the treated cashew plants.

Table 1: The incidence of the life stages of *Plocaederus ferrugineus* on the Trunks and Roots of dead stumps of *Spondias mombrim*

Plant part	Number of Trees Parts examined	Life Stage	Tree parts with insects	Rate of infestation (%)
Trunk	259	Egg	-	
		Larva	162	
		Pre-pupa	24	
		Pupa	8	
		Adult	13	
		Total	207	79.9%
Root	259	Egg	-	
		Larva	14	
		Pre-pupa	3	
		Pupa	-	
		Adult	-	
		Total	17	6.56%

Table 2: Comparative efficiencies of the different control measurers of *Plocaederus ferrugineus* on *Anacardium occidentale* at CRIN Headquarters, Ibadan, Nigeria

Location	Mode of Treatment	Number of treated trees	Plant recovery with time 24HAT	7DAT	6MAT	Number of larvae found
Zone 1, CRIN Germplasm, Zone 5, CRIN	Prophylactic Coal tar+Kerosene	24	24	24	24	-
	Therapeutic Physical	66	66	65	65	44
	Chemical	57	57	56	56	-

HAT = Hours After Treatment; DAT = Days After Treatment, MAT = Months After Treatment

Experimental Title: Leaf litter fall and soil nutrient dynamics under cashew plantation of different ages in Ibadan, Nigeria (Iloyanomon, C.I. and Ogunlade, M.O)

Objectives:

(i) to qualify the leaf litter fall under cashew plantation of different ages (ii) to determine the nutrient content of cashew leaf litter and (iii) to assess the soil nutrient status under cashew plantation of different ages.

Justification:
Litter fall and decomposition helps in the maintenance of soil fertility in the tropical forest ecosystem through nutrient re-cycling. The advantages of litter fall in deciduous trees lies in the resulting reduced rate of transpiration. Also the return of leaf and other materials and their breakdown, releases mineral nutrients to the soil which are available for re-cycling (OLA-Adams, 1987). Litter fall is the most wanted waste in forest ecosystems. It is a very welcome waste indispensable in the perpetuation of the physiological and bio-ecological processes in forests (Loria, 1999). It is a major pathway in the energy and nutrient transfer in a forest ecosystem. Through decomposition, litter fall's organic content and bio-elements are released to the soil and re-utilized by the plants. The organic matter from decayed litter fall is one of the most important components in soil sustainability. It serves as a source of nutrient for various micro-organism responsible for the release of minerals and fixing of atmospheric nitrogen (Loria 1999). A lot of these leaf litters are generated under cashew plantation but the amount of litter and their contribution to soil nutrient status have not been quantified and documented in spite of its importance, hence the need for this study.
Materials and Methods:

The experiment was conducted at the Cocoa Research Institute of Nigeria (CRIN), Headquarters Ibadan. Four cashew plantations of different ages were selected for the study. The cashew plantation designated A,B,C, and were of different ages. None of the plantation selected was less than one hectare in size. It was carried out in February, which was the Peak of dry season when leaf litters were in abundance.Each plantation was divided into four blocks for this study. A one meter square quadrat was used to demarcate 1m2 area where leaf litter where collected at distances of 10m apart and five such spots were demarcated per block to give 20 meters square area (20m2) per cashew plantation. The leaf litters collected in each demarcated area of 1m2 were put in bags and labeled.

Soil samples were taken at 0-20cm and 20-40cm depths using soil auger at the various points where leaf litters were collected. The soil samples collected were brought to the laboratory together with the leaf litters for processing and analysis. The leaf litters were further sun dried and weighed.

Outlook: the work is intended to be carried out in other cashew growing ecologies of Nigeria.

Constraints: Due to lack of funds soil and plant samples could not be analyzed.

TEA PROGRAMME:
AG. PROGRAMME LEADER: R.R. IPINMOROTI

Experimental Title: Effect of organomineral fertilizers and NPK on soil properties, yield and nutrient uptake of tea seedlings at Ibadan and Kusuku Location (Ipinmoroti, R.R.)

Introduction:
Tea is a crop with high demand for N.P.K, Ca bd Mg. These nutrients are in short supply in the soil due to the low fertilizer status of soils of most suitable sites for tea in Nigeria. Inorganic fertilizer with which to supplement the soil native fertility are costly and sources. This work was investigate the potentials of some readily available farm wastes as alternative nutrient sources for tea yield, nutrient uptake and soil fertility reserves compared to NPK.

Materials and method:
Cocoa husk, cowing, poultry droppings, Siam weed and tea fluff were each mixed with NPK to formulate organizational fertilizer to supply 0.75, 150 and 300kg N/ha. The mixing were at ratio 3:1 (organic, inorganic) and 1:1 (organic: inorganic). A total of 160 plastic pots of 10kg size were filled with soil at both Ibadan and Kusuku locations. The plots were labeled and arranged in 4 blocks 240 pots each. There were 5 organic minerals fertilizer based materials at 2 mixture levels, at 4 rates and at 4 replications for & 5 & 2 & 4x4 factorial laid out in RCBD. DATA on yield and nutrient uptake were calculated. The soils were analyzed for nutrient reserve and data obtained were analyzed statistically using ANOVA.

Result and Discussion:
The tea yield was generally higher with organomineral fertilizers than NPK at bother locations. The OMF at 3:1 ratio resulted to higher influence than the OMF at 1:1 mixture ratio. The cocoa husk was better utilized at the 1:1 ratio than at 3:1, values at Kusuku were significantly higher than the Ibadan values for both yield and nutrient uptake. The reserved soil N.P.K. Ca and Mg were significantly ($p<0.05$) higher for organomineral fertilizer treatments compared to NPK and control at both locations. The Kusuku values were, however, higher compared Ibadan values (Table 2). The organominerals resulted to higher tea yield, nutrient uptake and soil nutrient reserve compared to the conventional NPK fertilizers and is therefore recommended.

Table:1 Effect of Organomineral and NPK fertilizers on yield (g/plant) of tea and nutrient uptake (mg/plant) at Ibadan and Kusuku.

Treatment	Ibadan Yield	N	Uptake P	K	Ca	Mg	Kusuku Yield	N	Uptake P	K	Ca	Mg
Organomineral (3:1)												
Cocoa husk	11.7	770	16	243								
Cow dung	13.3	830	22	161								
Poultry Droppings	20.2	1280	40									
Siam weed	14.8	870	24									
Tea fluff	17.5	1290	31									

Experimental Title: Effect of boron-treated fertilizers on growth performance of tea seedlings (Ipinmoroti, R.R.)

Introduction:
Boron is an important micronutrient element in tea production. Soils under tea cultivation must have the capacity to supply sufficient amount of B to meet the need of tea plants all the time. This is particularly so, in the most commercial inorganic fertilizers adapted to tea production do not contain B. The continuous cultivation of tea will eventually lead to B deficiency, with the manifestations of its associated symptoms. Hence, there is need to investigate on the supplementation of fertilizer materials with B, to assess its effect on tea seedlings performance.

Materials and Methods:
A total of 30 plastic pots of 5 litre size were filled with 5kg soil and arranged in a 6 rows of 5 pots each in the nursery. There were 6 treatments as follows: (1) control (no fertilizer) (2) NPK fertilizer (3) cow dung (4) control + B (5) NPK +B (6) Cowing + B. Each was applied to a row of 5 plastic pots planted to tea

seedlings of similar age and size. The fertilizers were applied to supply equivalent of 150kg N/ha while the B was applied at 50ml of 4% Boron solution. Data on plant height, girth, number of branches and levels were taken on monthly basis and analyzed statistically.

Results:
Data on the growth parameters obtained indicated that fertilizer treatments resulted to significantly ($p<0.05$) higher plant performance than the control. The organic fertilizer compared favourably with NPK on grown performance, while organic fertilizer supplemented with B resulted to 7.5%, 5.2%, 12.6% and 14.1% higher plant height, girth number of branches and leaves than treatments without B. The work is on going, further information on yield and its effect on nutrient uptake and soil reaction would be provided in subsequent reports.

Experimental Title: Hybridization study in tea (S.S. Omolaja and Muyiwa.A)

Objective;
To hybridize the commercial tea clones for improved yield

Justification;
Five commercial tea clones namely 35, 68, 236, 143 and 318 are currently recommended to farmers for planting. Theses clones have a realizable yield of 2.0 tonnes per hecta per annum since breeding is a continuous exercise, which aimed at achieving un-ending improvement in yield for the benefit of farmers; it is essential to hybridize among these commercial clones in order to perhaps obtain progeny that would perform better in productivity than any of the existing commercial clones.

Methodology:
The five commercial clones 35, 68, 143, 236 and 318 were crossed in a complete diallele. Fruit will be obtained in six month after pollination.

Result and Discussion:
Fruit set is being awaited

Constraints:
Epileptic power supply at CRIN Headquarters had hindered the execution of the tissue aspect of the work.

FARMING SYSTEMS PROGRAMME

AG.PROGRAMME LEADER: E.A. ADEYEMI

Experimental Title: Determination of the optimum spacing and plant population of Kola and citrus in Cocoa Kola/Citrus intercrop (Famaye, A.O, Adeyemi, E.A, Olaiya, A.O, Hammed, L.A, Oloyede, A.A and Ayegboyin, K.O)

Justification and Objectives

This experiment was initiated as a result of the diagnostic which revealed that farmers intercrop cocoa, kola and citrus on their plantations. However, the general poor performance of intercrop these components crops necessitated the need to investigate appropriate spacing for this practice of multiple cropping systems. The experiment was initially established at Ajassor (Cross River State) and is now being replicated at Ibadan, CRIN Headquarters. Objectives of the study are;

1. To determined optimum spacing of kola and citrus in cocoa/kola/citrus intercropping system
2. To evaluate the effect of this intercropping system on nutrient dynamics of the soil
3. To study the effect of these crops mixture on the pests and diseases status on each of the component crops.

Materials and Methods:

The Ibadan experiment which covered 1.3ha of land area was laid out in a Randomized Complete Block Design with kola and citrus spaced as follows;

i. 24m by 24m which gave 17 trees/ha each of kola and citrus crops
ii. 24m by 12m " " " " " " "
iii. 21m by 10.5m " " " " " " "
iv. 12m by 12m " " " " " " "
v. 9m by 9m " " " " " " "
vi. 7.5m by 7.5m " " " " " " "

Cocoa was planted at the spacing of 3m by 3m to give 1,111 cocoa trees/ha in all the treatments.

Cocoa and Kola seedlings used for the experiment were obtained from CRIN central nursery but citrus seedlings used were procured from National Horticultural Institute of Nigeria (NIHORT) Ibadan. The varieties used were F3 Amazon, cola nitida and Agege variety of cocoa, kola and citrus were used respectively.

Result and Discussion

Sequel to the low survival count (10%) recorded in the experiment in 2005 (CRIN Annual Report, 2005). The missing stands for cocoa were supplied in 2006. The survival count which were very high (90%) at 3 months after supplied later drastically dropped to 23% towards the end of the dry season of the year being reported. This drop in the survival count might largely be as a result of drought during the dry season and lack of water for irrigation purpose on this plot. However, kola and citrus were not supplied to this plot during the year under review due to financial constraint.

Outlook: The missing gap on the plot for cocoa, kola and citrus would be re-supplied in year 2007.

Constraint: Inadequate labour for timely operations, lack of vehicle and irrigation facilities.

Experimental Title: Weed incidence and biomass under coffea canephora Pierre Ex. Froehner intercropped with food crops at establishment stage in South Western Nigeria (Oloyede, A.A.)

Justification

The two cultivated species of coffee belongs to the Rubiaceae family and are found throughout the tropics. All the cultivated species originated from African (Rehm and Espig, 1991). Coffee is grown in thirteen states of the federation namely: Taraba, Kogi, Ondo, Oyo, Ogun, Osun, Edo, Kwara, Ekiti, Adamawa, Plateau, Abia and Cross-River (Omolaja, 2003) – he further reported coffea canephora to constitute 96%. The importance of coffee cannot be over-emphasized, in African Annual revenue of between $2.24 billion from 17.2 – 20.6 million bags has been reported. (ACRN, 2001). Cultural practices such as weeding, mulding, mulching, intercropping etc had been reported to enhance production (Oladokun 1978, Okelana, 1982). weed poses a serious limitation to crop

cultivation. Although various methods such as manual, mechanical and chemical are available at controlling weed. However, they are mostly not at the reach of the farmers. Fluctuating prices of coffee have also made intercropping of coffee with food crops imperatives. This study aims at studying the effect of intercropping coffea caneohora Pierre ex Forehner with selected food crops such as cassava, maize, cocoyam, okro pepper in specific combinations at controlling weeds on coffee plots in the Southwestern Nigeria.

Material and Methods

The experiment was initiated at the Headquarters of the Cocoa Research Institute of Nigeria (CRIN) in year 2001. CRIN is located on latitude $7^{o}10^{1}$N longitude $3^{o}52^{1}$E and altitude of 122 metres above sea level. Rainfall is tropical with dry and raining seasons. Average temperature is 31^{o}c while average relative humidity is 79%. The experimental design was Randomized Complete Block Design (RCBD) in three replicates. The treatments evaluated are coffee/sweet potato/maize (T1), coffee/cassava/maize (T2), coffee/cassava (T3), coffee/cocoyam/okro/pepper (T4) and sole coffee (T5), Mounds were constructed for cassava, cocoyam and sweet potato. For weed evaluation, a quadrant of $0.3m^2$ were thrown according to the method of Adenikinju (1970) by throwing quadrate three times in a plot of $54m^2$
(9m x 9m).

Result and Discussion

Table 1: Percentage weed incidence as influence as influenced by the treatments

Treatment		Weed types	Percentage Cover (%)
T1	(i)	*Ageratum conyzoides*	90.8
	(ii)	*Chromolaena odorata*	4.8
	(iii)	*Axonopus compressus*	3.7
T2	(i)	*Ageratum conyzoids*	63.4
	(ii)	*Axonopus compressus*	23.4
	(iii)	*Desmodium sp*	8.4
T3	(i)	*Ageratum conyzoides*	75.6
	(ii)	*Axonopus compressus*	22.4
	(iii)	*Desmoodium sp*	2.0
T4	(i)	*Ageratum conzoides*	53.7
	(ii)	*Axonopus compressus*	23.0
	(iii)	*Talinum triangulare*	8.4
T5	(i)	*Sxonopud comptressus*	48.3
	(ii)	*Ageratum conyzoides*	34.2
	(iii)	*Setaria sp*	7.8

dominated by Siam weed, chromolaena odorata. This result was similar to what was experiment by Adeyemi (1989) on cashew plot intercropped with food crops.

Table 2: Weed biomass yield in the intercrop

Treatment	2001		2002	
	Wet wgt (g)	Dry wgt (g)	Wet wgt (g)	Dry wgt (g)
T1	530.9	84.5	929.7	191.7
T2	830.3	131.8	850.7	161.7
T3	683.2	130.9	808.0	181.3
T4	718.7	108.8	762.30	121.3
T5	995.3	207.9	149.70	379.0
Means	751.7	132.8	969.50	270.0
LSD (P=0.05)	177.7	47.5	309.10	102.5

Table 2 shows the wet and dry matter yield of weeds in the different intercrop combinations. Result reveals that various intercrop significantly reduce weed biomass yield more, compare with sole coffee. Herrera and Hardwood (1973) had reported that ground is covered much faster in polyculture than in monoculture thereby preventing weed growth. Morphological and physiological differences in the component crops in the different mixtures of crop association played a major role in the effectiveness of weed control. Coffee/sweet potato/maize combination reduce weeds than other treatments as the trailing habit or sweet potato

incapacitate the growth of most weed species. The poor performance of the sweet potato component in the following year (2002) renders the combination less effective than the previous year.

Generally, coffee/cocoyam/okro/pepper combination was more effective as suppressing weeds than the other combination and the control.

Cumulative means of growth parameters of coffee (2001-2003)

	2001			2002			2003		
*	HT	GT	LA	HT	GT	LA	HT	GT	LA
T1		55.3	0.60	58.8	84.2	1.3	98/4	62.2	2.0	115.7
T2		49.3	0.55	55.2	73.1	1.1	129.2	81.3	2.4	130.7
T3		48.2	0.54	54.4	76.4	1.1	128.7	45.0	1.5	78.8
T4		59.9	0.65	69.6	83.8	1.2	134.9	116.8	2.5	183.7
T5		56.6	0.66	48.1	69.9	1.2	100.4	69.5	1.8	139.4
LSD (5%)		5.72	0.07	9.11	7.34	0.10	20.07	30.86	0.48	43.76

*Treatment as indicated in the materials and methods

Table 3 shows the growth of coffee in the various treatment combinations and control. Coffee/Cocoyam/Okoro/Pepper gave the best vegetative growth compared with other combinations. Opoku – Ameyaw et al (1999) have reported that intercropping of Coffee with food crop did not affect coffee growth.

Conclusion: This experiment has clearly revealed that intercropping arable crops with coffee is capable of reducing weed incidence and biomass yield particularly when coffee/cocoyam/okro/pepper combination. Intercropping with arable also enhances coffee growth.

Experimental Title: Evaluation of cocoa plantation as habitat for honey production (R.A. Hamzat, A.O. Famaye and E.A. Adeyemi)

Justification and Objective:

One of the ways of ensuring sustainability of cocoa production in Nigeria is through engaging the cocoa plantation in other income- generating ventures in order to boost the income base of the cocoa farming households. One of these productive activities is honeybee keeping under the natural habitat of cocoa plantation. The raising of honeybees under cocoa plantations will encourage farmers to return to their abandoned cocoa plantations producing honey under cocoa plantation is also one effective way of converting and utilizing cocoa products with minimal wastes. This project was aimed at promoting cocoa production through additional income generation from the cocoa plantation.

Materials and Methods

Thirty beehives constructed by a wood worker were located in different zones across the cocoa plantations of the Cocoa Research Institute of Nigeria, Ibadan, Nigeria. The operations lasted for twelve months. The hives were constructed with wooden boards of dimensions 108cm by 44cm. the numbers of top bars for each hive was placed on iron stands with legs dipped in spent engine oil to prevent the colony from ants and other crawling insects. The hives were placed with their flight entrance towards the eastern direction. The hives were colonized between September and December 2005. Harvesting of March and May 2006. The development and strength of the bee colony within the observation period was highly encouraging. A ten – member panel that is used to licking honey and in addition trained prior to the serving of the honey for evaluation assessed the samples. The honey was served in white plates with a glass of water to rinse their mouth after each lining. They were arranged on the table such that there would not be any interference between the tasters (Methodology adapted from Hamzat, 2004). Evaluation was based on colour, taste, flavor, mouth feel, stickiness (handfeel) and overall acceptability. Scores were based on a hedonic scale of 1-9 with 1 = dislike extremely and 9 = like extremely as discussed by Larmond (1977). Data obtained were subjected to ANOVA using SAS (1995).

Result and Discussion

Few hives were colonized. A lot of absconding was observed which might be due to lack of standy mobility to routinely manage the sited and colonized hives. Despite this, the colonies wee better retained at the plantations that were undisturbed (far from areas of

frequent human activity) (Table 3). The honey harvested appears dark in colour and low in viscosity. The low viscosity may be due to the prevailing atmospheric conditions (rainy conditions) as at harvest time and the nectar moisture content. The honey harvested may have not been produced from cocoa nectar or fruits. Bee nectars of interest to foraging bees as at honey flow period may be unrepredictable, because there are many species within the site. The sensory evaluation of the honey from the different sites was the same (Table 2). This means that honey raised from the different sites, including cocoa plantation, have similar quality characteristics and thus well acceptable. However, the cocoa resources contribute to honey production, foreign exchange and increase in farmers' total income. This project is till at its starting phase and it is expected that more data will be obtained as time proceeds.

Table 1: Chemical Composition of Honey (g/100g)

Component		Average (Expected)
Water (Moisture)	24	
Fructose	34	
Glucose	30	
Sucrose	1	
Other sugars		9
pH		3.0
Energy		320Kcal
Potassium		50
Sodium	5	
Calcium	5	
Magnesium		4
Iron		0.2
Manganese		0.2
Zinc		.04
Copper		0.07
Phosphorus		16
Sulphur	7	
Chloride	10	
Thiamine		5
Riboflavin		30
Nicotinic acid		200
Pyridoxine		100
Panthothenic Acid		60
Folic acid		4
Biotin		0.1
Ascorbic		2000

Source: Ojeleye (2000)

Table 2: Sensory Evaluation of honey raised under different habitats

SAMPLE NO	SENSORY PARAMETERS					
	Taste	Flavour	Mouth feel	Stickness	Overall (handfeel)	Colour acceptability
CAB	8.13	8.41	7.53	8.21	8.10	8.53
BCA	7.20	8.62	7.57	8.49	8.61	8.43
CBA	6.55	8.22	7.64	8.64	8.50	8.22
ABC	7.33	8.42	7.62	8.65	8.55	8.44
p>0.05	NS	NS	NS	NS	NS	NS
CV	22.41	21.63	22.24	21.93	22.44	23.12
SE	0.22	0.19	0.18	0.21	0.21	0.19

CAB – Honey from citrus plantation, BCA – honey from cassava plantation; CBA-honey from a thick forest; ABC-honey from grassland.

Table 3: Performance record of *Apis mellifera adansonii* raised under cocoa plantations

Parameter (%)	PLT – 001	PLT - 002	PLT – 003
Duration of investigation (wks)	28	28	28
No of hives sited	10	10	10
Percent of hives colonized	50	60	40
Percent absconded	40	20	30
Percent retained	10	40	10
Maturity status at harvest time	Matured	Matured	Matured

Outlook

The desire to obtain a high quality honey would be achieved provided there is a high level of biodiversity which can be achieved by conserving forests and grasslands. Subsequent studies will focus on the effect of beekeeping (under cocoa plantation) on pollination and fruit set.

Constraints: Mobility and inadequate funding.

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Experimental Title: Assessment of socio-economic benefits of agro forestry systems among cocoa farmers in Edo State, Nigeria. (E.O. Uwagboe and O. Adeogun)

Introduction

Agro-forestry is a collective name for land use systems and technologies where woody perennials tree crops such as cocoa, palms, shrubs etc, arable crops and animals are deliberately used on the same land management.

Lungren and Raintree (1993) observed that in agro-forestry three are both ecologival and economic benefits through interaction between the different components. Onumadu (2000) reported that agro-forestry have potentials that are environmentally, socially and economically beneficial to the farmers.

Cocoa is grown in one of the forest agro ecological zones in Nigeria and some of the cocoa farmers have their farms in the forest. Edo state is located in the forest area of the southern agro ecological zone and it belongs to the medium cocoa producing states of Nigeria hence a need to assess the agro forestry practices among the cocoa farmers on the state ascertains the benefits derived from these practices with the following specific objectives:

1. investigate the personal characteristics of the farmers in the study area;
2. examine the various crops and animals cultivated with cocoa in the study area; and
3. examine the socio-economic benefits of these practices in the study area.

Materials and Methods

Systematic random sampling technique was used to select one hundred and twenty farmers from the list of cocoa farmers provided by the Agricultural Department of the Ovia North East and Ovia South West Local Government Areas of Edo State. The sampling interval of three was used to select every third farmer from the list of three hundred and sixty farmers. Well structured questionnaire was used to elicit information from the farmers.

Percentages, Frequency counts and charts will be used for data presentation while chi-square will be used for the analysis.

Validation Instrument

Pre-testing of the instrument was done during the pre survey with twelve farmers outside the villages selected for the study. This attempt was to eliminate ambiquous questions and to facilitate clarity.

Experimental Title: Determination of farmers' perspective to kola farm rehabilitation technologies in Osun State (S. Adebiyi)

Justification

The main problems associated with kola production in Nigeria is low yield, due to old age and in some cases, compete sterility of individual trees and at time whole plantation. The primary aim of the kola research programmed therefore is to increase production through replacement of low yielding and sterile trees with improved varieties and coppicing of old trees where the need arises.

Olaniran and Morakinyo (1980) have succeeded in rehabilitating a kola groove that has been unproductive for twenty years by coppicing the unproductive for twenty years by coppicing the unproductive trees and budding the re-growth with scions from kola selections know to be very productive. This study is therefore necessary to determine farmers' level. The study will provide useful information and technical advice to the local farmers in there efforts to advert the factors militating against kolanut production.

Objectives:

1. The study was designed to determine the personal characteristics of the farmers.
2. To determine the information source of kola farmers to know the perspectives of respective respondents to kola farmers rehabilitation by coppicing.

Materials and Methods

The study involved the use of structured questionnaires to collect data from 100 kolanut farmers in Osun State.

Result and Discussion

The questionnaires prepared but not distributed due to lack of fund.

Budget Estimate: 115,000
Fund Released: Nil
Fund Utilized Nil
Conclusion: To be continued
Constraints: None release of fund for research

Experimental Title: Grass cutter rearing in cocoa and cashew plantations (Uwagboe, E.O., Adeyemi, E.A. and Aigbekean, E.O.)

Justification and Objectives
The rearing of grass cutter in cocoa and cashew plantations will constitute another economic enterprise for the farmer. This activity will then bring about a symbiotic relationship in terms of input use, such as labour efforts, by-products of cocoa (pod husk) and cashew apple as well as the droppings of the animals. Since both cocoa and cashew have their lean periods of productions, human efforts would be directed and concentrated in the tendering of these grass cutters during these times. However, the location of this activity will greatly pay off if it is within the farm premises and the farmers himself is also domicile. This will in effect minimize pilferage that will otherwise undermine the net income of the farmer. This study is therefore considered worthwhile, even though what is currently being practiced is the homestead activity of grass cutter rearing.

The objectives of this study are:
1. Determine income generation potential of Grass cutter in cocoa plantation.
2. Determine the utilization of cocoa pod husk and cashew apple residue by Grass cutter.

Materials and Methods
Six Grass cutters will be procured from IAR&T at 1 male to 5 females as recommended and stocked in a cage. The cage will be constructed for the Grass cutters, and placed in the plantations of cocoa and cashew.

The animals will be fed on cocoa pod husk (CPH) and cashew apple residue (CAR).
Status: New
Duration: 2 years
Location: CRIN Headquarters
Budget: 200,000

Results and Discussion:
Data have been collected and submitted for analysis.

Outlook:
There is need to widen the scope of the study to cover more forest agro-ecological zone in cocoa production area of Nigeria.

Constraint:
Late release of fund and limitation of scope of the study area to available fund.

BIOTECHNOLOGY RESEARCH PROGRAMME:
AG. PROGRAMME LEADER: L.N. DONGO

Experimental Title : In vitro assessment of cocoa (Theobroma cacao L). Zygotic explants types for clonal propagation potential in Nigeria/ Clonal multiplication of cocoa tissue culture and vegetative propagation system (ALL BIOTECHNOLOGY MEMBERS).

Introduction
Cocoa belongs to the family sterculliancee. It is grown from seed, but can be vegetatively propagated by cuttings and grafting. Constraints to its production include, low yield and inadequate control of pests and diseases. The length of time involved had necessitated the need to establish rapid vegetative propagation, thus biotechnology had become tools employed to improve coca yield and quality through tissue culture and micro propagation techniques. Various parts of cocoa had been used in vitro but no plantlet has been regeneration. A more recent technique is the use of staminode and petals explants by the Penn State University, U.S.A. The success recorded had necessitated the need to use zygotic explants of Nigeria cocoa to regenerate plantlets for micro propagation.

Objectives
1. To assess Cocoa Zygotic explants potential in Nigeria
2. To clonally multiply Zygotic explants of Cocoa

Materials and Methods
Three clonal materials of cocoa T86/45, T87/79, T85/79, used routinely in the institute were used for this investigation. The tissue culture media protocol established by the Pennsylvania State University was followed.
Zygotic explants of cocoa was surface sterilized, using 20% V/V sodium hypochlorite for 10mins Excised, and cultured on the primary callus growth (PCG), secondary callus growth (SCG) and embryo development (ED) media. One litre media preparation was used for each clonal material while cultures were kept in the Clark at room temperature. Explants were sub cultured at 14 days interval.

Results
Callus formation was evident on all the clones cultured. On clone T86/45, promising trait of somatic embryos was observed. It was later lost due to culture conditions. However, the result showed the possibility of regenerating plantlets through zygotic means. The research is till on going.

Table 1

Clone	Callus Formation	No of Callus	Somatic Plantlet	
mbryo	Regeneration			
T86/45	Evident	20	3	Nil
T87/79	Evident	20	Nil	Nil
T85/799	Evident	15	Nil	Nil

Conclusion
The next stage of the work is to find solution to culture condition problems and to regenerate plantlets through zygotic explants.

Author (s)
[1]Muyiwa, A.A. Cocoa Research Institute of Nigeria Ibadan [2]Esan E.B. Babcock University Ilisan Remo.

Occurring plant
1. Local sourcing of naturally, occurring plant tissue culture medial ingredients (studies using *Theobroma cacao* L). Cocoa Journal (Science focus) 2003 Vol.4, pp 37 – 43
2. Performance of cocoa floral parts is viro journal (Science focus) 2005 Vol.8 pp 67-73

Result and Discussion
Data have been collected and submitted for analysis
Outlook: there is need to widen the scope of the study to cover more forest agro ecological zone in cocoa producing area of Nigeria.

Contraints: Late release of fund and limitation of scope of the study area to available.

CPU/EUR RESEARCH PROGRAMME:
AG. PROGRAMME LEADER: R.A. HAMZAT

Experimental Title: Physico-chemical and sensory quality of wine produced from cashew apple powder **(**Ogunjobi, M.A.K. and Ogunwolu, S.O.).

Introduction

Cashew, *Anacardium occidential*, was introduced into Nigerian in seventeen century, but large scale planting started in1953. However, Cashew cultivation has spread to Western, Eastern, and Northern states of Nigeria. Cashew tree was reported to flourish in all agro-ecological regions of Nigeria.

Cashew fruit is made up of the apple that bears the fruit in which the kernel is embedded. Cashew has been a seasonal crop. Its fruiting period is always short-lived i.e. 3-4 months. Due to short post-harvest storage of cashew apple as a climacteric fruit, there is need to develop a method for processing the cashew apple into powder which is very much stable and can be used for the production of various food products. Most importantly, it was reported that because of its high sugar content, the apple has been used for wine production. However, once the cashew apple is off-season, wine production stops. This research focused on the potential utilization of Cashew apple power for wine production.

Materials and Methods

The cashew apples were harvested from the Cashew plantation of the Institute. Matured, ripen cashew apples were carefully harvested and washed. Nuts were removed manually and the apples were diced into smaller pieces manually using stainless steel knife. The diced apple was oven dried at 55^0C for 24Hrs. The diced apple was milled using Kenwood Mixer. The Powder was sieved using mesh of 250um aperture size.

The CRIN Standard Method of Wine Processing was adopted for the wine processing. Three concentrations of cashew apple powder were used for the experiment. Physico-chemical analyses were carried out on the Musts in duplicates at intervals of 24Hrs fo five days during fermentation as well as the matured wine. Sensory analyses was carried out on Matured wine and compared with other wines produced from Cashew apple, Kola nut and Cocoa using the procedures reported by Rivella (1987).

Results and Discussion

The pH in all the samples decreased as fermentation progressed. This trend was in agreement with reports of other workers (Akinwale, 1999; Aroyeun et. al, 2005). The trend of decrease in pH, total soluble solids, and specific gravity varied was not significant in all the samples. There was no significant difference in the macro and micro nutrient contents of the apple powder wine and fresh apple e wine.

The mean sensory scores of all the four wine samples compared favourably well with commercial samples in taste, colour, odor and overall acceptability and there were no significant differences in the cashew wines ($P<0.05$).

Conclusion

The utilization of cashew apple powder in wine production produced a good flavour and well acceptable wine. With this developments, cashew wine can be produced throughout the year from the apple powder.

Mean sensory scores of the wine samples

Samples	Taste	Aroma	Colour	Overall acceptability
Cashew powder wine	6.8a	6.9a	7.0a	6.5a
Cashew juice wine	6.6a	6.8a	6.9a	6.4a
Cola wine	5.8b	6.3b	5.8b	5.3b
Cola wine	5.6b	6.7a	5.8b	5.6b

ab means along same vertical column with same superscripts are significantly different at P<0.05

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Experimental Title: Utilization of cashew nut in milk products **(**Jayeola C. O.)

Introduction

Milk, a scarce and costly commodity amongst the developing countries of the world occupies a significant position in the nutrition of infants due mainly to the nature expert balancing of various nutrients that are commonly found in food (Banigo et al, 1986).

Many programmes have been initiated for the best methods of producing milk analogues from vegetable sources (Chandrase et al 1972). Milk has been successfully produced from soybeans, melon seeds, groundnut milk and coconut milk.

The nutritional importance of milk in food has led to increase in demand and inadequate supply of milk for its various uses. Over the years, efforts have been geared towards obtaining milk from cheaper sources rather than from animal sources for economic and dietary reasons.

Materials and Methods

Jumbo size cashew nuts, Anarcadium Occidential were obtained from the Cocoa Research Institute of Nigeria CRIN, Headquarters, Ibadan. The nuts were removed from kernel with manual cashew kernel breaker. The nuts were dried at oven temperature of 600C for 6 hrs for easy removed of testa. 250g of cashew nut was soaked in alkaline solution of 5% Naci overnight. The soaked nut was cleaned and ground to paste. The Cashew nut paste was diluted with 3 parts of water, sieved and the super tent was sweetened with 16g of sugar, 0.6g of salt and 0.6g of vanilla flavour, bottled and pasteurized at 750C for 15 minutes.

Proximate analysis was carried out on the nut and the milk using the method of AOAC (1990). The quality attributes were determined through sensory evolution analysis between cashew milk, soy milk and commercial milk (Peak milk).

Results:

Proximate and mineral analyses of cashew nut.

Component	Amount (g)/mg
Water	7.6g
Protein	17.4g
Fat	45.4g
Total CHO	29.3g
Crude fiber	1.4g
Ash	2.6g
Ca	76mg
P	578mg
Fe	18mg
Thiamine	0.65mg
Riboflavin	0.25mg
Niacin	1.6mg
Ascorbic acid	7mg

Discussion:

Cashew nut is a very good source of nutrient. It has a high protein content of 17.4g and fat content of 45.4g, Ash 2.6, and total CHO of 29.3. Minerals and Vitamins like calcium, iron, vitamin B, Riboflavin and ascorbic acid were also present. This is shown in Table 1, from the result. Cashew nut is a good source of nutrient ad a good alternate for cow's milk. The result of the sensory evaluation of the cashew milk as compared to other vegetable and animal sources revealed that it compared very well with cows milk.

Conclusion:

The research work has brought about another vegetable source that can be used in developing countries a an alternate to cow' milk.

Cashew nut will not only be used as export crop, but can be used locally for a nutritious product like cashew milk. This adds to other avenue through which money generations can be accrued to cashew.

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Experimental Title: Production of cashew apple powder and it's use in biscuits (Sweet Cookes) (Ogunwolu, S. O. and Ogunjobi, M. A. K.)

Introduction:

Increasing urbanization in African countries is changing the food habits and preferencesof the population towards convenience foods. Bread, Biscuits (cookes) and other baked products are some of the foods now relished by the populace.Cashew fruit is made up of the apple that bears the fruit in which the kernel is embedded. Cashewis of considerable economic importance because its components are of one economic use or the other. Cashew apple is used as food, and in the production of cashew type beverage and spirits. Also osmotically, dehydrated cashew apple received high acceptability. In view of the increasing production of cashew apple and its high nature of (perishability due to its high water content), there is need for further development of new products apart from the ones mentioned above. Hence, this study was aimed at producing cashew apple powder and its subsequent utilization in cookies production.

Materials and Methods

Cashew apples used for the study were harvested from the cashew plantation of the Institute. The nuts matured, ripen cashew apples were manually removed after sorting. The sorted apples were rinsed with clean water and then cut into smaller pieces of increase the surface are for quick drying. The diced apple was oven-dried at 55oc for 24 hours. The dried apple was milled using Kenwood blender.

The formulation for standard biscuit was followed in the production of cashew powder cookies. However, cashew apple powder was added at various concentrations to the formulation as a part replacement for wheat flour. The wheat flour, cashew apple powder, baking powder, margarine, sugar and milk were mixed thoroughly. The thin paste obtained was rolled in a flat rolling board. Circular biscuits of 5.80cm diameter were cut and baked at 160^{O}C for 15minutes.

The cashew apple powder and biscuit were analyzed for moisture, ash, crude protein, and crude fat content following AOAC methods. Weight, diameter and height of the biscuits were measured. Sensory evaluation was conducted in the biscuits for colour, texture crispness, aroma and overall acceptability. Wheat biscuit (100% wheat flour) was used as the control in the sensory analyses.

Results and Discussion

The moisture and also contents were not significantly different in all the samples and were in conformity with specification for standard biscuits. The fat and protein contents of the reference sample were greater than observed in cashew apple powder biscuits because of the greater amounts of these components in wheat flour. The results of sensory evaluation showed that cashew apple powder biscuit samples had higher scores for colour, taste, aroma and overall acceptability. However there was no significant difference in Crispness and Texture.

Conclusion

Biscuits (cookies) of acceptable quality, similar to the quality of whole wheat cookies have bee made from the blends of cashew apple powder and wheat. Substitution up to 20% inclusion of cashew apple powder did not affect the quality of the cookies. Cashew apple powder has potential for its usage in other food products.

Sensory Evaluation of the Biscuits

	Mean Scores of Attribute					
Samples acceptability	Colour	Texture	Crispness	Taste	Aroma	Overall
10% Cashew apple Powder biscuits 5.2a	6.2a	5.9a	6.2a	6.8a		7.0a
15% cashew apple Powder biscuits 5.3a	6.3a	5.8a	6.2a	6.7a		7.0a
20% cashew apple Powder biscuits 5.2a	6.4a	5.9a	6.1a	6.9a		7.0a
Biscuits made from 100% wheat flour	4.7a	6.2a	5.8a	5.3b	5.3b	6.8a

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Oyewole, O.B., Sanni, L.O., and Ogunjobi, M.A.K. (1996): Production of biscuits using cassava flour. Nigerian Food Journal. Vol. 14 pp25-29

Experimental Title: Growth response of clarias gariepinus juvenile to cocoa husk endocarp based diets.**(**Adebowale B.A.and Olubamiwa O.).

Materials and Method

Cocoa Husk Endocarp Preparation: Freshly broken cocoa pod husks were collected from the Fermentary Unit of the Institute. Sharp knives were used to extract the innermost layer of the pod husk called the endocarp. This fresh endocarp was sundried on a concrete slab at the Fermentary Unit. The well dried endocarp was ground into fine particles.

Experimental feeds

Five isonitrogenous experimental diets containing an average of 40.00% Crude Protein were formulated. Diet A(Control)had 0% maize replacement, whereas diets B,C,D, and E contained 10,15,20 and 25% maize replacement with the endocarp. Known quantity of each diet was weighed out and pelleted to facilitate intake.

Experimental fish and design

Four hundred Juvenile *Clarias gariepinus* were purchased from a fish farm within Ibadan city. The fishes were randomly grouped in triplicates into fifteen bowls. The bowls were filled with water to about one quarter capacity. Mosquito (Nylon) nets were used to cover the top ends of the bowls to prevent the fishes from jumping out. The bowls were arranged and labelled in triplicate as A1, A2, A3, E1, E2, and E3, etc.

Result and Discussion

Mean value of weight gain was best (1.05) an Diet A which has 0% maize replacement. Other value for growth parameters like feed conversion efficiency and protein efficiency ratio was also best on Diet A. This could be due to highest feed intake which occurred in A. There was no significant difference ($P < 0.05$) between FCR for diets A and D (20%), and these values were better than those of Diet B, C, and E. Mean weight gain and feed acceptability increased until diet D, beyond which there was a fall in the trend. This observation could be attributed to slight better taste of the dried endocarp whose increasing inclusion, led to reduced acceptability to Diet E. According to the report of Faleye(1998), the usefulness of unconventional feedstuffs in fresh diets, depends on certain factor such as palatability, energy level, composition, digestibility, and availability of nutrients.

This study revealed that high concentration of cocoa husk endocarp beyond 20% in the diet of *C. gareipinus* depressed in growth rate.

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Parameters	Diets				
	A(0%)	B(10%)	C(15%)	D(20%)	E(25)%
Initial mean weight (g)	5.71	5.74	5.75	5.74	5.76
Final mean weight (g)	9.82	9.08	9.24	9.65	7.49
Mean weight gain (g)	4.11	3.34	3.50	3.91	1.73
Specific growth rate	2.26	2.18	2.20	2.25	1.99
Mean growth rate g/day	0.34	0.28	0.29	0.33	0.14
Mean total feed intake	4.31	4.06	4.11	4.18	3.99
Feed conversion ratio	1.05	1.22	1.17	1.07	2.31
Feed conversion efficiency	95.36	82.27	85.16	93.54	45.36
Protein efficiency ratio	2.39	2.06	2.15	2.24	1.08

Experimental Title: Production and evaluation of baking yeast from cocoa sweating (*Theobroma Cacao L.)* **(**Igbinadolor, I. O.and Jaiyeola, C. O.)

Introduction

With very few exceptions, *Sacchoromycs cerevisae* is the only yeast which could be called 'Baker's Yeast'. Their use has been traced to their ability to ferment sugar solutions (Adeiber et al; 1984). It has been confirmed that out of the species and general yeast used industrially, *Sacchoromycies cerevisiae* has the greater technical importance in wine and beer manufacture and for the leavening of dough. Bakers yeast produces CO_2 that results in dough leavening and contributes to flavour and crumbs structure of the bread.

Yeasts are microscopic and unicellular fungi which lack typical mycelia (Pelizar et al; 1988). A typical yeast cell consists of small oval cells ranging in sizes from 50-10.00 am and also vary in shapes with species and even within species. They may be globosely, ovoid, elongated, lemon shaped etc, even elongated into false or true mycelium (Pelizer et al; 1986). They are sometimes joined together to form chains of pseudo mycelium. Individually, they appear colourless but when grown on artificial solid media, their colonies may be white, creamy or tinges with brownish pigments (Alexopoulos 1988).

Before now our fermentation and baking industries rely solely on imported dried strain of commercial powdered yeast from foreign countries which usually involved huge amount of money. Commercial baker's yeast has been reported not to be a microbial pure culture of *S. cerevisiae.* Thus for baking industry attempting to enhance their product (Bread) with cocoa powder supplementation or other supplements, there is the need to re-evaluate the fermenting yeast in pure forms from our local materials like cocoa sweating and others.

Cocoa sweating, the pale yellowish liquid is a by-product of cocoa fermentation. It is the breakdown product of the mucilage (pulp) surrounding the fresh cocoa beans. This mucilage constitutes about 20% of the weight of the cocoa fruit (Adams et al; 1982), and it is a rich medium for microbial growth like yeasts which are the primary colonizers.

To complement and advance the resachstudies on local sourcing of raw materials for the nation/small scale industries, this study aimed;

(a) to isolate and identify yeasts from cocoa sweating
(b) to determine the dough leavening potentials of the isolates
(c) to screen for isolates with high keeping qualities (i.e. increased shelf-life)
(d) to compare the leavening characteristics, acceptability and nutritional composition of bread produced from locally isolated yeast strains with the imported dried strains of yeast.

Materials and Method

Collection of sweating: Fresh cocoa sweating was collected from the Fermentary Section of Cocoa Research Institute of Nigeria (CRIN), in a sterile container and taken to the laboratory for yeast isolation.

Yeast isolation: Samples of the juice were serially diluted and 1.0ml each of the diluted and undiluted samples was plated out in yeast extract Agar and potato dextrose Agar supplemented with antibiotics.

The plates were incubated for 3 days at warm temperature. Pure culture of the yeast were purified. Kept in slant and preserved.

Results:

Six morphologically different yeast isolates designated CY1 to CY6 have so far been isolated. Further work on identification and screening of dough leavening potentials is still on-going.

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Experimental Title: Determination of optimal time and temperature relationship in the production of Kola powder (Mokwunye, F.C.)

Recently, there has been a call by farmers for the processing of kolanut into dried powder for both the local and international markets. This is because it is becoming increasingly difficult to store large quantities of the nuts due to pests and diseases.

Therefore, the objective of this project was to determine the optimum time and temperature relationship during treatment of kolanut prior to milling.

Methodology

Dried kolanut (Cola nitida) was subjected to heat in a hot air oven at 5 different temperatures (T) (50, 60, 70, 80, 90C). The drying kolanut was tested for moisture at 5 different time (t) materials (3,6,9,12 and 15 hours) until the moisture content of 6% was achieved for each temperature.

Results and Discussion

The generally accepted and adequate moisture content for powder is 6%. However, the result as presented on Table 1 showed that at 500C, kolanut has to be dried for 15 hours to achieve a moisture content of 6% and this is quite long and time consuming. On the other hand temperatures 600C and 700C at 12 and 6 hours respectively gave moisture content of 5.52 and 6.44% respectively. But at 800C with drying time of 3 hours, the moisture content obtained was 6.2% which is quite close to the averaged moisture content for powders and has shorter drying pencil. The work is on-going.

Table 1: Time/temperature relation in the production of Kola Powder.

	T50t15	T60t12	T70t6	T80t3	T90t3
Temperature (T0C)	50	60	70	80	90
Time (t/hours)	15	12	6	3	3
Moisture content (M.C)*	6.00	5.52	6.44	6.20	4.75

- The closet moisture content to the reported average (6.00%) at each temperature

Experimental Title: Reduction of Ochratoxin A in spiked cocoa powder and cocoa beverage using aqueous extract and essential oil of *Aframomum Danielli*

Introduction

Mycotoxins are secondary metabolites of moulds and are of public health significance (Varga et al. 2005). Important mycotoxins include fumonisins, aflatoxin B_1 and ochratoxin A from *Penicillium spp* and *Aspergillus ochraceus* species (Tagne et al, 2000. Tjamos et al, 2004, Varga et al, 2005). Coffee, cocoa, tea, wine, barley and groundnuts are considered to be potential sources of OTA. The control of mycotoxins is of utmost importance to farmers from the standpoints of reducing sale losses and to exporters in order to reduce consignment rejection, and the population as a way to reduce food shortage.

Other economic effects can be subtler but have major implications world wide with regards to food production and processing (James *et al*, 1995). It has been estimated by the Food and Agricultural Organization (FAO) that 25% of the world's crops are affected by mycotoxins. Many investigators have also used essential oils as cinnamon, peppermint, basil and thyme to protect maize kernels against *A.flavus* infection without affecting germination and corn growth. *Aframomum danielli* (Hook, f) K.Schum, which resembles cardamom, belongs to the family Zingiberaceae. It is a large, robust perennial plant, 3-4mm tall plant found in Central and West African countries. It is non-toxic with oval, shiny and olive-brown seeds and is commonly used for flavouring traditional dishes. *Aframomum danielli* has been reported to be inhibitory to the growth of ochratoxigenic fungi- *A. ochraceus* (Adegoke and Skura, 1994).

Preparation of standard solutions of OTA

A standard stock solution of 100µg/ml was prepared by dissolving 1mg of OTA in 100 ml of toluene: acetic acid (99.1). Standard Working solution of 1µg/ml was obtained by dissolving 10µl of the stock solution in 990µl of the mobile phase.

Source of raw materials

Aframomumom different warehouses at Lagos, Nigeria Cocoa powder ($CO1_{-3}$) were purchased from cocoa processing industries in Lagos, Ibadan and Ondo and stored for 10months under relative humidity of 75-80% before analysis. Cocoa beverage was obtained by dissolving 10g each of the powder samples in 100ml of cold deionized water. These were labelled $Cbev_{1-}$ Lagos, $Cbev_{2-}$ Ibadan, and $Cbev_{3-}$ Ondo.

Detection of fungal contaminants

Isolation and identification of moulds were carried out as described by Raper and Fennell (1965). Triplicate sets of each cocoa sample were prepared from whole unshelled cocoa beans- CB_{1-} CB_{2-} shell and CB_{3-}cocoa nib obtained after deshelling the cocoa beans

Preparation of essential oil and aqueous extract of *Aframomum danielli*

Essential oil of *A. danielli* was obtained by hydro-distillation of ground powder of already air-dried A. d*anielli* seeds (Eur-Pharm, 2002) using n-hexane of analytical grade (Merck: Darmstadt, Germany) as a solvent. The solvent was subsequently evaporated under vacuum and the quantities of the essential oil were determined gravimetrically.

Aqueous extracts of the spice was obtained using the methods described by Adegoke and Skura, (1994).

Spiking of cocoa powder and cocoa beverage

Ochratoxin A – free sample of cocoa powder (10g) and 10 ml of cocoa beverage contained in a 250-ml Erlenmeyer flask were spiked with standard solutions of OTA at 100ppb, 120ppb, 140ppb, 160ppb, 180ppb, and 200ppb respectively. Spiking was carried out in duplicate and a single analysis of blank sample was carried out in line with the method of Varga *et al* (2005).

Effect of spice on reduction of OTA

The effects of *A. danielli* on ochratoxin A-spiked sample were determined using different concentrations of spice essential oil- 500ppm, 1000ppm, 2000ppm and 300ppm in cocoa powder and 0. 500ppm, 700ppm and 750ppm of the aqueous extracts in cocoa beverage respectively. Both the essential oil and the aqueous extracts of *Aframomum danielli* were allowed to equilibrate for 5hours with the spiked cocoa powder and cocoa beverage samples. Thereafter, quantification of OTA was done using thin layer chromatography plates (AOAC, 2000).

Results and Discussion

A niger, A. ochraceus, and A. flavus were found in the samples tested and the frequency of occurrence of *A. ochraceus* was highest in cocoa bean with shells whereas nibs had the lowest occurrence of the toxic species. Cocoa beans had the highest number of *A. niger, A.flavus*, and *A. ochraceus* (Table 1). The high fungal loads recorded for the cocoa bean shells in this study were probably due to exposure of the outer shells of the beans to environmental contaminants while inadequate shell removal during deshelling might have been responsible for the fungal levels recorded for the cocoa nibs.

No ochratoxin A was detected in cocoa nib. Increases in the concentrations of *A danielli* essential oil caused increased reduction in the corresponding OTA levels in cocoa powder from initial 10ppb to 1ppb at 1000ppm of essential oil of *A.danielli* used (Table 3) resulting in OTA reduction by 95% and above 1000ppm, the OTA was no more detectable. The effects of aqueous extract of *A. danielli* on OTA was not as strong as the essential oil although there appeared to be increase in % OTA reduction according to the concentrations of the aqueous samples used for example at 750ppm, the maximum percentage reduction was 72.2%.

Table 1: Frequency of occurrence of ochratoxigenic fungi isolated in cocoa beans nibs and shells

Fungal species	Cocoa beans	(F/O)	Nibs	(F/O)	Shells	(F/O)
Aspergillus niger	+	40	+	40	+	52
Aspergillus flavus	+	30	+	40	+	30
Aspergillus ochraceus	+	80	+	40	+	50
Viable fungal count (propagule/g)	9.92×10^{6}		4.58×10^{5}		1.39×10^{7}	

F/O: frequency of occurrence; +: positive

Table 2: Reduction of OTA in spiked cocoa powder using the essential oil of *A. danielli*

Spike levels (ppb)	Essential oils (ppm)			
	500	1000	2000	3000
100	30 (70)	1 (90)	nd	nd
120	40 (66.7)	1 (91.7)	nd	nd
140	40 (71.42)	1 (92.9)	nd	nd
160	50 (68.8)	1 (93.8)	nd	nd
180	40 (77.8)	1 (94.4)	nd	nd
200	50 (75)	1 (95)	nd	nd

( ): % reduction; nd: not detec

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Experimental Title: Utilization of dried husk endocarp (Dche) as snail mash (R.A. Hamzat)

Aim and **Objectives**:

1. To utilize cocoa husk endocarp (CHE) hitherto regarded as wastes in snail feeding
2. To enhance the keeping value of the CHE
3. To compound snail mash using CHE as a total replacement for maize

Methodology:

Four sole dietary treatments (A, B, C, D,) comprising of A(Maize chaff), B (Cocoa husk endocarp), C(palm kernel cake) and D (cassava peel) were used for this trial. A parameters studied on the experimental snails included: shell length, shell thickness, foot weight, and carcass.

Results:

The laboratory analyses as well as the statistical analysis of data generated are on going.

Experimental Title: Extraction and characterization of varying components of Cashew Nut Shell Liquid **(**Yahaya, L.E.)

Introduction

Cashew nut shell liquid was extracted using soxhlet extraction according to standard methods. The next stage of the research work is to vacuum- distill the resulting product using a vacuum distillation unit with a vacuum pump. However, the fund earmarked is insufficient to procure the
vacuum pump. Work will continue in the 2007 work plan.

EXTENSION RESEARCH PROGRAMME:

AG. LEADER: S.O. ADEOGUN

Experimental Title: Information and its implication on Cashew farming in Oyo State. (E.O. Uwagboe, B. Obatolu and S.O. Adeogun)

Introduction

Agricultural extension service in developing countries is believed to be a catalyst for agricultural and national development. Cashew is one of the important tree cash crops in Nigeria. Central Bank of Nigeria (2003) reported that 60,000 metric tones of cashew nuts are exported annually with gross earning of $702 million/year to the national economy. Ezeagu (2003) stated that there are over 20 states producing cashew of commercial quantity in Nigeria and Oyo State is one of them. Onuchi and V. Aiyelabowo (2005) reported that yield and quality of cashew nuts from the northern part of Oyo state particularly Ogbomoso and its environs are reputed to be good.

Cashew has various uses, but has not attained its full potential in Nigeria as most of the fleshy parts are wasted whereas it could be useful in the beverage and confectionary industry (Akinwale, 2004; and Aroyeun, 2004). This could be as a result of limited information to cashew farmers.

With varied and immense benefits of communication methods on various farming activities, it is of interest to discover cashew farmer's preference of source of information, and how such methods have been transmitted into positive increase productivity between contact and non-contact farmers in the cashew industry in Oyo state, Nigeria.

The objectives of the study are to:

1. determine the preferred sources of information available to cashew farmers.
2. dertermine the types of information available to farmers.
3. compare effect of information supply between contacts and non-contact farmer

Ho: There is no significant relationship between contact and non contact farmers' information sources.

Materials and methods

A multistage sampling technique was used to select 3 cashew growing Local Government Areas (LGA'S) including Surulere, Orire and Ogbomoso North out of the five LGAs producing cashew in Ogbomoso area while simple random sampling technique was used to select 176 farmers comprising contact and non-contact farmers see table 1. The instrument for collection of primary data was questionnaire.

Results and Discussion

Extension agents (76%) ranked as the most important source of information for the farmers while television (1.1%) was the least source. This could be as a result of farmers' access to ADP extension agents while television is scarcely relied upon for information due to incessant electric power outage and possibly lack of awareness of existing programmes see table 2. Information on processing methods (3.4%) is the least type of information and it is not unconnected with the fact that adding value through processing of cashew is still at an infant stage in the Nigerian cashew industry see table 3. Till date majority of the primary produce of cashew which is the raw cashew nut is still being exported. Revenue was not significantly different when compared for the two groups of farmers ($P = 0.163$), though yield showed a high significance ($P=0.006$) see table 4. The result of the analysis of variance was not significantly different which implies that the sources of information of both contact and non-contact farmers have no effect on the revenue generated from their produce while farm size is significantly different.

Conclusion and Recommendation

There is a need to exploit the benefits of interpersonal communication through the use of extension agents as it is the most preferred source of information. However, the quality of information needs to be improved from "Production driven" to "Market driven" and also how farmers can add value to their produce.

Outlook: CRIN Extension Group in collaboration with ADP should intensify research efforts awareness

creation on processing and market information to cashew farmers.

Constraints: The scope of this research work would have been expanded to cover other local government areas but for financial constraints.

Group of farmers	Surulere LGA	Orire LGA	Ogbomoso North
Contact farmers	29.6 (40)	40.7 (55)	29.7 (40)
Non Contact farmers	36.5 (15)	34.1 (14)	29.3 (12)

Frequency in parenthesis

Source: Field Survey, 2005.

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Table 1: Distribution of Contact and Non-Contact Farmers in Different LGA's

Table 2: Rank Distribution of Respondents Based on Source of Information

Source of information	Rank of farmers
Extension Agents	1 (76%)
Friends	2 (66.4%)
Radio	3 (17.6%)
Cashew Association	4 (1.7%)
Television	5 (1.1%)
Research Institute	5 (1.1%)
News Papers	7 (<1%)

Source: Field survey, 2005

*Percentages in Parenthesis. (Total percentage exceeds 100% as a result of multiple responses)

Table 3: Rank of Farmers Based on Preference Areas of Agricultural Information

Table 3: Rank of Farmers Based on Preference Areas of Agricultural Information

Areas of Agricultural Information	Rank of farmers
Cultivation Methods	1 (96%)
Market Information	2 (60%)
Access to farm input	3 (43%)
Proper methods of storage	4 (19.3%)
Processing methods	5 (3.4%)

Source: Field survey, 2005.

*Percentages in Parenthesis. (Total percentage exceeds 100% as a result of multiple responses)

Table 4: Mean Distribution of Farm Size, Income and Yield of Contact and Non-contact Farmers

Variable	Contact farmers	Non-contact farmers	Overall Mean	Variance (Vr)	P
Farm size(ha)	2.54	1.47	2.41	4.21	0.042
Revenue(N)	176,441	112,883	168,858	1.97	0.163
Yield (Kg)	39,084	12,095	35,864	7.64	0.006

Source: Field survey, 20005.

Experimental Title: Land tenure system and its implications on women cashew farmers in Kogi State Nigeria. (S.O. Adeogun and E.O. Uwagboe.)

Introduction

Land tenure refers to a set of rights which a person or organization holds on a piece of land and Security of tenure is often the key to having control over major decisions such as what crop to grow, what techniques to use and the decision on what to consume and what to sell. Ekong and Olowu (2002), posited that women do not have access to land in Nigeria and the constraint according to these authors adversely affects the productivity and well-being of women.

Cashew is an important cash crop in Nigeria and has contributed to the national economy Onuchi and Aiyelabowo (2005) reported that women constitute a major chain in the cashew industry and yet are the poorest in the rural community. Kogi state is one of the major producers of cashew in Nigeria; hence, this study will therefore examine the contribution of women to cashew production and effect of land tenure system on their production in Kogi state, Nigeria.

Specific objectives of the study are to:

1. to describe selected personal characteristics of women cashew farmers in the study area;
2. to determine the involvement of women in cashew production in the study area; and
3. to examine land ownership pattern of women cashew farmers in the study area.

Hypothesis of the study

H_{o1} :There is no significant association between selected personal characteristics of women cashew farmers and their land ownership pattern in the study area.

Materials and Methods

Data were collected from three out of the twenty-one local government areas of Kogi state by random sampling technique. The selected local government areas were Ankpa, Idah and Ayangba out of the major fifteen LGAs producing cashew in the state. From each local government area, forty women cashew farmers were selected using simple random sampling technique, given a total sample size of 120 respondents. A well-structured interview schedule was used to elicit information from the respondents.

Data were described with frequencies, means, and percentages for demographic and other relevant data while chi-square was used to analysis the data.

Results and Discussion

Personal Characteristics of the Respondents

Table (1) shows that most of the respondents (76%) were elderly while 7% were youths and 17% were young adults. It also reveals that 58% respondent were married, 24% were widowed, while 10% were divorced, and a few (8%) were single. Furthermore, most of the respondents (45%)
had 1 – 4 children; 39% had between 5 and 8 children; 5% had more than nine children while other respondents (11%) had no child. This implies that most of the women cashew farmers are old and those with children that are willing to help their parents on farm could be a favourable condition to cashew production in the study area.

Involvement of women in cashew production in the study area:

Farm sizes of the respondents

Farm sizes of the respondents were generally small, fifty-two percent of the respondents had less than 3 hectares of cashew farm land; 35% had between 4 and 7 hectares; 11% had between 8 and 10 hectares; while the remaining (2%) had more than 10 hectares of cashew farm land (fig.1).

Age of the respondents' farms

Cashew farms had existed for many years in the study areas as majority (69%) of the respondents farms are over 40 years, 21% had farms aged between 31 and 40 years, while each reported that their farms had been in existence for about 11 – 20 years and 21 – 30 years respectively, few (3%) of the respondents farms had existed for only 1 – 10 years. This implies that majority of the Cashew farms in the study area are of age and the productivity level of such farms would have reduced due to old age which needs rehabilitation. Establishment of young plantation might have been difficult due to limited land resources for women in the study area (Table 2).

Other income generating activities of the respondents

Figure (2) shows the various income generating activities of the respondents. Some (39%) of the respondents are traders, (30%) are civil servants, (9%) are running restaurants, few (4%) are cassava processors and (5%) are into various vocational jobs while the remaining (13%) claim to be involved in other forms of farming activities. Most of the farmers are involved in various income generating activities to compensate for the limited land resources available for cashew production by women and also to generate enough income to contribute to the welfare of their household.

Land ownership pattern of women cashew farmers in the study area

As revealed in Fig. (3), many of the respondents (40%) worked on their husbands' farms, about (25%) use land belonging to the community, 10% rented their lands, while only 9% inherited their cashew farms. The remaining 16% either bought or obtained their land through leasehold or as a gift. This implies that few women cashew farmers do own their farm land as revealed in this study.

Tested Hypothesis 1:

The personal characteristics of the respondents such as age, education, marital status and family size were significantly related to their land ownership pattern while farming experience of women cashew farmers did not show any relationship.

The contingency coefficients CC of 0.393 for education, 0.343 for marital status, 0.299 for years of farming experience. 0.429 for farm size and 0.366 for age, represent weak strength of relationships of these variables with the land ownership pattern of the women cashew farmers Table (3)

Tables and Charts

Table 1: Personal characteristics of the respondents

Age Categories	Frequency	Percentages
20 – 40	8	7.20
41 – 60	19	17.10
61 and above	84	75.70
Total	**111**	**100.00**
Marital status		
Single	**9**	**8.00**
Married	**64**	**58.00**
Widowed	**27**	**24.00**
Divorced	**11**	**10.00**
Total	**111**	**100.00**
Number of children		
No child	12	11.00
1 – 4 children	50	45.00
5-8 Children	43	39.00
9 and above	6	5.00
Total	**111**	**100.00**

Source: Field survey, 2005.

Table 2: Distribution of respondents based on the age of their farms

Years	Frequency	Percentages
1 – 10	3	3.0
11- 20	8	7.0
21 – 30	8	7.0
31 – 40	23	21.0
>40	69	62.0
Total	**111**	**100**

Source: Field survey, 2005

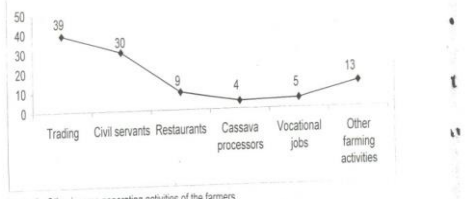

Figure 2: Other income generating activities of the farmers
Source: Field Survey 2005.

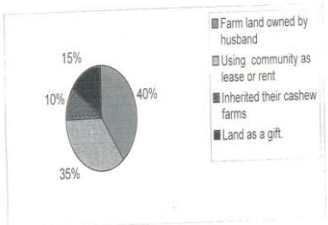

Figure 3: Land Ownership pattern of the respondents.
Source: Field Survey 2005.

Table 3: Personal characteristics and land ownership pattern of respondents.

Land Ownership Pattern	df	X^2 cal	X^2 tab	Level of significance	Decision	CC
Age	8	17.24	15.51	0.05	S	0.366
Education	6	20.22	12.59	0.05	S	0.393
Marital status	6	14.41	12.59	005	S	0.343
Years of farming experience	8	10.88	15.51	0.05	NS	0.299
Income from cashew	3	12.36	9.49	0.05	S	0.660

Source: Field Survey 2005

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Table 3: Personal characteristics and land ownership pattern of respondents.

Land Ownership Pattern	df	X2 cal	X2 tab	Level of significance	Decision	CC
Age	8	17.24	15.51	0.05	S	0.366
Education	6	20.22	12.59	0.05	S	0.393
Marital status	6	14.41	12.59	005	S	0.343
Years of farming experience	8	10.88	15.51	0.05	NS	0.299
Income from cashew	3	12.36	9.49	0.05	S	0.660

Source: Field Survey 2005

Expeerimental Title : Awareness and attitude of cocoa farmers towards activities encouraging Hiv/Aids In Ondo State, Nigeria. (S.O. Adeogun, E.O. Uwagboe and E.O. Aigbekaen)

Introduction

Acquired Immune Deficiency Syndrome (AIDS), a clinical syndrome (a group of various illnesses that together characterize a disease) resulting from damage to the immune system caused by infection with the Human-Immuno-Deficiency Virus (HIV). In the absence of treatment, it generally taken six months to ten years from the point of infection to develop AIDS, although the rate of disease progression may vary substantially from person to person (Encarta, 2005).

In Nigeria today, this deadly disease has attacked over 8 million people with the greatest percentage residing in the rural areas where little attention is given to awareness creation despite the importance of farmers who reside in this part of the country. The spread of HIV to rural population and its negative effect in Nigeria pose a lot of concern to policy makers due to their perceived higher vulnerability and relevance to national food security. The recent shift from urban to rural areas in efforts towards addressing the problems of AIDS is worthwhile because the disease is having some tremendous impact on the agricultural sector of several developing countries like Nigeria (CTA 2004)

Cocoa farmers constitute an important integral part of Nigerian farmers because of the importance of cocoa crops to Nation's agricultural sector.

This study aims at determining the awareness and attitude of cocoa farmers to activities that encourage spread of HIV/AIDS in Ondo state which is a major producer of cocoa in the country. Specifically, the study seeks to describe the personal characteristics of cocoa farmers; determine the level of cocoa farmers' awareness of HIV/AIDS, examine the activities of the cocoa farmers that may encourage spread of HIV/AIDs in the study area; and ascertain farmers' attitude towards activities that may encourage spread of HIV/AIDS.

Hypothesis of the study:
H1: There is no significant relationship between cocoa farmer's selected personal characteristics and their attitude towards the activities that may encourage spread of HIV/AIDS.

Materials and Methods
The study was carried out in Ondo State, Nigeria, which is the largest producer of cocoa in Nigeria with sixteen local government area (LGAs) planting cocoa out of the existing eighteen LGAs. Multistage sampling technique was used to select 6 LGAs including; Ondo East, Ondo West, Idanre, Ile Oluji, Owo and Akure South while random sampling technique was used to select 240 respondents from sixteen villages in the study area.

Results and Discussion
Personal Characteristics
The result revealed that 4.3% of the respondents are between 20 and 40 years, 20.5% of the respondents are above 60 years of age, while 75.2% are between ages 40 and 60 years see table 1. This implies that majority of the respondents are already in their old age with few youths involved in cocoa farming. Many (62.2%) of the respondents have no formal education while 15.2% have primary, 17.4% secondary and the remaining 5.2% have tertiary see table 1. The low level of literacy among the respondents may affect their attitude towards activities that may encourage the spread of HIV/AIDs in the study area.

Respondents' level of awareness of HIV/AID
Majority 59.7% were not aware of the activities that may encourage spread of HIV/AIDS while 40.3 percent of those who were aware of HIV/AIDs show varying degree of awareness based on the number of these activities know to them see Table 2. The respondents' knowledge of these activities will determine their rate of vulnerability of this deadly disease. Awareness of this disease is low which could have adverse effect on cocoa farmers and their production. 1

The level of respondents' awareness of activities that may encourage the spread of HIV/AIDS.
Table 3. revealed that 40.3% of the respondents who were aware of activities encouraging spread of HIV/AIDS show varying degree of awareness. More of the respondents were aware of the fact that extra marital could encourage the spread of the disease. This is followed by premarital sex, using already used unsterilized sharp objects, use of already used toothbrush, syringe, barbers' clippers and lasting pedicure and manicure practices. This is in support of Encarta (2005) report on practice that increase the likelihood of blood contact that may cause HIV/AIDS, such as sharing toothbrushes or razors.

The ranking result implies that the respondents do not attach importance to the potentials of some of the activities listed above that may encourage the spread of HIV/AIDS in the study area.

Hypotheses Testing
The chi-square analysis revealed that educational status ($P=0.01$), marital status ($P = 0.02$), and Age ($P = 0.12$) at $P<0.05$, were found to be significantly related to the respondents' attitude towards activities encouraging spread of HIV/AIDS while sex ($P=0.51$) at $P>0.05$ were not significantly related. The Contingency Co-efficient of 0.6 and 0.7 for educational status and marital status show a very high strength of relationship see table 4.

Conclusion and Recommendation
The study reveals that the awareness of the respondents to activities that may encourage
HIV/AIDS was low as majority was not aware of activities that could encourage the spread. It is recommended that government and non-government organizations should make efforts to carry out sensitization programmes to enlighten cocoa farmers on the danger of carrying out activities that could encourage the spread of HIV/AIDS. Secondly, HIV/AIDS education should be incorporated in extension programmes in the study area, since AIDS affects the physical well being of its victims and consequently their agricultural activities and food security.

Outlook: This research is necessary in all the cocoa producing states.

Constraints: Administration of the questionnaire was not easy due to difficulty in getting responses from farmers.

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Tables and Figures

Table 1: Age of the respondents

Age	Frequency	Percentage
20-40	10	4.3
41-60	173	75.2
>60	47	20.4

Level of Education		
No formal education	143	62.2
Primary education	35	15.2
Secondary Education	40	17.4
Tertiary education	12	5.2
Total	230	100

Source: Field Survey, 2005.

Table 2: Awareness of activities causing HIV/AIDS by the respondents (n = 124)

Level of awareness	Frequency	Percentage
Aware of activities that may encourage spread of HIV/AIDS	50	40.3
Not aware of activities that may encourage spread of HIV/AIDS	74	59.7
Total	125	100

Source: Field survey, 2005.

Table 3: Frequency distribution showing the extent of respondents' awareness of activities that may encourage the spread of HIV/AIDs in Ondo State (n = 50)

S/N	Activities causing HIV/AIDS	Frequency	Percentage	Rank
1.	Use of already used syringe	12	24	5th
2.	Pre-marital sex	25	50	2nd
3.	Sharing toothbrushes	15	30	4th
4.	Pedicure and manicure practices	5	10	7th
5.	Extra marital sex	30	60	1st
6.	Using unsterilised barbers Clipper	6	12	6th
7.	Using already used unsterilised sharp objects	20	40	3rd
8.	Receiving unscreened blood	3	6	8th

Source: Field survey, 2005.

Table 4: Chi-Square analysis of the significant relationship between respondents' personal characteristics and attitude towards activities that may encourage spread of HIV/AIDS in Ondo State of Nigeria.

Personal Characteristics	df	P-value	Contingency Co-efficient	Remark	Decision
Age	4	0.12	0.3	NS	Accept H_0
Sex	2	0.51	0.1	NS	Accept H_0
Educational Status	6	0.01	0.6	S	Reject H_0
Marital Status	6	0.02	0.7	S	Reject H_0

Source: Field Survey, 2006
Significant Level P< 0.05.

Experimental Title: Assessment of primary cocoa beans processing methods in Owan West Local Government Area of Edo State. (Agbongiarhuoyi A.E.)

Introduction

Theobroma cacao is a vital economic tree crop second to oil in terms of foreign exchange earnings in Nigeria (Filani, 1997). Since the dissolution of cocoa board in 1986. Nigerian cocoa suffered serious and immeasurable deterioration in quality due to neglect of quality parameters such as proper fermentation and drying of cocoa beans by farmers and activities of emergency cocoa buyers who buy all sorts of beans regardless of its quality (Akinbola, 2003 and Toye, 2004). It is against this back drop that this study assesses the primary cocoa beans processing methods used by farmers in Owan West Local Government Area of Edo State. Wet cocoa beans could be processed using heap, basket, box, tray sun-drying and artificial methods.

Objective

The main objective was to investigate cocoa beans processing methods used by farmers. The specific objectives were to:

(i) Describe selected farmers personal characteristics
(ii) Identify processing methods used by farmers.
(iii) Identify farmers' sources of information on cocoa processing.
(iv) Determine the utilization of identified methods.

Justification

The issue of fermentation and drying of wet cocoa beans processing by farmers is a crucial operation in determining the quality of cocoa. The type of method used in processing cocoa beans at the primary level plays a significant role in obtaining good taste, flavour and aroma, which are essential factors in chocolate manufacturing. Kehinde (1982) and Suainman (1998) reported that the processing of unacceptable defective beans such as slaty, mould and insect damage beans results in lower quality, low grading and rejection by exports

Materials and Methods

Data were collected from 126 farmers in three main cocoa producing communities: Uhonmora, Uzebba and Okpuje in the study area using interview schedule and questionnaire. A simple random sampling technique was used to select farmers from the communities chosen. Descriptive statistics and Pearson product moment correlation (PPMC) were used to analyse data.

Results and Discussion

The results in table 1 revealed that in farmers' characteristics, majority of respondents (92.8%) were male while 7.2. percent were female. 41.6 percent were between 54.62 years old. Forty-eight percent had no formal education. Majority (59.2%) cultivates small farm sizes of less than 2.0 hectares.

All the sampled farmers (100%) identified the heap method, 93.6 percent knows the basket methods. None of the farmers knew the tray, box, and artificial processing methods. A higher proportion (98.4%) ferment cocoa beans in heaps and all dry in the sun. 15.2 percent identified and used synthetic sack method in fermenting cocoa beans. This method was discovered during data collection for the study.

Produce buyers (99.2%) were the major source of information to farmers on cocoa beans processing. Other sources: Radio (37.6%), CRIN (32.0%) Cocoa Farmers Association of Nigeria CFAN (22.4%) and ADP (4.8% showed low sources. It implies that cocoa produce-buyers had more contact with farmers than other sources. Correlation analysis at P>0.05 in Table 2 indicates that identified processing methods were significantly related to utilization (r=0.472.

P=0.00). It means that the more farmers identify the proper cocoa processing method, the more its use.

Conclusion and Recommendation

The study showed that majority of cocoa farmers were aware of the heap, basket, synthetic sack and sun drying methods of processing cocoa beans. Heap method was the most commonly used. Tray method which, CRIN recommended is not known by farmers. Farmers obtained information on cocoa processing from cocoa buying agents who are mainly involved in marketing.

A number of measures should be put in place by CRIN through government intervention such as NDCD and ADP to strengthen good extension contact with farmers. Efforts at enhancing the quality of cocoa beans should be geared towards improving the current heap method used by farmers. Farmers should also be sensitized on the use of tray method.

Outlook: It is expected that in the nearest future, cocoa processing by farmers at the primary level would witness improvement because the heap method mostly adopted is cheap and traditionally practiced by farmers in Nigeria.

Table 1: Frequency distribution selected farmers' personal characteristics

Personal Characteristics	Frequency	Percentage
Sex		
Male	116	92.8
Female	9	7.2
Age (years)		
27 – 40	9	7.2
41 – 54	46	36.8
55 - 68	61	48.8
69 - 82	9	7.2
Educational level		
No formal education	60	48.0
Primary	39	31.2
Secondary	18	14.4
Tertiary	8	6.4
Farm size (Ha)		
1 – 2	74	59.2
3 – 4	37	29.6
5 and above	14	11.2

Source: Field survey, 2004.

Table 2: Relationship between identified processing methods and utilization of cocoa processing methods.

Variable	R	P	Decision
Identification	0.472**	0.00	S

Source: Field Survey, 2004.

R = coefficient, P = probability, s = significant.

Experimental Title: Assessment of income generating potentials of cashew amongst farmers in Ogbomoso, Nigeria. (E.O. Uwagboe and S.O. Adeogun.)

Introduction

Food and cash crops constitute important components in meeting both domestic and industrial requirements of the nation's agricultural economy. The role of the food and cash sub-sector therefore, has been a critical source of raw materials for the growing industrial sectors, and improving the poverty level of farmers as well as foreign exchange earnings (Federal Department of Agriculture and National Planning Commission, (1995). Cashew is an important cash crop in Nigeria and an estimate of 15,000 metric tones is exported which contributes $702m annually to the national economy (Central Bank of Nigeria, 2003).

Olunloyo (1999) reported that cashew has the following potentials:

- Raw nuts are exported for foreign exchange while roasted nuts sold as snacks
- Kernels are consumed as roasted nuts.
- The pseudo apple (fleshly fruit) is used in the manufacture of good quality wine, juice (rich in Vitamin C), Vinegar, Gin Jam.
- Ground cashew kernels mixed with cocoa to produce a thermo-resistant chocolate suitable for the tropics.
- Broken kernels are made into cashew butter, cooking oil and shell liquid.
- Also crumbs and husks are sold as poultry feeds.
- Products obtained from dried cashew apple are used in making doughnuts, sweet cookies, sponge cake, Masala cookies, banana cake, raisings mushroom curry.

Cautney, pickle in oil (Azam-Ali and Judge, 2000). Cheke (1997) also observed that cashew apple is a good raw materials for soft drinks industry and when fermented with appropriate enzymes, it produces very valuable alcoholic drinks.

Justification

Various opportunities exist in cashew produce and its by-products, which could increase farmers' revenue. However, these opportunities are presently not utilized adequately as the present consumption of cashew pseudo apple is about 10% of cashew total production. Most of the cashew nuts produced in Nigeria are exported, hence the economy of the producing areas, has a considerable dependence on price fluctuations in the International market (Akinwale et al., 2001.).

Based on the present state of the Nigerian economy and agitation for self-economic reliance, there is need to look at cashew fruit for income generation among cashew farmers in Ogbomoso, Oyo State.

The general objective of the study was to ascertain the factors influencing the income generating potentials of cashew fruits amongst farmers in Ogbomoso, Oyo State, Nigeria.

Specifically, the study seeks to:

1. identify the selected personal characteristics of the cashew fruit farmers in the study area;
2. identify the farmers' farming activities and constraints; and
3. determine their level of income generated from cashew fruits.

Hypothesis of the study

HO1: There is no significant relationship between selected personal characteristics of the respondents and the level of income generated from cashew fruits in the study area.

Materials and Methods

A multistage stratified random sampling technique was used in selecting the sample for the study. The

Agricultural Development Programme (ADP) structure has five blocks in Ogbomoso zone.
Three blocks (Iresaadu, Ikoyi-Ile and Kinira) out of five Iresaadu, Ikoyi-Ile, Kinira, Arowomole and Ajawa) were selected through simple random sampling technique.
A sample of 40 farmers was selected per block given a total of 120 farmers which represents 2% of the total list of 600 ADP contact farmers that cultivate cashew through a simple random sampling technique.

Questionnaire was used to elicit information from the respondents in the study area. Frequency counts and percentages were used to describe the data while Chi-square and Pearson Product Moment Correlation (PPMC) were used to analysis the data.

Results and Discussion

Personal characteristics of the respondents

The respondents are at their prime age which could be favourable to cashew production since 53 percent were aged between 30-49 years, 44 percent were above 50 years and 3 percent less than 30 years. Age range of 30 and 49 years represents a productive age range of cashew farmers in the study area see Table 1. This implies that majority of the cashew farmers are still active in farm work. The majority of the cashew farmers (54%) are educated while 46 percent of the respondents had no formal education which implies that training of the cashew farmers in the study are may not be difficult see fig. 1.

Farming activities of the cashew farmers

Fifty-five percent of the respondents cultivated cashew farm size of between 0.10 and 5 99ha, 20 percent cultivate on lands between 6.00-99ha wile 25 percent cultivated on lands with 10ha and above see Table 2. An estimate of 60,000 hectares is considered to be devoted to the cultivation of cashew of which 60% are owned by small scale farmers (Olunloyo, 1996). Most of the cashew farmers (78%) planted local varieties referred to as Ogbomoso variety, which few (9%) and 13 percent planted CRIN improved local variety and Brazilian Jumbo Nuts, respectively see Table 3.
Lack of capital (finance) was ranked 287) by the respondents as the most severe constraint while lack of storage facilities was ranked (104) as the least serious constraint see Table 4. This implies that the Cashew farmers in the study area have financial capital constraint to invest on cashew to generate more income.

Income generated from cashew fruits

Most of the respondents (70%) made below ninety nine thousand Naira (N99,000) only from cashew fruits per year while 30 percent of the respondent made above average (N99,000) see table 5.

Tested Hypothesis

A significant relationship exist between educational level of the respondents and the level of income generated from cashew fruits (X_2 = 9.700, $P<0.05$) while sex (X_2 = 0.401, $P>0.05$) and farming experience (X_2 – 0.742, $P>0.05$) show no significant relationship. This implies that the educational level of the respondents has influence on the level of income generated, while age and the years of experience of the respondents do not influence the level of income generated by the respondents in the study area. The contingency coefficient (CC) of 0.283 for educational level shows a week strength of relationship see Table 6.

Conclusion and Recommendation

It is therefore, recommended that Cocoa Research Institute of Nigeria (CRIN) in collaboration with ADP and other stakeholders should intensify their effort at increasing the creation of awareness on adding value to cashew. This could be done by training trainers to train farmers and which will encourage farmers in the establishment of cottage industries to enhance their level of income generated from cashew fruits and improve their household food security.

Outlook: Seed gardens of improved varieties should be established and properly distributed to reduce the use of local varieties in cashew producing areas. Formation of viable farmers cooperative group needs to be encouraged to facilitate easy access to farm inputs.

Constraints: Inadequate funding

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Tables and Figures

Table 1: Personal characteristics of the respondents

Categories	Frequency	Percentages (%)
Age		
11-30 years	3	3.0
30-49	60	53.0
50 and above	51	44.0
Total	114	100.00
Sex		
Male	95	83.0
Female	19	17.0
Total	114	100.00

Source: Field Survey, 2004

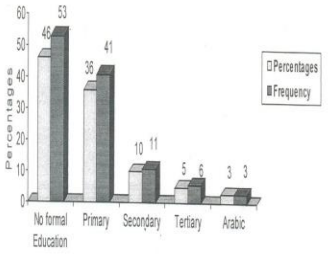

Fig. 1: Educational level of the respondents
Source: Field survey, 2004

Table 2: Respondents' Farm Size

Farm Size	Frequency	Percentages (%)
0.10-5.99Ha	63	55.0
10Ha and above	23	20.00
Total	28	25.00
Total	**114**	**100.00**

Source: Field Survey, 2004.

Table 3: Varieties of cashew planted by respondents

Varieties of Cashew	Frequency	Percentages (%)
Local varieties	89	78.0
CRIN improved varieties	10	9.0
Brazilian Jumbo nuts varieties	15	13.0
Total	**114**	**100.00**

Table 4: Respondents ranking of constraints according to their Severity

Constraints to Cashew Crop Production	Scores: Very severe 3	Severe 2	Mild 1	Total Scores	Rank
Insufficient price information	25	62	26	225	3rd
High cost of transport	23	35	54	193	8th
Low farm gate price	30	47	33	217	4th
Inadequate extension services	8	17	81	139	11th
Insufficient labour	26	48	36	210	6th
Poor marketing channel	30	40	39	209	7th
Lackof market information	20	561	30	212	5th
Poor quality nuts	6	32	69	151	10th
Lack of storage facilities	22	44	38	104	13th
Lack of processing industries	73	19	16	273	2nd
Lack of good access road	28	29	43	185	9th
Lack of buyers	7	20	67	128	12th
Lack of capital (Finance)	77	22	12	287	1st

Source: Field Survey, 2004.

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	Scores				
Constraints to Cashew Crop Production	**Very severe 3**	**Severe 2**	**Mild 1**	**Total Scores**	**Rank**
Insufficient price information	25	62	26	225	3rd
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Lack of processing industries	73	19	16	273	2nd
Lack of good access road	28	29	43	185	9th
Lack of buyers	7	20	67	128	12th
Lack of capital(Finance)	77	22	12	287	1st

Source: Field Survey, 2004

Table 5: Relationship between personal characteristics of respondents and their level of income generated from cashew fruits.

Variables	X^2	Df	Probability	Contingency Coefficient (C)	Decision Remark
Sex	0.401	1	0.527	0.060	NS Accept
Education	9.700	4	0.46	0.283	S** Reject
Farming experience	0.742	1	0.389	0.081	NS Accept

S** = P<0.05

Source: Field Survey, 2004.

Experimental Title: Assessment of cocoa farmers' awareness of the use of Integrated Pest Management (Ipm) practices In Osun State. (S.O. Adeogun and E. O. Uwagboe)

Introduction

Aside the oil boom of the 1970's and civil war of the late 1960's and the severe drought of the early 1970's and 1980's, which were socio-economic and structural factors, associated with the fluctuating performance of cocoa production in Nigeria. Pest, disease and parasites on cocoa trees are epidemic and have also become significant economic and environmental problems

The incidence of pest and diseases is a major problems in cocoa plantation in Nigeria. The use of chemical to combat disease and pest apart from the residual effects on the crop, equally have the hazardous effect on cocoa farmers and its potentials to pollute the environments it also increase the cost of production. To address the problems of pest and disease infestation,, Vos et al (2003) identified the various cultural methods that could be adopted by cocoa farmers in addition to use of chemical. These methods include, pruning and shade management, Soil nutrient management, Pest management, the use of pest resistant varieties and weed control. A number of weed control methods are available to small holders. Cultural and mechanical control, include use of shade (both by the cocoa canopy and its shade trees), weed slashing with a machete, and maintaining leaf litter on the soil to function as a mulch.

The need for cocoa farmers to adopt integrated pest management becomes essential to address the problem of widening gap in cocoa demand compare to the supply in Nigeria due to pest and disease infestation. This method of control, which is more cost effective and farmers' friendly will certainly help to increase production and enhance the socio economics status of cocoa farmers if adopted and utilized. It is in this light, that this study aims at assessing cocoa farmers' awareness towards the use of integrated pest management (IPM practices in Osun state.

The specific objectives were to:

i. Identify the personal characteristics (age, gender, educational level) of cocoa farmers in the study area;
ii. Examine the farmers' awareness of IPM practices in the study area; and
iii. Identify the cocoa farmer's source of information on farm hygiene and management practices on cocoa production in the study area.

Hypothesis

The following hypothesis would be tested.

Hoi: There is no significant relationship between cocoa farmers' source of information and cocoa farmers awareness towards the use of IPM practices on pest and disease control in the study area.

Materials and Methods

Sampling procedure and sample size.

The study was carried out in Osun state where there are four ADP circles, namely, Ilesha, Ife, Osogbo and Ede circles. Two of these circles namely Ilesha and Ife circle were randomly selected for the study. From these 2 circles two communities each planting cocoa were selected to make a total of four communities. From the 4 communities selected, 30 cocoa farmers per community were administered with well-structured questionnaire to make a total of 120 respondents.

Results and Discussion.

Most of the respondents (82%) were male while the remaining 18% were female, this could be attributed to the tedious nature of cocoa farming and the land tenure system in the study area which favours men see Fig.1

The study shows that 23.3% of the respondents were between age 21 and 40 years while 60% were in the range of 41-60 years, the remaining 16.7% were above 61 years see Fig. 2. This implies that few youth are involved in cocoa farming in the study area, which is a development in negative direction.

Farmers' awareness of IPM practices by cocoa farmers

The awareness level of the use of IPM strategies in pests and disease control is very low among the respondents. Only 20% claimed to be aware of IPM practices. This implies that there is the need to emphasize the use of IPM practices see Fig. 3.

Source of Information

The result shows that the most important sources of information to cocoa farmers on use of IPM is social group and neighbours followed by farmers organizations and radio while bulletin or handbills provides little information to cocoa farmers see table 2. This shows that farmers need to be encouraged to join farmers' organizations or form farmers cooperative where it does not exist.

Testing of Hypotheses

Ho_i: There is no significant difference between the selected personal characteristics (Age, gender farming experience educational status and leadership role) of farmers and cocoa farmers' awareness of IPM practices in the study area.

The results of chi-square analysis in table 3 shows that sex (P = 0.4), years of farming

(P = 0.57), and farm size (P = 0.76) did not show any significant influence on awareness of respondents on the use of IPM in pests and disease control. While age (P = 0.021), educational status (P = 0.03). Organizational membership (P = 0.001) and training attendance (P = 0.03) significantly influenced the awareness of respondents on the use of (IPM in pests and diseases control. The contingency co-efficient for educational status organizational membership and training attendance of 0.6, and 0.7 respectively revealed a very high relationship between these variable and awareness.

Conclusion and Recommendations

This study assessed cocoa farmers' awareness towards the use of integrated pest management (IPM) practices in Osun state. The study concludes that the awareness level of cocoa farmers in the study area is low. Also the study revealed that significant relation exists between information sources, educational status training attendance, age organization membership and awareness of IPM practices on pest and disease control in the study area.

It is recommended that governmental and non-governmental organizations should make efforts to carry out sensitization programes to enlighten cocoa farmers on the danger of concentrating solely on use of chemicals in pests and diseases control on cocoa farms and regular training should be organized for cocoa farmers on the usefulness of adopting the IPM practices in pests and diseases management to enhance cocoa production in the study area.

pp. 7-9.
David Sonii, Agororku S., Bassanga, S., Couloud J.Y., Kumi M.A., Okuku I., and Wandji D. (2005). A field guide for conducting farmer field schools on cocoa integrated crop and pest management. P 1-66. Sustainable Tree Crops Program.
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Vos, J.M., Ritchie. B.J., Flood, J., (2003). Discovery learning about cocoa. An inspirational guide for training facilitators. CABI Bioscience. UK. Pp. 4-7. Available at: http://www.worldcocoafoundation.org/library

Tables and Figures

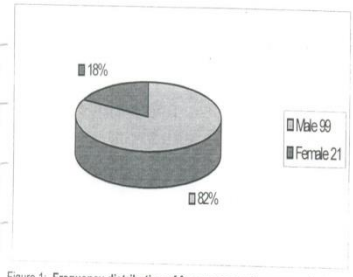

Figure 1: **Frequency distribution of farmers according respondent sex**
Source: Field Survey, 2004

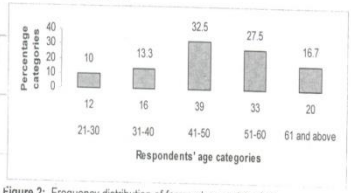

Figure 2: Frequency distribution of farmers' age categories.
Source: Field Survey, 2004

able 1: Distribution of Farmers' Educational Status

Educational Status	Frequency	Percentage
lo formal education	74	61.6
rimary education	21	17.5
Secondary education	19	15.8
Tertiary education	6	5.0
otal	120	100

Source: Field Survey, 2004.

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TABLES AND FIGURES

Figure 2: Frequency distribution of farmers' age categories.
Source: Field Survey, 2004.

Table 1: Distribution of Farmers' Educational Status

Educational Status	Frequency	Percentage
No formal education	74	61.6
Primary Education	21	17.5
Secondary education	19	15.8
Tertiary education	6	5.0
Total	120	100

Source: Field Survey, 2004.

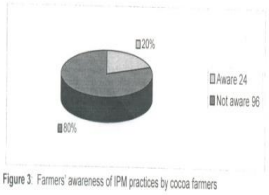

Figure 3: Farmers' awareness of IPM practices by cocoa farmers

Table 2: Ranking of Farmers' according to sources of information

Source of Information	Not at all		Rarely		Frequency		Very frequently		Info. Score	Rank
	Freq.	%	Freq.	%	Freq.	%	Freq.	%		
Radio	23	19.2	31	25.8	22	18.3	44	36.7	207	3rd
TV	43	35.8	22	18.4	30	25.0	25	20.8	157	4th
Social group/Neighbours	29	24.2	5	4.2	10	8.3	76	63.3	253	1st
CRIN	72	60.0	8	6.6	20	16.7	20	16.7	108	6th
Cocoa buying agents	76	63.3	13	10.9	12	10.0	19	15.8	94	7th
ADP	24	20.0	65	54.2	17	14.2	14	11.7	141	5th
Farmers' organizations	12	10.0	20	16.7	38	31.7	50	41.7	246	2nd
Bulletin/hand bills	92	76.7	10	8.3	8	6.7	10	8.3	56	8th

Source: Field Survey, 2004.

Table 3: Chi-square analysis showing significant difference between the selected personal characteristics cocoa farmers' awareness of IPM practices in the study area

Variables	Df	Contingency Coefficient	P value	Decision
Sex	1	0.4	0.45	NS
Age	4	0.03	0.021	S
Educational Status	3	0.6	0.03	S
Organizational membership	1	0.5	0.001	S
Years of farming	2	0.2	0.57	NS
Farm size	3	0.31	0.76	NS
Training attendance	1	0.7	0.003	S

Source: Field Survey, 2004

References

CBN (1998). Annual report and statement of accounts for the year 1998. Central Bank of Nigeria pp. 7-9.

David Soni, Agororku S., Bassanga, S., Couloud J.Y., Kumi M.A., Okuku I., and Wandji D. (2005). A field guide for conducting farmer field schools on cocoa integrated crop and pest management. P 1-66. Sustainable Tree Crops Program.

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Figure 3: Farmers' awareness of IPM practices by cocoa farmer

Table 2: Ranking of Farmers' according to source of information

Frequency Source of Information	Very Frequency		Not at all Info		Rarely		Rank
	Score		Freq.	%	Freq.	%	Freq
Radio	23	19.2	31	25.8	22	18.3	44
36.7	207	3rd					
TV	43	35.8	22	18.4	30	25.0	25
20.8	157	4th					
Social	29	24.2	5	4.2	10	8.3	76
63.3	253	1st					
Group/Neighbours	72	60.0	8	6.6	20	16.7	20
16.7	108	6th					
CRIN	76	16.3	13	10.9	12	10.0	19
15.8	94	7th					
Cocoa buying agents	24	20.0	65	54.2	17	14.2	14
11.7	141	5th					
ADP	12	10.0	20	16.7	38	31.7	50
41.7	246	2nd					
Farmers'	92	76.7	10	8.3	8	6.7	10
8.3	56	8th					
Organizations Bulletin/hand bills							

Source: Field Survey, 2004.

Table 3: Chi-square analysis showing significant difference between the selected personal characteristics cocoa farmers' awareness of IPM practice in the study area.
Source: Field Survey, 2004.

Variables	df	Contingency Coefficient	P value	Decision
Sex				
Age	1	0.4	0.45	NS
Educational Status	4	0.03	0.021	S
Organizational membership	3	0.6	0.03	S
Years of farming	1	0.5	0.001	S
Farm size	2	0.2	0.57	NS
Training attendance	3 1	0.31 0.7	0.76 0.003	NS S

References

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Mark N.T. (2000). Review of production consumption, stock and prize-11.Cocoa Grower Bulletin No. 52 November, Pp 6-8

Vos, J.M.., Ritchie. B.J.., Flood, J. (2003). Discovery learning about cocoa. An Inspirational guide for training facilitators. CABI Bioscience. UK. Pp. 4-7. Available at: Http:/www.worldcocoafoundation.org/library.

Experimental Title: Status of excursion visits of students and organizations to CRIN Ibadan Oyo State, Nigeria. (Agbongiarhuoyi A.E.)

Introduction

Excursion or guided educational tour can better be described as an academic tour into the land of knowledge acquisition for purpose of acquiring practical knowledge and skills for a specified operation. In Cocoa research Institute of Nigeria (CRIN), excursion visits are vital strategies in educating and disseminating research findings on the Institute's mandate crops: Kola, Coffee, Cashew and Tea to the public. Visitors are intimated with all aspects of production including marketing, value addition and management.

Objective:

The main objective is to assess the situation of excursion visits by students and group to CRIN, Ibadan (2002-2006).

Justification:

Cocoa Research Institute of Nigeria (CRIN) has made a lot of tremendous progress in her research mandate crops: Cocoa, Kola, Coffee, Cashew and Tea. It could be waste of effort, time and resources if developed technologies are left on the shelf without bringing them to the awareness and adoption of end-users. Guided educational tours (Excursion) therefore, assist in exposing students, farmers and other stakeholders to available and perfected CRIN technologies, which would improve production, productivity and knowledge development of clientele. Excursion aids in the development of individuals including systematic training and instruction of young people Hornby (1974)

Materials and Methods

Data for 2002 to 2006 was collected from Extension Group in charge of the official records of excursion, CRIN Ibadan and also through oral interview. The data were analysed using descriptive statistics

Results and Discussion

Table 1 showed the distribution of visitors on excursion to CRIN, Ibadan according to States in Nigeria. The results revealed that majority of visitors (52.54%) comprising students (Nursery/Primary, Secondary and Tertiary School), farmers and religious groups came from Oyo State while 12.86 percent was from Ogun State. The turn out from FCT, Sokoto, Kaduna, Niger, Eboyin, Kwara, Imo and Kogi States were very low. Also, the turn out from Adamawa, Edo, Ondo and Enugu State were low. The low turn out could be attributed to distance from such States Oyo and Ogun State gave appreciable turn out because of their proximity to CRIN. The tables equally revealed that between 2002 and 2006, 5,784 visitors came to CRIN and were enlightened on the Institutes' research technologies and development..

Within the period the under study, visit of people mainly students to the Institute was highest in 2005 (1,473) and lowest in 2002. The sections visited during the periods were Entomology, Agronomy, Crop processing and utilization, Plant Pathology and Plant Breeding. Others include Extension, Economics and statistics, Plantation management, Nursery, Fermentary and Administration. Visitors were impressed and satisfied with the level of technologies available and on-going work within and outside laboratories.

Table 2: indicates the distribution of school/organizations to CRIN, Ibadan from different states between 2002 and 2006. The result showed that 108 schools as well as farmers and religious group came for excursion. This number is low when

compared to the number of schools from Oyo State while 14.81 percent was from Ogun State 5.55 percent was next to Lagos and others as specified in table 2. It therefore means that Oyo and Ogun States utilized the opportunities of the closeness of CRIN to exposed students in their schools to various agricultural knowledge, skills, innovation and potentials in the institute. In both table 1 and 2, nineteen states visited the institute.

The pie chart in figure 1 indicates the categories of visitors on excursion to CRIN, a 99.15 percent-represented student visitors, 0.50 percent was farmer group while 0.35 percent was religious group. It therefore implies that students constituted the greatest proportion of visitors to CRIN between the periods under investigation.

Conclusion

Excursion visits to CRIN revealed that students constituted the highest proportion of visitors. Excursion plays a significant role in exposing, sensitizing and educating group of people on practical knowledge in Agriculture. The dissemination of research results to stakeholders in the Cocoa, Kola, Coffee,, Cashew and Tea industries through excursion visits had in no small way contributed to the promotion of CRIN technologies to virtually all geo-political zones in Nigeria.

It is recommended that excursion among farmers to agricultural research institutes be encouraged by government, NGOs and research institutions in order to strengthen research-farmer linkage. More students participation in guided educational visits should be enhanced through their state ministries of Agriculture and Education. This would bring about increase production and food security.

Outlook: It is expected that with appropriate government policies in the agricultural sector, in three years time, more farmers, and students involvement in excursion would be recorded.

Constraints

Inadequate funding and power supply militated against the study.

Table 1: Distribution of visitors on Excursion to CRIN, Ibadan according to States, (2002 – 2006)

YEAR	2002	2003	2004	2005	2006	TOTAL	PERCENTAGES
STATES							
Oyo	294	876	444	525	600	3,039	52,54
Ogun	17	49	137	196	345	744	12,86
Lagos	30	141	27	90	54	342	5.91
Ondo	11	26	0	60	15	112	1.94
Osun	0	2	95	269	0	366	6.33
Ekiti	0	0	0	186	130	316	5.46
Delta	50	81	82	0	0	213	3.68
Edo	0	80	0	0	0	80	1.38
Enugu	0	66	0	47	0	113	1.95
Imo	0	0	50	0	0	50	0.86
Ebonyin	0	33	0	0	0	33	0.57
Kwara	0	31	0	0	10	41	0.71
Kogi	0	0	0	0	52	52	0.90
Niger	0	0	0	20	18	38	0.66
Kaduna	0	0	13	0	0	13	0.23
Bauchi	60	0	0	80	0	140	2.42
Adamawa	0	0	0	0	65	65	1.12
Sokoto	0	0	0	0	24	24	0.42
FCT	0	3	0	0	0	3	0.05
TOTAL	762	1388	848	1473	1313	5,784	100

Source: Extension Group, CRIN

Table 2: Distribution of Schools/organisations on Excursion to CRIN according to States, 2002 – 2006.

STATE	2002	2003	2004	2005	2006	TOTAL	PERCENTAGE
Oyo/Ogun	9	15	8	10	10	58	48.14
Lagos	1	2	2	5	6	16	14.81
Ondo	1	2	1	1	1	6	5.55
Osun/Ekiti	1	1	0	2	1	5	4.63
Delta	0	1	2	2	0	5	4.63
Edo	0	0	0	2	1	3	2.77
Enugu	2	2	1	0	0	5	4.63
Imo	0	1	0	0	0	1	0.93
Ebonyin	0	1	0	1	0	2	1.85
Kwara	0	0	1	0	0	1	0.93
Kogi	0	1	0	0	0	1	0.93
Niger	0	1	0	0	1	2	1.85
Kaduna	0	0	0	0	1	1	0.93
Bauchi	0	0	0	1	1	2	1.85
Adamawa	0	0	1	0	0	1	0.93
Sokoto	1	0	0	1	0	2	1.85
FCT	0	0	0	0	1	1	0.93
TOTAL	0	0	0	0	1	1	0.93
	0 15	1 28	0 16	0 25	0 24	1 108	0.93 100

Table 2: Distribution of Schools/organisations on Excursion to CRIN according to States, 2002 – 2006.

STATISTICS - SOCIO ECONOMICS AND TECHNO-ECONOMICS STUDIES
PROGRAMME: AG.PROGRAMME
LEADER: SANUSI, R.A

Experimental Title: Determinants of managerial capabilities of small scale cocoa farmers in Oyo State of Nigeria. (Shittu, T. R.; Adejumo, M. O.. & Lawal, J.O.)

Introduction

The problem of management is more acute for small holders who personally face the difficulty of earning a net income that is inadequate for their needs.

Management on cocoa farms is a very important aspect of cocoa production and therefore cocoa production should be more of a business than a way of life. Profit from cocoa cultivation can be increased through good management practices of the farmers. There are five major resources which the farmers need to manage on their farms and these resources are, the soil, climate, the tree, human resources and time.

Objectives

The specific objectives addressed by this study are as follows:-

(1) Examination of problems associated with managerial capabilities of cocoa farmers in the study area.
(2) Determination of profitability of cocoa farms.
(3) Investigation of the socio-economic variables on farms' managerial ability.
(4) Identification of major constraints to cocoa production.

Methodology

Data for the study were collected through the use of structured questionnaire. The respondents were selected using the multistage sampling techniques. Ten cocoa growing local governments, four areas in Oyo state were randomly selected. In each of the selected local governments, four villages were randomly selected and five (cocoa growers) farmers were chosen in each village to give a total of 200 farmers. For analysis, only 172(86%) of the administered questionnaires were found useful.

Descriptive statistics such as frequency distribution, mean, range and percentages where used for socio-economic variables while principal component analysis (PCA) was used to capture the selected variables that influenced managerial capabilities of the respondents.

Results and Discussions

Table 1 showed that cocoa farmers in the study area are dominated by old people with the mean age of the respondents being 59 yrs. About 93.1% of them are over 40 years of age while only 6.9% were less than or equal 40 years.

The land in the study area was mainly acquired through inheritance and 53% of the farmers have farm size of less than one hectare each, then about 40% have farm sizeof between one and three hectares while only one percent have farms large than five hectares. The average farm size is 1.33 hectares.

Labour which is another resource were either family (9.7%), hired 29.2% or family and hired 61.1% depending on the operation to be performed. Hired labour is only employed in most cases at the peak period during weeding and harvesting.

Cocoa farming activities in the area is usually constrained by lack of credit as 83.3 percent of the respondents meet their farm expenses from personal savings while the remaining 16.7 percent finance theirs through borrowing from different sources such as money lenders, friends etc.

Table 3 presents the PCA, the table gives the eigen-values, the proportion and the percentage cumulative variation in order of size of roots. The first component is observed to contain about one fifths of the total variation in the forty five variables. Only five components comprise about half of the total variation. The remaining components account for the rest of the variation. The eigen-value of 0.978 obtained provides an index of how well this particular solution accounts for all the variables taken together implying that the variables are not different from each other and they account for all the groups.

Table 3 was used to interpret the result as it gives all the significant ($P > 0.23$) zero order correlation coefficients of the variables with five components that have more than 2.3 variation of the total output.

From table 3, farmers age, educational level, family size, farm objective, purchase of labour service and amount spent on labour have positive influence on the farmers managerial ability. Other variables that positively influence the managerial ability of the farmers are purchase of transport service and its cost, off-farm/ occupation, marker place for cocoa output,

places where highest price is obtainable for cocoa beans, average income from cocoa. All these reduces the waste tendencies, promote better resource management, increased economic efficiency, better utilization of time during slack period in cocoa agriculture, and readiness to accept innovations that increase their output.

On the other hand, sources of credit, time and effectiveness of spraying, cocoa variety grown, source of labour, number of mandays used in land preparation have negative impact on managerial ability of cocoa farmers in the study area. The following explanations could be adduced in respect of these variables; they are either spending a good part of their time travelling up and down to negotiate for credit, time that could have been better spent attending to farm duties; spraying could have taken place at the wrong time with the use of unapproved but cheaper sprayers and chemicals. They could have also planted old amelonado varieties which have lower yield than newer varieties that are high yielding, pests and diseases resistance.

The number of mandays for land preparations and planting of food crops negatively impacted on farm managerial ability probably because returns per unit of labour expended on cocoa cultivation is greater than on food crop cultivation.

In summary, seventeen out of the forty five factors considered are having positive impact on managerial ability of cocoa farmers in the study area. On the other hand, seven (source of labour, purchase of fungicide, cocoa variety grown, source of credit, number of mandays for land preparation and planting as well as effectiveness of spraying) have negative impact on the managerial capabilities of small scale cocoa farmers in the study area.

Conclusion

Managerial capabilities of farmers are age, labour, sources of credit, farm size and farm objective dependent which if properly harnessed and implemented, permeates all major activities and decision making which improved farmers' productivity. Therefore, to provide superior farm performance over the long run there is managerial capabilities on one hand combined with first rate implementation and strategy execution on the other. The chances are that when a farmer has a well-conceived, well executed cocoa production strategy; he will be a high performer i.e. in terms of productivity, CRIN necessarily have to incorporate managerial capability improving elements in extension packages for farmers.

Future outlook:

It will be of benefit to have CRIN contact (cocoa) farmers who would be thought the act of record keeping so as to examine its effect on managerial capability of farmers.

Constraints:

Mainly insufficiency of fund.

Table 1: Socio- Economic Characteristics of Sampled Cocoa growing farmers

Characteristics	No of Respondents	% of Respondents
(a) Age (years)		
Less than 30		
31 – 40	12	6.94
41 – 50	29	16.67
51 – 60	45	26.39
61 – 70	55	31.94
> 70	31	18.06
Total	**172**	**100**
(b) Farm size		
0.1 – 1.0	91	52.8
1.1 – 2.0	55	31.9
2.1 – 3.0		
3.1 – 4.0	14	8.3
4.1 – 5.0	10	5.6
> 5.0		-
	2	1.4
(c) Labour source		
Family labour	17	9.7
Hired labour	50	29.2
Family/Hired labour	150	61.1
(d) Credit source		
Personal savings	143	83.3
Others: Friends, Coop, Banks, local lender, etc	29	16.7

NB: N=172

Source: Field survey 200

Table 2: Latent Roots of Orthogonal Transformation for the Forty-five Variables

Component Number	Eigen value	Proportion	% Cumulative Variation
1	7.77141	17.7	17.7
2	3.87921	8.8	26.5
3	3.33315	7.8	34.1
4	3.03510	6.9	41.0
5	2.45244	5.6	46.5
6	2.15298	4.9	51.4
7	1.83764	4.2	55.6
8	1.74955	3.9	59.6
9	1.59968	6.6	63.2
10	1.37661	3.1	66.3
11	1.31832	3.0	69.3
12	1.27906	2.9	72.2
13	1.16330	2.6	74.9
14	1.12138	2.5	77.4
15	1.04830	2.4	79.8
16	1.01784	2.3	82.1

Table 3: Zero Order Correlation Coefficients, Variables with Components Significant of Output.

Variable	Component				
	1	2	3	4	5
X1				0.2378	0.3089
X2				0.2781	
X3				0.2646	0.2646
X4		0.2721			
X5				0.2561	0.2915
X6		-0.3872			
X7					
X8					
X9					
X10					
X11			0.3163		
X12		0.2436			
X13					
X14					
X15			0.4612		
X16					
X17					
X18			0.3271		
X19					
X20					
X21					
X22		0.4452			
X23					
X24					0.2561
X25					
X26					0.2752
X27					
X28					0.2475
X29					
X30					
X31					-0.2718
X32					
X33		0.3107			
X34					
X35		0.3135			
X36		0.2767			
X37					
X38					
X39					
X40					
X41				-0.3309	
X42				-0.3433	
X43					
X44					
X45					

	0.2825
	0.3050
	0.3030
	0.2952
	0.2630
	-0.2821
	-03134

Experimental Title: Socio-economic variables and cocoa production in Cross Rivers State, Nigeria.
(K.A. Oluyole and R.A. Sanusi)

Introduction

Nigeria as a developing country was rated the second largest world producer of cocoa in the 1960s (Adegbola and Abe, 1983), and, for a long time, the crop has been generating substantial foreign exchange earnings for the country. However, the production of this important cash crop for export has suffered a reduction in the recent years in the country owing to a number of factors.

Villalobos (1989) identified some of these factors as low yield, inconsistent, production patterns, disease incidence, pest attack and use of simple farm tools. In addition, Adegeye (1997) identified ageing cocoa farms as one of the factors responsible for the decline in cocoa production in south western Nigeria. He observed that many farms were over 40 years old and such farms constitute as much as 60% of the cocoa farms in Nigeria. Apart from these, socio-economic variables of farmers such as age, sex, level of education and marital status have been found to have substantial impact on production. According to Nelson and Phelps (1966), education is a measure of human capital and it reflects the ability to implement technology. Hence, education is expected to increase technology adoption and output of the farmers. In this study, the socio-economic characteristics of the farmers were used, in assessing cocoa farmers' production in the study area.

Objective

The specific objectives of the study are:-

(i) to describe the socio-economic characteristics of the respondents.

(ii) to evaluate the effects of socio-economic variables of cocoa farmers on cocoa production.

Methodology

The study was carried out in Cross Rivers State of Nigeria. Cross River State is known as the second largest cocoa producer in Nigeria (MANR, 2006). Out of a total of fourteen cocoa producing Local Government Areas (LGAs) in the state, four LGAs were selected for this study.

The LGAs selected include Ikom, Etung, Obubra and Boki. A total of fifty respondents were selected for

interview and the information was collected from the respondents with the aid of structured questionnaire. The date collected was analysed using descriptive statistics and regression analysis. Descriptive statistics was used to analyse the socio-economic variables of the respondents, while regression analysis was used to analyse the effect of the socio-economic variables of the respondents on the level of cocoa production. Explicitly, regression model is expressed thus:

In Y = ao+a1X1+a2X2+a3X3+ a4X4+a5X5+U

where:

Y = Cocoa output (Tons);

X1 = Age (Years);

X2 = Sex (Male = 1, Female = 2);

X3 = Marital statues (Married = 1, Single = 2);

X4 = Household size;

X5 = Educational level (X5 = 1 if farmer has formal education, and X5 = 2 otherwise);

U = Random error term.

Results and Discussion

Youths of age bracket 20-30 years had the highest proportion (36%) of the respondents (Table 1). This is closely followed by the respondents with age 41-50 years (30%). However, the least proportion of 10% is by the age bracket 31-40 (Table 1). The result however showed that there was a wide spread of respondents among all the age groups. This implies that cocoa farming is embraced by all the age groups of the respondents in the study area. Table 1 also showed that majority of the respondents (92%) were males while just few (8%) were females, showing that majority of cocoa farmers in the study area are males. This is so because cocoa farming is a tedious job and requires more strength which females may not be able to provide. Furthermore, from Table 1, most of the respondents (86%) were married while just 14% were single. As regards the educational level of the respondents, it could be observed from Table 1 that majority of the respondents had tertiary education. This is an indication that some graduates were involved in cocoa production in the study area. This is a good pointer to improved productivity as the level of education is a tool with which an individual could be efficient at whatever endeavour being undertaken by the individual (Oluyole and Usman, 2006).

As regards the farm size, a high proportion of the respondents (33%) had not more than two hectares of farm while only 18% of the total respondents had between six and eight hectares of farm. This however shows that most of the respondents were small scale cocoa farmers. However, the reason given by most of the farmers for not expanding their farms was lack of fund. Apart from this, one of the problems affecting the farmers in the study area is the lack of roads. Most of the farms could not be reached by vehicles; hence it is very difficult for the proceeds from such farms to be brought to the market.

The result of the regression analysis (Table 2) shows that out of six explanatory (socio-economic) variables used, only two variables were significantly affected the level of cocoa production in the study area ($p< 0.05$). This is due to the fact that the more a farmer is formally educated, the more the ability to be efficient and hence the more will be the productivity of the farmer. Farm size of the respondents was also found to significantly affect the production level of cocoa in the study area ($p< 0.01$). This is so because the hectarage of a farm, the more will be the output from the farm (especially if the farm is given the desired agronomic/management practices). Other variables that did not to significantly affect the level of production in the study area were age, sex marital status and household size.

Conclusion

Higher proportion (36%) of cocoa farmers in the study area are youths within the age bracket 20-30 years. This is however a good pointer to an increased cocoa production in the study area simply because youths would have more strength to work than old people.

Majority of the respondents (80%) had formal education while 20% had no formal education. This also embraces increases production level since those that are educated would be able to adopt new technologies more because they would be able to read the instructions guiding the adoption of such technologies. A high proportion (38%) of the respondents were small scale farmers, that is, their farm size was not more than two acres. While few respondents significantly affected the level of cocoa production I the study area. However, it was discovered that other socio-economic variables considered such as age, sex, marital status and household size were found not to have significantly affected the level of production.

Since education level was found to have significantly affected the level of cocoa production, then farmers

could e encouraged to improve their level of education. This could be in form of attending adult literacy programmes. This will however assist the farmers to be able to read and write to an extent and hence increase their efficiency.

Government (or any non-governmental organization) should assist the farmers with soft loans so as to enable the farmers to be able to expand the hectarage of their farms since production level was found to have significantly affected by farm size. In addition, farmers should assisted to provide the necessary infrastructural facilities such as road network, this will in no small way help the farmers especially in evacuating their proceeds from farms to the markets.

Future outlook:

It is necessary to investigate:- i. the accessibility of (cocoa) farmers to agricultural credits; ii. Facto(s) responsible for low level of investment in cocoa cultivation particularly by the youths, iii. Evaluate the existing land tenure with regards to impact(s) on cocoa cultivation.

Constraints: i. Insufficiency of fund; ii. Uncooperative/suspicious attitude of farmers.

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Table 1: Socio-economic Variables of the Respondents

Variable	Frequency	Percentages
Age (years)		
20-30	18	36
31-40	5	10
41-50	15	30
51-60	6	12
> 60	6	12
Total	**50**	**100**
Sex		
Male	46	92
Female	4	08
Total	**50**	**100**
Marital status		
Single	7	14
Married	43	86
Total	**50**	**100**
Educational levels		
Non-formal education	10	20
Primary education 11	22	
Secondary education	23	46
Tertiary education 6	12	
Total	**50**	**100**
Farm size (Ha)		
0-2	19	38
2.1-4	10	20
4.1—6	12	24
6.1-8	9	18
Total	**50**	**100**

Source: Field survey, 2006

Table 2: The Regression Result

Variables	parameter Estimates	Std. Error	T
Constant	-4.294	4.581	-0.937
Age	-1.22E-02	0.071	-0.170
Sex	0.531	1.877	0.283
Marital status	3.114	2.031	1.533
Household size	0.366	0.376	0.972
Educational level	1.638**	0.706	2.321
Farm size	1.578*	0.220	7.171
R^2	0.588	-	-
Std. Error	0.03300	-	-
DW	1.937	-	-
F	10.217	-	-

Source: SPSS Software Computer Printout
** Significant at 5% level, * Significant at 1% level

Experimental Title: Information source and its implication on cashew farming in Oyo State (E. Uwagboe; B. Obatolu And S. Adeogun)

Introduction

In Nigeria an estimated 80% of its population is involved in agriculture and a reasonable proportion of this population is considered to be illiterate and practice their farming activities in small farm holdings (CBN, 2002; and World Bank, 2004.)

Agricultural extension service over the years has focused on the transfer of technology to farmers especially in the areas of crop management, resource management and improved storage practices (Lipton, 1989, and Reijntjes et al, 1999). The effectiveness of extension service delivery is believed to have been limited as a result of prevailing socio-cultural and economic circumstances of not only the farmer, but more importantly prevailing authorities either government or non-government agencies that are expected to carry out the task social change (Ferrington et al, 2002; Roling and Wagemakers, 1998).

Information on new technologies and innovations reaches a large proportion of farmers through personal contacts such as visits from extension agents while electronic and other mass media methods are scarcely used; the high cost of print media and time slots through electronic media as well as an inappropriate and inconsistent government policy could be attributed for the high reliance on personal contact especially in developing countries (Van Woerkun, 2002).

Interpersonal communication is regarded to be an effective but not sufficient method of bringing about social change especially among the rural poor. Leeuwis (2004) opined that some of the functional qualities in personal communicative intervention strategy include the following amongst others;

i. In-dept dialogue
ii. Active learning and opinion formation
iii. Tailor-made
iv. Collective iddues
v. Time flexibility
vi. High spatial flexibility
vii. High relational support

However, despite the numerous benefits that can be gained through interpersonal contacts with change agents, some farmers still have problems in making themselves available to these agents. Rolings (1988) suggests that as a result of disappointments from prior failed intervention strategies some groups of farmers inevitably fill insecure with new ideas and more importantly with change agents. On the other hand however, Rivera and Zip (2002) showed in recent studies or emerging economies, interpersonal contacts by change proved a vital role and not “cashing in” on the trend could leas to “slow growth economies”.

There is however a need to reposition agric extension service in developing countries especially in recent times as there is an increased need for information by farmers in the areas of markets and better pricing in view of globalisation, liberelisation and the “know how” of farmers can form bargaining, cooperatives and pressure groups.

Cashew is one of the most important cash crops in Nigeria. Federal office of Statistics (FOS, 2001) estimated that 15,000 metric tonnes of cashew nuts are expected annually grossing $702 million/year to the national economy. Ezeagu (2003) stated that there are over 20 states producing cashew of commercial quantity in Nigeria of which Oyo state is one of them. Hence, cashew is grown in all ecological zones in Nigeria. An estimated hecterage of 60,000 is considered to be devoted to the cultivation of cashew of which 60% are owned by small scale farmers (Olunloyo, 1996).

Cashew marketing involves domestic and export trade, a trade, a larger proportion of domestic produce is exported. Despite its varied uses, cashew not attained has not attained its full potential in Nigeria as most of the fleshy parts go to waste whereas it could be useful in the beverage and confectionary industry as stated by Akinwale (2004) and Aroyeun (2004). On the other

hand the industry uses of cashew such as in buildings & construction, printing, pharmaceuticals and automobile industry is begging for attention.

Statement of the problem: Due to the varies and immense benefits of communication methods of information flow on various farming activities, it is of interest to discover farmer's preference of source of information, and how such methods has been transmitted into positive increased productivity between contact and non-contact farmers in the cashew industry in Nigeria.

Objectives: The specific objectives of the study are:

1. to determine the preferred sources of information available to cashew farmers.
2. to determine the types of information available to farmers.
3. to compare effect of information supply between contacts and non-contacts farmers.

Methodology

The study was carried out in Oyo State, in Ogbomoso area which is located approximately 8^0 North and 4^0 East. The vegetation type is derived savannah with a rainfall regime of between 1500-2000mm / year. Agriculture is the main stay of the economy in the rural areas (arable and tree crop) while the urban centres are more involved in trading and service delivery. A multistage sampling technique was used in the study. 176 farmers were randomly selected from 3 cashew growing Local Government Areas (LGA's) which included contact and non contact farmers. The LGA's are Surulere, Orire and Ogbomoso North. The instrument for collection of primary data was questionnaire.

Table 1. Distribution of Contact and Non-Contact Farmers in Different LGA's

	Surulere LGA	Orire LGA	Ogbomoso North
Contact farmers	29.6 (40)	40.7 (55)	29.7 9 (40)
Non-Contact farmers	36.5 (15)	34.1 (14)	29.3 (12)

* Frequency in Parenthesis, Source: Field Survey 2005

Results and Discussion

There were various sources of information used by the farmers. Extension agents were ranked as the most important source of information while this was closely followed by source from friends, while television and radio were the least used sources respectively. Table 2 shows the position of ranks of the various sources of information.

Table 2: Rank Distribution of Respondents Based on Source of Information

Source of Information	Rank of farmers
Extension Agents	1 (76%)
Friends	2 (66.4%)
Radio	3 (17.6%)
Cashew Association	4 (1.7%)
Television	5 (1.1%)
Research Institute	5 (1.1%)
News Papers	7 (>1%)

*Percentages in Parenthesis. (Total percentage exceeds 100% as a result of multiple responses)

Source: Field Survey, 2005

Extension agents and friends provide interpersonal communication. However, extension agents can provide better quality service hence (76%) ranked. It as the first imformation source delivery compared to "friends" as technical details in information can be better explained by extension agents as they have received adequate training on the different issues of interest. Sadly, television is scarcely relied upon for information, this however does not suggest that it is not used by some agencies but rather it connotes a possibility of lack of awareness of existing programmes. Newspapers is probably not a delight to farmers considering that a greater percentage of farmers are not literate enough to utilise them, this does not suggest that there a drought of information in the print media on agriculture.

Information on agriculture issues covers various areas. Table 3 shows the rank of various areas of information to farmers.

Table 2: Rank Distribution of Respondents Based on Source of Information

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*Percentages in Parenthesis. (Total percentage exceeds 100% as a result of multiple responses)

Source: Field Survey, 2005

Table 3: Rank of Farmers Based on Preference Areas of Agricultural Information

Areas of Agricultural Information	Rank of farmers
Cultivation Methods	1 (96%)
Market Information	2 (60%)
Access to farm input	3 (43%)
Proper methods of storage	4 (19.3%)
Processing methods	5 (3.4%)

*Percentages in Parenthesis. (Total percentage exceeds 100% as a result of multiple responses)
Source: Field survey, 2005.

Farmers require a number of cultivation information especially on techniques of ensuring good management practices that will increase productivity. From Table 2 it was observed that information on cultivation methods (96%) was the most vital while information on market information ranked second (60%). Market information is considered very important as it ensures that produce will be promptly evacuated to avoid spoilage when there is proper linkage between producer and buyers. Information on processing methods (3.4%) is the least required this is not unconnected to the fact that adding value through processing of cashew is still at an infant stage in the Nigerian cocoa industry. Till date, majority of the primary produce of cashew which is the cashew nut is still being exported.

Farmers are believed to be anxious of increased their productivity in the face of limited resources, however it is noteworthy to mention that some farmers are equally caution of exposing themselves to change agents, this is not unconnected to the previous experiences of the past failure of some development initiatives which has made such farmers do develop an apathy towards change agents. Hence, the basis selecting contact and non contact farmers.

Table 4: Mean Distribution of Farm Size, Revenue and Yield of Contact and Non-contact Farmers

Variable	Contact Farmers	Non-contact Farmers	Overal Mean		Variance(vr)	Probability(P)
Farm size (ha)	2.54	1.47	2.41	4.21		0.042*
Revenue (N)	176,441	112,883	168,858	1.97		0.163
Yield (Kg)	39,084	12,095	35,864	7.64		0.006**

Source: Field survey, 2005
*Significant at 5%, *Significant at 1%

Mean Farm size of contact farmers was 2.45ha as against 1.47ha for non-contact farmers this was significant ($p<0.05$). The results suggest that size of farm could be a contributing factor as at the need to have personal contact with farmers since such farmers would have more at stake in production. Revenue on the other hand was not significantly different when compared for the two groups op of farmers, though yield showed a high significance ($p<0.01$). The result of the analysis of variance suggests that though revenue was not significantly different, this is attributed to the common rural practice of farmers where they use their farm produce to settle creditors (creditors could be the licensed buying agents who provided financial assistance to farmers for their agricultural or domestic commitments). Hence, the resultant scenario would lead to a short fall in revenue in comparison to total actual production capacity. Correlation (r) results showed that farm size and output is correlated for contact farmers (r = 0.75) while it was not for non-contact farmers
(r =0.03).

Conclusion

Farmers are rational human beings and problems of the past seem to linger on for many years. As much as many know the usefulness of information there is still a researvation based on the failure of some previous promises of "green revolution" and the likes. There is a

need to exploit the benefits of interpersonal communication through the use of extension agents considering that it is the most preferred source of information, being aware of its strong potential in enhancing decision making through collective approach, time flexibility and high relational support. However, the quality of information need to be improved from "production driven" to "market driven" and also how farmers can add value to their production. There is a need to find methods of enhancing a full support of all farmers to get involved in holistic approach of using better agricultural practices , since the emphasis in recent times is promoting efficiency of resource use which is the only way of achieving national economic growth. This becomes inevitable as to act contrary will result in reduced activity.

Future Outlook: There is a need to investigate how the farmers can set up small scale processing units on their farms where the apples could be processed as this would reduce the wastage of apples on their farms.

Constraints: Insufficiency of fund

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Experimental Title: Mirid pest infestation and revenue loss of cocoa farmers in Ogun State, Nigeria

(J.C. Anikwe, B.O. Obatolu, T.C.N. Ndubuaku and O.O. Oduwole)

Introduction

The cultivation of cocoa in Nigeria dates back to 1874 when a local chief (Squiss Ibaningo) established a plantation at Bonny in the eastern region. In 1887, the government sent seedlings from the old botanical garden at Ebute-meta (Lagos) up country (Ibadan) for trials. Nigeria reported her first cocoa export in 1900

(Opeke, 2003). The cocoa survey conducted by the Nigerian Cocoa Marketing Board in the early 1950's produced data, which showed that the area of cocoa held by each farmer was only 0.6ha. But these smalhodings of farmers accounted for about 90 percent of aggregate hectarage (Opeke, 1992).

In 1969 alone, cocoa earned N106 million, which accounted for 40% of all agricultural exports for that year (Federal Office of Statistics, 1972). Presently, Nigeria is the fifth largest producer of cocoa in the world after Cote d'ivoire, Ghana, Indonesia and Brazil (ICCO, 2003). This was not so in the 1970's when Cote d'ivoire was placed at a distant third in Africa with 143,000 tonnes behind Nigeria's 196,000 tonnes. Nigerian cocoa output has declined from over 300,000 tonnes in 1971 to 155,000 tonnes in 1995 with average annual growth rates declining from 8.3% during the 1992 – 1996 periods to 1.8% during the 1997 – 2001periods

At this point, it is no gainsaying that among the 1,500 different species of insects pest attacking cocoa, less than two percent is of genuine economic importance (Entwistle, 1972; Wood and Lass, 1989). And in Nigeria, the brown cocoa mired, *Sahlbergella singularis* Haglund (Hermiptera: Miridae) remains the major insect pest of cocoa (Ojelade et al 2005).

The brown cocoa mired, *S. singularis* has been reported as the most important economic insect pest of cocoa dominating control practices. Beans from pods affected by mirids at the early stages are always distorted thereby reducing the quality of the beans. Mirids feed by injecting toxic saliva into plant tissues and this cause extensive damage in the form of dieback on twigs and fan branches (Ojelade et al, 2005).

Statement of the Problem

The resultant loss of cocoa beans as a result of the mirid infestation which is capable of reducing yield by a minimum of 30% if not left unabated, not only reduce the productivity of farmers but equally reduces their revenue derived from cocoa farming.

Objectives of the Study:

i. to find out and compare the extent of mired damage across different Local Government Areas (LGA's)
ii. to find out and compare revenue loss across different LGA
iii. to find out and compare percentage of mirid damage loss against total output loss in different LGA's

Materials and Methods

Study site

The study was conducted across 7 local government areas (which accounts for 80% production) in

Ogun State between February and March 2006. Out of the 52 villages visited for the survey of cocoa production (not reported), only 19 villages were set aside for this study. Ogun state is located in the Southwest of Nigeria from latitude 6-8^{o}N and longitude 2-5^{o}E. Ogun state has an ecology ranging from that of a humid rainforest in the south to that of a derived savannah towards the north. Ogun state has an estimated rainfall of about 1400mm/year and an average annual temperature of 26^{o}Cyear. Twenty Local Government Areas (LGA's) in the state produce cocoa with an estimated 106,000 hectares under cultivation by small scale farmers numbering over 50,000 with a majority having less than 1 hectare/farm family and an annual cocoa production of 10,000-12,000 tonnes/year (Cocoa Development Unit, Ogun State:2006).

Studies on insect pests prevalence and damage symptoms

In every village visited, a minimum of seven farms with average size of 0.5ha were randomly evaluated for obvious damage symptoms of insect pests, giving a total of 194 farms evaluated. 100 contiguous cocoa stands were selected from each farm and assessed for mirid damage on pods and twigs. The number of pods with mirid feeding punctures (lesions) per tree was recorded while trees with dieback conditions as a result of mired attack were counted. This evaluation only gave an indication of the prevalence of the pest.

Method of Analysis

The means of various interest variables was analysed using the analysis of variance (ANOVA) and also the correlation results was tested. Using the estimate of 24 fresh pods producing 1kg of dry weight cocoa (J. Gocowski and O. Oduwole; 2003), the number of pods lost/ha can be used to estimate the expected loss in dry weight of cocoa bean/ha. Percentage loss of cocoa is computed to reflect the loss/ha compared to the total anticipated output of a well manage farm (%loss A)

which is put at 1200kg/ha. Also, the loss is computed as percentage of mean shortfall (420kg/ha) of cocoa expectation/ha (%loss B) the shortfall is the result of deducting the average observed output/ha from anticipated output/ha i.e 1200kg/ha – 780kg/ha = 420kg/ha.

Result and Discussion
Pest Prevalence

Table 1: Gives the summary of all the villages covered during the field survey

Table 1: Cocoa farms selected in different LGA's in Ogun State.

LGA's	Villages	Number of farms
Obafemi owode	Aiyegbani	7
	Olowotedo	8
	Agbedi	10
	Sub total	**32**
Ijebu East	Ojelana	16
	Aba Yellow	12
	Sub total	**28**
Ijebu North	Osuku	11
	Etemi	15
	Aredi	11
	Ajibandele	8
	Erinlamo	11
	Sub total	**56**
Yewa North	Tibo	9
	Imala	12
	Sub total	**21**
Abeokuta North	Aseso	7
	Idi Emi	12
	Sub total	**19**
Imeko Afon	Ibara afon	11
	Gbenla Afon	13
	Sub total	**24**
Yewa South/Ilaro	Igbogbin	12
	Idoggo	13
	Sub total	**25**
	Grand Total	**205**

Source: Field Survey 2006

Table 2: Mean Distribution of Cocoa Pods Loss in Different LGA's In Ogun State from Mirid Infestation

	Overall Mean	Abeokuta	Ijebu North	Ijebu East	Imeko N E	Obafemi	Yewa	Yewa NS
Pods loss/ha	1272	2245	5677	1926	2708	909	1481	2347
Kg loss/ha	53	94	236.6	80	112.8	38	62	97.8
% loss A	4.4	7.8	19.7	6.7	9.4	3.2	5.1	8.15
% loss B	12.6	22.3	56.3	19.1	26.9	9	14.7	23.3

Source: Field survey 2006

Table 2 shows that the loss of cocoa as a result of mirid infestation was an overall mean of 2347 pods/ha. Ijebu East had the highest recorded incidence of 5677 pods/ha and Yewa North had the lowest at 909 pods/ha. The overall variance was 5.8 and F. probably stood at 0.005 which was significant. Results show that mirid accounted for an overall means loss of 23.3%/ha of total loss of cocoa beans on the farm (% loss B) while the overall mean percentage loss of mirid damage as a function of total production was 8.15%
(% loss A) (refer to 2:3)

Table 3: Distribution of villages Based on % loss to Mirid Infestation in Ogun State

% Loss of total loss on Farm	≤10%	≥10.1-2%	≥20.1-30%	≥30.1%
Number of Village	3	10	1	5

Source field survey 2006

Table 3. shows that over 5 villages; Ayegbani, Olowotedo, Ojelana, Aba Yellow and Erinlomo account for over 30% loss of total loss from the farms as a result of mired infestation. On the other hand 3 villages; Tibo, Imala and Aredi contributed less than 10% to total loss on the farmsas a result of mired infestation

Conclusion and Recommendation
In CRIN today, over eight different insecticides have been recommended for routine protection of cocoa farms in Nigeria and myriads of novel insecticides

belonging to different groups are being screened for their efficacies in mirid control (Anikwe, 2005, Pers. Comm.). The following insecticides have been approved by CRIN, viz; Agrothion, Basudin, Dursban, Elocron, Mipcin, Unden, Thiodan, Decis and Craker. Idowu (1989) reported that cocoa farms require two or three sprays of insecticide during the mirid season to effectively maintain cocoa farms from economic loss as a result of mirid damage. However, with the awareness of integrated Pest Management concept, the number of spray applications has been further reduced. The era of blanket or calendar spraying of cocoa farms should be a thing of the past since farmers only need to spray when mirids are present in the field and in sufficient number to cause economic damage. So far in Nigeria, there is nothing like organic cocoa, as synthetic pesticide spray application must be embarked upon to keep plantations productive. The output and revenue loss of reasonable proportion is experienced by farmers. However, more profit is accruable to the farmers in the long run if he engaged in judicious insecticide application on his farm.

Other factors, which militate against increase in production, include the outright refusal to carry out regular phyto-sanitation/cultural practices in the farm such as pruning, weeding, and so on. It has been reported that regular pruning of cocoa farms reduces the incidence of pests attack (Idowu, 1989).

The farmer is better empowered if he can access chemical inputs to control insect pests and diseases problems known to combat cocoa. cocoa yield would drastically increase in Ogun State if through the National Cocoa Development Committee at both State and Local Government levels; ensure that input distribution (such as Insecticides) gets to the real farmers for protection of their farms against obnoxious pests.

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Experimental Title: Physical evaluation of land suitability for cocoa production in Nigeria: A methodology study using Geographic Information System (GIS) (B.O. Obatolu and Oduwole, O.O.)

Introduction

The ecology of the tropical rain forest, which is the case of Nigeria is considered to be highly suitable for the production of cocoa, hence there is a need to maximize the various potentials within this ecology to effectively meet up with the growing global demand for cocoa (Opeke, 2003); (Wood and Lass, 1998). Obatolu (2003) stated that there is an increase in the states in Nigeria clamoring for attention as cocoa producing states, though it is possible that some states just wanted extra funding from the Federal Government while some other states could be rightly justified. Therefore, there is a need to look for the optimum solution regarding the

land-use planning for cocoa production in Nigeria. FOS (2002) state that about 780,000 hectares is committed to cocoa production in Nigeria.The large area perspective of aerial and space-borne remote sensing data potentials of reducing field work and decreasing travel cost as well as accurate, timely, complete and cost-effective information, are few of many reasons for the increasing use of remote sensing techniques by resources manager (Hussein, 1994; Mongkolsawatt et al, 1997).Since we need to use different kind of data and information (soil, hydrology, geomorphology, topograph, etc) the geographic information system (GIS) become a flexible and powerful tool than conventional data processing systems. It (GIS) provides a means of taking large volume of different kinds of data sets and manipulating and combining the data sets into new data sets which can be displayed on maps. (Bandibas, 1995). In this study, a combination is made of climatic, topographic, soil and land use data sets in order to produce land suitability maps.

Objectives

The specific objectives of the study are:

1. to create climatic, edaphic and potential maps of suitability for cocoa production in Nigeria
2. to ascertain the area of cocoa under different suitability class

Methodology

The study area

The study area, Nigeria, is located in West Africa and covers an area of about 923,768 sq. kms. The vegetation consist of tropical rain forest in the south-west, south-south and south-east, guinea savannah in the middle belt and the sahel savannah in the north-east and north-west regions. The climate is dominated by the south-westerly wind bringing moist and humid weather resulting in heavy rains in the month of March-October, while the northern easterly wind bring dry and hut weather between November and February resulting in harmattan. The altitude ranges from the coast line to the northern regions is 0.2500 metres above sea level in the high ranges (Adamawa and Jos Plateau). Apart from the alluvial plains, the other prominent topography of the area is the high hill which lies in various parts of Nigeria. Field crops vary from annual crops to tree crops. Mean annual rainfall is about 500mm.

The process of evaluating the land is adopted the system developed by FAO (1983). The method to be proposed is intended to design for assessing land for cocoa cultivation under various agro-ecological conditions. In order to develop a set of themes for evaluation and ultimately produce a suitability map for cocoa, the crop requirement in terms of land qualities was reviewed (ICCO, 2004 and FAO 1983). Moreover, results obtained from experimental reports and regional experience were adopted to identify land quality as related to cocoa yield. The land qualities used in this evaluation thus include a number of land characteristics, rainfall, temperature, relative humidity, altitude, organic carbon, soil depth, salinity and alkalinity (Ph). Each land characteristic is considered as a thematic layer in the GIS.

Materials and Supporting Data

The most common data for land use analysis are satellite data. They become very popular in recent years because of their better spatial and spectral resolution and their capacity to generate multi-temporal products more cheaply than aerial photos. Besides that land suitability analysis needs thematic maps such as soil, slope and rainfall maps. Data on crop rotation agricultural statistics and socio-economic conditions are also valuable background information.

- The following data were used in this study;
- SPOT XS image of 1989 and Landsat 1990
- Topographic maps scale 1-1000km and scale 1-500km
- Soil map scale 1-2500km
- Rainfall map
- Field information

Land Suitability Mapping

Land suitability evaluation is the process of assessing the suitability of land for specific use. These may be major kinds of land use such as rainfed agriculture, livestock production and aforestations. The topographic characteristics, the climatic conditions and the soil quality of an area are the most important determinant parameters of the land suitability evaluations. In this study, the rules used by the Food and Agriculture Organization (FAO) published on the frame work of land evaluations were applied.

Geographic information system (GIS) methodology was used to evaluate the land suitability. It can be defined as a digital processing system of geo-referenced data. Its main function which is automatic editing of existing maps, provides the possibility, after digitizing of boundaries and themes on existing maps to produce derived maps by digital updating of boundaries, extracting selected themes or by super imposing different maps together in a desired projection and scale, and the possibility of combining different levels of geographical data using logic and arithmetic operators. These capabilities allow the construction of models from which a new thematic map (e.g. land suitability map) can be produced from a set of thematic maps (e.g. climate, soil topography and land cover).

Table 1: Optimal Environmental Conditions Required for Cocoa Production

Factors	Minimum	Maximum
Annual rainfall	1200(mm)	3000 (mm)
Temperature	18-21°c	32°c
Relative Humidity	70%	100%
Attitude	0	900m

Source: FAO (1976)

Table 1 describes the range of the factors required for the production of cocoa. it is interesting to note that Nigeria ecology has all the parameters described for the climatic requirements as well as the soil requirements specified in Table 2.

Table 2: Optimal Soil conditions required for Cocoa Production

Factors	Range
Organic carbon	>2%
Soil Depth	>150cm
Salinity and Alkalinity	5.5-6.5

Source: FAO (1976)

Table 1: The Suitability area for Cocoa in Nigeria

Suitability Class	Area (km^2)	%
Highly Suitable	231,400	25.1
Moderately Suitable	56,500	6.1
Marginally Suitable	94,000	10.2
Unsuitable	541,868	58.6
Total	923,768	100

The study provides an approach to identify parametric values in modeling the land suitability for cocoa. The results indicate that the highly suitable land cover an area of about 231,400km^2 and is restricted to the geo-political zones. The area unsuitable for cocoa cultivation in Nigeria is 541,868km^2 which is about 58% of total land area and this is predominately in the central and northern parts.

To assess the reliability of the methodology developed, the suitability classes were checked against the cocoa yield data available with the FOS, Cocoa Association of Nigeria, Cocoa Research Institute of Nigeria and the information derived was found to be highly satisfactory to the developed model in the maps of suitability designed. In conclusion, with spatial analysis, it is possible to assess the land suitability with higher accuracy. In addition, the modeling provided an alternative approach to the ease of arriving at development of policy issues as it reflects on the cocoa sector of Nigeria. It is recommended that government should generalize this model for other interest crops in the country.

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Experimental Title: Evaluation of the effect of climatic changes on cocoa production in Nigeria. A case study of Cocoa Research Institute of Nigeria (CRIN) (Mrs. J.O. Lawal)

Introduction

For sustainable cocoa production, weather in the most important and uncontrolled variable whose effect can lead to increase incidence. Efforts to evaluate weather effects on crop yield have ranged from complex biophysical simulation models to multiple regression models using many variables. Acock & Acock (1991) and Ng (1982) had earlier presented prediction of the yield potentials in cocoa on a simulation model while Yapp et al (1991) later used another comprehensive model. Boyer (1970) showed that flowering is highly reduced in cocoa when mean monthly temperature drops below 23^{o}C. Dakwa (1977) associated the development of black pod disease to high relative humidity obtainable in the morning across cocoa growing belt of West Africa.

Objectives

The aims of this study were:

1. To determine the effect of weather parameters (Rainfall, Temperature & Relative Humidity), Black pod disease incidence on cocoa.
2. To find the best level at which weather parameter will boost cocoa yield.

Methodology

The data used for this study cover a period of 1985 – 2004 and were obtained from the fermentary unit and meteorological data unit of the institute.

The data were subjected to multiple regression analysis and data used included yield (ton) of cocoa beans. Annual record of Rainfall, Temperature, and relative humidity and black pod incidence (pods) at CRIN.

Results and Discussion

Analysis of variance ANOVA – show that the weather parameters has significant effect on yield at a= 0.05 with R^2 – 44.5%, correlation coefficient of 0.6674 and a non- significant effect on Black pod disease incidence with R^2 = 17.8%, correlation co-efficient of 0.4220.

Negative correlation (-0.2569) and 0.1964 was established on weather parameters effect (Rainfall and

relative Humidity respectively) on yield meaning that as rainfall and relative humidity increased yield reduced.

Positive correlation (0.596) was established between temperature and yield that is as temperature increased the yield also increased (photosynthesis). This is in line with Ziska et al (1997) who found that High temperature affects a number of metabolic processes that influence growth and yield of crops.

As yield increased, black pod disease incidence also increased, since the black pods are also part of the yield with correlation coefficient of 0.63, also increase in rainfall brought about decrease in black pod disease incidence.

For black pod disease incidence, positive correlation was established for temperature and relative humidity (0.3696 and 0.003) respectively, while negative correlation was established for rainfall effect.

Therefore, a combination of minimal rainfall (1,125mm) relative humidity (74%) and optimal temperature (29^{o}C) will give better yield and reduced black pod disease incidence in cocoa in Nigeria.

Future Outlook: It is necessary to investigate the effects of (i). Number of rainy days on cocoa pod yields ;(ii). Temperature and relative humidity components on cocoa pod yields.

Constraints: Data limitations.

Table 1: Annual Weather parameters and blackpod Disease incidence

Year	Yield (ton)	R/F (mm)	Temp°CR/H%	Blackpod	incidence (pods)
1985	11.32	1036.9	23.8	75	27.049
1986	17.26	1546.6	24.3	72	39.012
1987	9.84	1372.0	23.4	70	19.871
1988	13.07	1219.9	24.2	70	19.093
1989	8.42	1571.9	23.7	74	4.688
1990	5.38	1495.8	23.6	76	3027.000
1991	6.45	1399.6	24.0	76	4479.000
1992	4.62	1589.7	23.3	74	8047.000
1993	7.05	1314.8	23.9	73	11958.000
1994	10.47	1208.8	23.9	76	5.935
1995	12.27	1208.8	27.7	75	1548.000
1996	10.85	1247.0	27.1	75	4490.000
1997	13.99	1047.5	27.1	72	7347.000
1998	13.29	786.8	27.6	72	2361.000
1999	11.97	1540.0	27.0	76	26730.000
2000	12.86	1165.3	26.3	72	58120.000
2001	12.10	1054.1	27.3	75	44994.000
2002	8.32	1348.5	27.4	77	37094.000
2003	19.58	1604.4	27.7	77	46724.000
2004	23.83	1105.1	28.1	74	50649.000

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STATISTICS UNIT (Emaku, L.A. Busari, L.A. and Pelemo, A)

The statistic section of the Group analysed research data sent in from other groups and in addition collected data on cocoa yield and agrometerology.

Cocoa Yield

Yield statistics (cocoa) were carefully collected & documented. Thus, CRIN has information or data on total yield per plot for year 2006 which is under review. Also total black pods, total pods fermented, dry cocoa beans and other related yield statistics.

Agrometeorology

On daily basis, all functional meteorological equipment or instruments are read.

Thus, daily met data on rainfall max and min temperatures daily humidity (morning and afternoon), pich evapormeter, soil temperatures and wind direction were taken.

Graphical representation

Chart 1: it shows that we had the highest yield in November 2006. And July and August showed least yield (low yield).

Chart 2: Peak rainfall was September 2006. January to February, November & December had rainfall.

Chart 3: Cocoa yield and rainfall shown November; low rainfall (2.6m) and high yield (79,366 pods). Also, rainfall of 260mm & yield being 12766 pods.

Chart 4: shows cocoa yield with relative humidity. July and August had high relative humidity and low yield.

November had low R. Humidity and high yield.

Regression Analysis

Rainfall and cocoa yield showed a strength of relationship of 0.4591 (week). And rainfall accounts for 21% of the ANOVA shows no significant difference as regards the effect of rainfall on cocoa yield (yr.2006). the regression equation Y =39495.6 – 109.7 x show that increase in rainfall brought about decree in cocoa yield.

Also increased temperature showed increased yield (photosynthesis).

LIBRARY INFORMATION AND DOCUMENTATION

The Library continued to develop its collection through the acquisition of relevant publication, and electronic resources. Journal titles acquired in 2004 through due process were received. Other publications were received as gifts from many agricultural and related institutions. The use AGORA Library is now complements its acquisition.

Selective Dissemination of Information (SDI) is a personalized service and tailored to specific needs of each scientist. Abstracts and lists of articles in scientist's area of research are compiled and sent regularly to them. The needs of Scientists were also met through existing cooperation with other agricultural libraries. Scientists were given letter of introduction to libraries where they could consult their resources.

Visitors from different organizations who have stake in the mandate crops visited the library for information. Also, professionals and non-scientists in the vicinity who require a quite place for study use the library facilities. The photocopiers in the Library were repaired

to service the users at a token fee. The monthly Information Bulletin were published and distributed to Scientists and Substations throughout the year. E-mail services for correspondences were effectively carried out in the year. At least 2 Daily Newspapers were acquired daily for the readers to peruse.

Printing Unit: Printing of request by other departments was embarked on to meet their need.

Photographic Unit: Photographs of scientific trials within and outside Headquarters were taken. The use of Institute photographic laboratory has been discontinued with development of photo studios where the jobs could easily be done.

PLANTATION AND ESTATE MANAGEMENT

A. Plantation Activities: Cultural operations in zonal plots during the year under review cannot be overemphasized. Suitable field operations in terms of new season land preparations for planting such as clearing, packing, lining and pegging; planting, weeding, supplying of missing stands were done. Plants protection operations in terms of the removal of mistletoes; moribund plants; over head shades, pruning and spraying against black pod diseases were done to minimize spread.

It is of a greater encouragement and achievement that higher productivity was realized of the institute's mandate crops. During the year under review, marketing and sales of harvested cocoa pods, dry cocoa beans, kola nuts and cashew nuts were carried out.

Rehabilitation operations were carried out in terms of supply all missing stands at the appropriate time.

B. During the year under review, various operations e.g. cutlassing, slashing, weeding were carried out at the office laboratories complex, Rest House/Chalet buildings and the PRO's lodge, CRIN main gate to the Nursery. avenue road of SS 1 – 5, maintenance of junior staff quarters and CRIN Health centre. The football field and the PEM were not left out.

Regular trimming of Ornamental beautification were carried out at different locations.

Chemical control operations were also carried out by making use of herbicides to control weeds – this serve to reduce physical manpower to its minimal.
Slashers coupled to tractor were made used of for General Environmental Maintenance.

C. Harvested Cocoa Pods Year 2006

A gross total No. of 347,592 (Three hundred and forty seven thousand five hundred and ninety two) fresh cocoa pods were harvested during the year in review.

Data collected from the fermentary unit

S/N,	Harvesting Dates	Total No. of Pods Harvested
1.	January	30,280
2.	February	14,122
3.	March	21,651
4.	April	38,790
5.	May	36,347
6.	June	22,666
7.	July	3,280
8.	August	5,261
9.	September	12,766
10.	October	27,465
11.	November	79,366
12.	December	55,623

B.

Table 2: Cocoa Pods supplied by the Headquarters to Cocoa Growing State (NCDC Programme) October – December, 2006

S/No.	State	No. of Cocoa Pods Collected
1	Oyo	30,950
2.	Osun	7,190
3.	Ondo	5,793
4.	Ekiti	1,100x
	Total	**45,033**

(Forty-five thousand & Thirty-three fresh cocoa pods)

Constraints observations: Need for Recommendation on Zonal Activities

1. There is a gross inadequate manpower to cope with the various field operations for the institute's mandate crops – this inadequacy has a result affected the output of work done
2. There is the lack of transportation in the conveyance of workers from the main office to their distant zonal plots
3. In availability of drinkable water to refresh our workers after daily work
4. There is the need for urgent attention to the unsecured zonal offices/farm house which encourage theft/pilfering of properties during the weekends
5. There is the need to revisit the abandoned new zonal offices under construction which commenced sometimes in year 2005
6. The proposed toilet for the zones have not being effected

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