CIRAD

IRHO

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Département du Centre de Coopération Internationale
en Recherche Agronomique pour le Développement (CIRAD)

REPUBLIC OF GHANA

MINISTRY OF SCIENCE AND TECHNOLOGY
Council for Scientific and Industrial Research
OIL PALM RESEARCH INSTITUTE
KUSI RESEARCH STATION

IRHO AGRONOMICAL MISSION TO GHANA

27/11/89 - 5/12/89

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SUMMARY

This report describes the work carried out by the Agronomy Service at the Kusi Station in 1989.

I - CONTINUATION OF THE PROGRAMME ALREADY UNDER WAY

The production data for the 2 experiments K 3-5 (fertilization) and K 5-1 (spacing and thinning) were revised again. The Statistics Service is to carry out analyses. IRHO will also analyze experiment K 3-5 in 1990.

II - NEW WORKING PROGRAMME

- Relationship between climate-soils and production

a) Climatic studies: considerable data compilation work has been carried out. Additional information is still to be found.

b) Oil palm water supply: the basic data were grouped together. For this subject, and particularly the previous one, the participation of the Statistics Service is necessary for data processing, but it was agreed to make an initial "manual" approximation as far as possible.

c) Inventory of soils in Southern Ghana: the Soil Research Institute proposes making a synopsis in 1990 of all the knowledge available on soils in Southern Ghana, at a cost of US$ 6,546.

d) Water runoff control - Special Improvements: a small exploratory trial planted on individual terraces has been set up at Kusi. The Managing Director of GOPDC proposes its participation to set up a special improvements trial at the Kwae Plantation, if there is not enough land at Kusi.

- Mineral Nutrition and Fertilization

Two plots of around 5 ha each were planted on 2 types of soil (Temang, Nzima), with a view to setting up 2 fertilization experiments. It was decided to wait until 1990 before going ahead with these experiments, to take into account the condition of trees at 1 year old.

- Crop techniques

The legume comparative trial sown in 1989, which suffered from weed competition, is unfortunately uninterpretable.

- Oil palm and cocoa intercropping

The exploratory trials planted in 1988 and 1989 are in a satisfactory condition, apart from the irregular shading caused by the plantain, whose striking has proved difficult. A report detailing the initial observations of the Cocoa Research Institute has been programmed.

- Intercropping with food crops

Dr Wonkyi-Appiah indicates that setting up experiments at the station, or on smallholdings, poses a great number of practical problems, which makes it a risky business. In any case, this study topic is not a priority, because farmers currently easily agree to plant oil palm alone.

- Conclusion

Definite advances were made on certain topics in 1989; it is to be hoped that working conditions in 1990 will make it possible to continue this progress.

III - PROJECT SUPPORT PROGRAMME

Relations with GOPDC should be developed.

IV - TRAINING

This aspect was dealt with in a letter under separate cover.

V - RELATIONS BETWEEN OPRI AND THE CONSULTANT

Distribution of the Quarterly Progress Reports and the Annual Reports enables links to be established between the Consultant's two annual visits.

REPORT

I. GENERAL

LAND USE

1. On the 43 ha (106 acres) planted in 1989 in fields K23 and K24; 10 ha were used to set up 2 new agronomy experiments and a preliminary land improvement trial.

Expt K23-4 - Fertilizer trial on Temang soil series : 4.57 ha
Expt K23-5 - Fertilizer trial on Nzima soil series : 4.57 ha
Expt K23-6 - Water runoff control preliminary trial : 0.30 ha

CLIMATOLOGY

2. The National Meteorological Service has modified the rainfall data for the years 1985/86/87 and 88, quoted in the previous report (Doc. 2155 - Nov. 88). The new data are given in Table I.

Table 1 - OPRC - KUSI - Rainfall 1985/86/87/88/89 and water deficit (mm)

Updated data

	1985		1986		1987		1988		1989	
	mm	Rainy days	mm	Rainy days	mm	Rainy days	mm	Rainy days	mm	Rainy days
J	15.0	3	0	0	11.8	5	1.5	1	5.6	1
F	18.5	2	65.6	7	52.6	11	8.2	5	19.1	2
Mh	106.2	9	158.6	13	175.1	14	381.1(1)	11	53.9	11
Ap	160.8	12	95.6	10	138.0	17	199.4	12	178.7	12
My	215.4	17	156.7	15	179.0	9	383.6(1)	15	105.7	10
J	120.3	15	104.3	12	157.0	20	191.4	18	313.1	19
Jy	198.9	17	135.1	15	165.7	20	82.4	16	108.3	14
Ag	109.7	17	19.5	8	250.5	24	77.8	14	245.1	17
S	269.9	17	102.5	13	232.9	23	213.2	21	131.3	13
O	204.2	18	176.6	15	218.3	21	238.2	22	227.3	17
N	46.5	11	32.9	7	82.3	9	147.1	14	210.6	15
D	18.3	12	32.0	2	14.2	1	27.5	2	80.1	6
Total	1482.0	150	1079.0	117	1676.0	174	1951.4	151	1678.8	137
water deficit	301		485		209		290		264	

(1) Values apparently high for the months in question

3. It would be a good idea for the Kusi Station to establish closer relations with the National Meteorological Service officer responsible for recording data from the meteorological post installed at the Station, so as to ensure that information circulates more rapidly.

4. A comparison (Table 2) of rainfall and water deficits shows that climatic patterns are similar at the Kusi Station and the GOPDC plantation (Kwae), apart from in 1982, when the Kusi Station was miraculously spared by the exceptional drought that seriously affected GODPC. If that year is not taken into account, the coefficient of correlation between the annual water deficits at the two sites is 0.75.

Table 2 - Compared Rainfall

Year	GOPDC (Kwae) Rainfall mm	Nbr of days	Deficit mm	KUSI Station Rainfall mm	Nbr of days	Deficit mm
1978	1452	111	301	1385	129	356
1979	2092	124	251	1670	152	282
1980	1877	111	192	1526	160	139
1981	1423	104	174	1566	154	163
1982	890	73	850	1393	128	178
1983	1009	83	671	1086	108	566
1984	1545	93	241	1516	137	308
1985	1558	108	393	1482	150	301
1986	1350	98	251	1079	117	485
1987	1683	143	254	1676	174	209
1988	1560	133	239	1951	151	290
1989	-	-	-	1679	137	264
Mean 78/88	1494	107	347	1485	142	298
Mean minus 1982			297			310

5. It can also be seen that the annual number of days' rainfall is consistently higher at Kusi; on average over the 11 years, the relative difference is 35%.

AGRONOMY SERVICE PERSONNEL

6. One of the senior officers, Mr. A. NANTWI, has resigned and two junior agronomists have been appointed.

   a) Mr. BAIDOO ADOO - MSc. in Agronomy from the Agricultural Academy of Moscow, thesis topic: "Comparative performance trials of 4 varieties of maize".

   b) Mr. STEVEN DUKU - BSc. in crop production from the University of Science and Technology of KUMASI. Temporary appointment to be confirmed on 15/12/89.

   The Agronomy Service supervisory staff will therefore include 3 or 4 graduates in 1990.

STATISTICIANS

7. A second statistician, Mr. Ampoman, has been appointed on a temporary basis. The decision concerning his permanent appointment was due to be taken in December 1989.

EQUIPMENT

8. OPRI requested quotes for the following equipment, already mentioned in the previous report [1].

   a) 1 pressure bomb or water status console
   b) 1 portable leaf area meter
   c) 1 neutron soil probe
   d) soil tensiometers
   e) 1 soil density meter
   f) 1 soil compaction meter
   g) 1 viewing endoscope for root studies

9. It would be useful if the agronomy service specified the study programmes that will require the above equipment before any purchases are made. However, it would seem that the diffusion porometer, which could be used in the programme relative to "Relations between climate, soils and vegetation" is not on the list of equipment to be ordered.

VEHICLES

10. In November 1989, the Agronomy Service vehicle had been out of service for 6 months, due to lack of spares. The Kusi Station is considering making representations to the IBRD representatives about the difficulties encountered with the vehicles.

SERVICE LABORATORY

11. IBRD has decided to fund plant (leaf analysis) and soil analyses, which will be carried out by the Faculty of Agriculture (ACCRA-LEGON University) and the Soil Research Institute. The cost of analyzing a leaf sample is US$ 7.1. As already proposed in the 1987 Visit Report, it is recommended that the laboratory at the Faculty of Agriculture become affiliated to the international cross-checking system of plant analysis laboratories at the University of Wageningen (The Netherlands). This faculty and the SRI could also exchange leaf and soil samples with the CIRAD laboratory (Montpellier, France).

TRAINING

12. The reports on training courses taken in Côte d'Ivoire in 1988 would appear not to have been written up.

II - EXPERIMENTS ALREADY UNDER WAY

EXPERIMENT K 3-5/1969 - Mineral nutrition and fertilization

13. Field data (individual tree production) were revised for the entire 1972-86 period [5-6]. The IRHO Biometry and Agronomy Divisions will carry out a statistical analysis of them, along with agronomic interpretation in 1990. This study could be compared with that at the Kusi Station during the next mission in 1990.

EXPERIMENT K 5-1/1970 - Spacing, density and thinning

14. The field data were also revised a second time for the 1973-1986 period [5-6]. This experiment, which was initially a Latin Square, was analyzed, as a split-plot design with 5 replications, as the main treatments involve densities and the treatments are sub-divided by the 6 progenies. This analysis modification is acceptable [1], but the "power" of the experiment is low for the main treatment (spacing, density). In fact, the following was adopted:

a) The usual value of 5% for the 1st degree risk, which represents the risk of unjustifiably concluding that a treatment has an effect on production. The difference observed is therefore only accepted if it only has a 5% possibility of being due to chance. To be more demanding, the value taken could be 1%, and, if less demanding, maybe 10%.

b) A minimum relative difference, Δ , of 10% to be detected in the trial's mean annual production (bunch weight or production/acre), which is still not very ambitious.

15. Based on these hypotheses, the "power" (1) of the experiment was 0.06 in 1977 [1], for example, which means that for that year, the probability of the difference, Δ , really being detected was only 6 cases out of 100.

16. The low power of this experiment observed in 1977, which may be caused by various factors (soil heterogeneity, small number of replications, harvesting problems), may explain the absence of significant results obtained in 1988 by OPRI for the 77/83 period, despite the differences existing between treatment yields. This power should be checked for the other production years, when the revised data are processed per year and for several years combined. The analysis of variance software provide this element of assessment, at the same time as the "F" test value for block experiments.

17. In our opinion, it would be adequate to keep to conventional analysis, as we feel that the "*a posteriori*" reblocking method should not be adopted (2). It is neither possible, nor wise, to make an experiment say more than the analysis than the initial protocol allows.

18. It is proposed that this experiment, which will be 20 years old in 1990, be stopped at the end of this year.

III - NEW WORKING PROGRAMME

This programme was defined in the previous 3 Visit Reports.

RELATIONS BETWEEN CLIMATE, SOILS AND PRODUCTION

a) Climate Studies

19. Considerable work has been done in this field, since it was possible to obtain daily rainfall data for the 1968-1987 period from the Meteorological Service (Legon-Accra), for 53 stations to the South of the 8th parallel North. As the data are only complete for thirty or so stations, enquiries will have to be made at Regional Meteorological Offices to fill in the missing data. Cross-checks between the

(1) The "power" is defined as the difference (1 - β), where β is the 2nd degree risk which evaluates the probability of not detecting a true difference.
(2) Can the Statistics Services provide the theoretical basis for this method ?

different stations make it possible to eliminate uncertain data. Once the basic information has been verified, this enquiry will thus make it possible to compile the checked rainfall data file that was lacking for South Ghana.

20. The calculation of ten-day, monthly and yearly water deficits is being carried out in conjunction with the Station's Statistics Service, which is computerizing the file. It is planned to go ahead with an initial set of 4 provisional annual water deficit maps per 5-year period from 1968 to 1987.

21. The compilation and mapping of rainfall data for the last 20 years in South Ghana will be useful to the oil palm sector and also to other users.

b) Oil Palm Water Supply

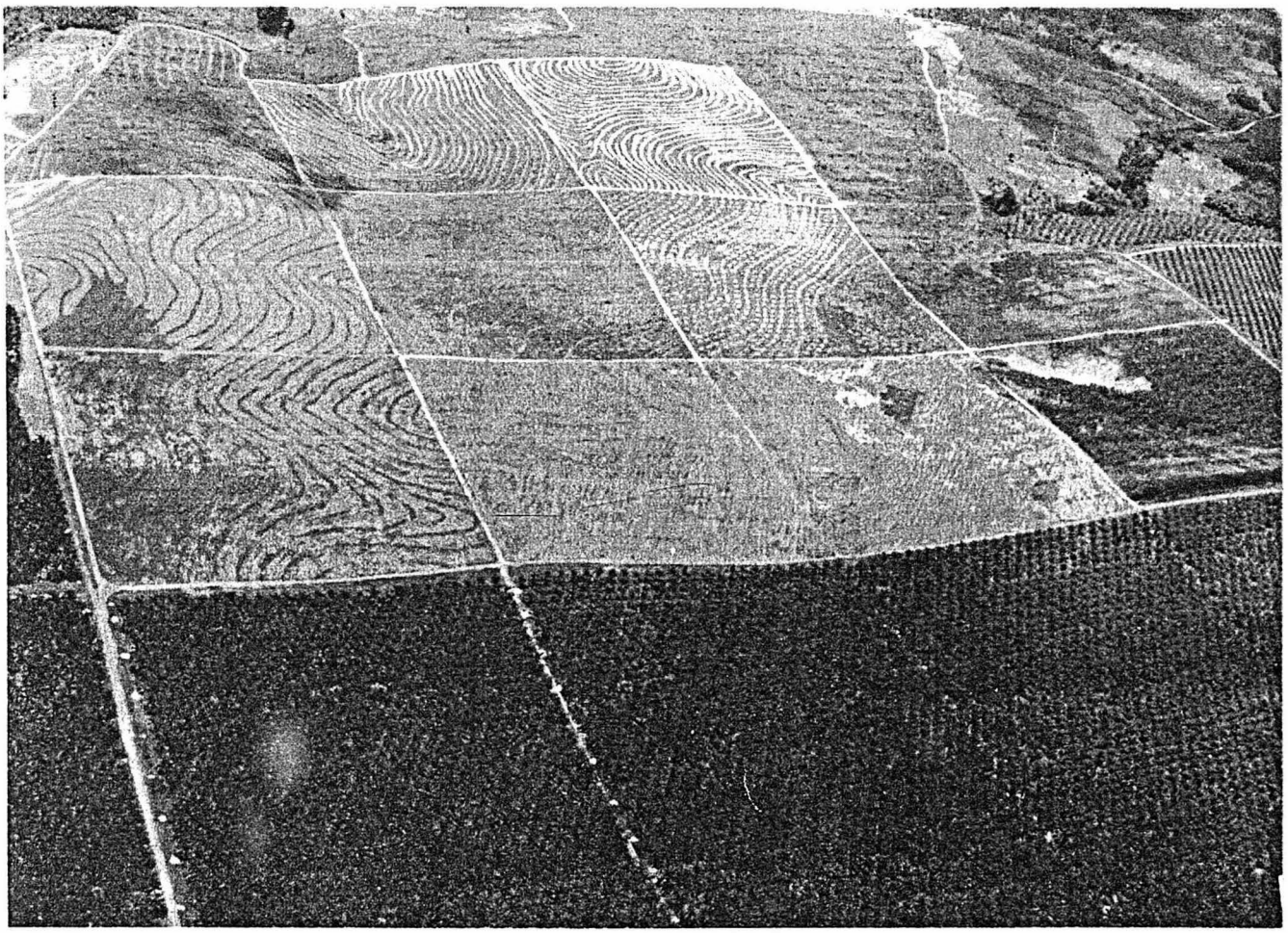
22. The individual production figures for field K13 (C material) from 1985 to 1988, along with tree height measurements, were submitted to the Statistics Service [4-5], for data processing (regionalization). Pending the processing results, the Agronomy Service can transpose the mean production for the 4 campaigns, and tree height, onto a map of the field, so as to compare the zoning of the observed values with the soils map that the Soil Research Institute is going to draw up.

c) Inventory of soils on lower slopes and in bottomlands providing a good water supply

23. The Soil Research Institute has undertaken a considerable amount of work on soil inventories and maps, which, supposedly, cover the whole of South Ghana [4-5]. However, none of this work has been condensed. After long, informal negotiations, SRI proposed to OPRI in its letter CP/13/V.9/223 dated 3/10/89 that it undertake this synthesis for the equivalent of US$ 6,546. The report will include soil and soil suitability maps, a detailed morphological description and chemical analysis of all the soils involved. It would be a good idea for these maps to be drawn to a scale of 1:100,000, or at least to 1:200,000 to make for easy reading.

24. The Geological Survey Department could also supply useful mapping data, but no collaboration with SRI has so far been officialized.

25. This general synthesis work on soils, and more particularly the bottomlands of South Ghana, will probably, like the rainfall study, be useful to the oil palm sector, but also to other agricultural projects.



d) Water runoff control - special improvements

26. The very first investigative trial was planted on a slope in field K 23. It contains 28 oil palms with terraces, alternating with 28 oil palms without terraces. The current terraces should be widened to provide a diameter of 2 m, perpendicular to the slope. Growth measurements should be taken a year after planting.

27. The soil and topography maps of the station that are going to be produced by SRI, will show whether it is possible to locate well adapted plots for setting up comparative trials, between the standard planting method in triangles and planting along contour lines, with infiltration trenches [2, para. 48, page 15]. If this trial cannot be set up at Kusi, the Managing Director of GOPDC is prepared to consider setting it up at Kwae, with Kusi station Management. The enclosed photograph provides a glimpse of a trial - though large-scale in this case - involving special improvement of slopes, set up on another research station in Africa.

MINERAL NUTRITION AND FERTILIZATION

28. The inventory of field K 20, planted in 1988, showed that it was not suitable for setting up an experiment [4].

29. Two plots (4.57 ha each) were planted specially in 1989 in field K 23, to set up 2 fertilizer experiments; one will be located on the Temang soil series (bottomlands) and the other on the Nzima soil series (slope).

30. Each planting plot can be sub-divided into 27 experimental plots of 25 trees (5 rows x 5 trees), including 9 useful trees (3 rows x 3 trees). It is thus possible to set up two factorial trials with one replication, each studying 3 factors at 3 levels. This is a conventional design.

31. The square shape of the experimental plots, along with the unit number of useful trees, is satisfactory; indeed, there exists no optimum number of trees per plot [9]. However, as in many experiments conducted on oil palm (including those at GOPDC which were used as a reference), the number of replications is low, due to the ever-present dilemma between the power and the cost of the experiment. The maximum power can be estimated for several hypotheses based on annual production per tree:

Hypotheses

Residual standard deviation	10 kg	10 kg	10 kg
1st degree risk	5%	10%	5%
Minimum production difference to be detected	10 kg	10 kg	15 kg
giving a maximum power of	35%	68%	78%

Concessions therefore have to be made in respect of one of the hypotheses, so as to obtain a worthwhile power.

32. A tour round the 2 plots showed that certain problems have to be solved before the experiments are set up. In particular, drainage has to be improved in the plot planted on the Temang series. It was therefore agreed that the 2 plots would receive the usual fertilizer for young plantings in 1989 and that the decision whether to set up the 2 experiments would be taken in 1990, taking into account the condition of the trees and their homogeneity (growth measurements), and in accordance with the soils map drawn up by SRI.

CROP TECHNIQUES

a) Introduction of legume cover crops

33. A performance trial studying 16 different legume crops was planted in April 1989 [4-5]. It includes 3 replications and the elementary plots have an area of 16 m².

TEPHROSIA EHRENBENGINA
PUERARIA PHASEOLOIDES
PUERARIA JAVANICA
MUCUNA COCHINCHINENSIS
" 82/502)
" 82/116) FROM
" 82/136) GHANA, BENSO
" 82/507)
" 82/504)
CALOPOGONIUM MUCUNOIDES
STYLOSANTHES
FLEMINGIA CONGESTA
CLITORIA TERNATEA
DESMODIUM OVALIFOLIUM
CAJANUS CAJAN

34. The legumes suffered from heavy weed competition, so their emergence was very low. No conclusions can therefore be drawn from this trial.

35. If the Agronomy Service wishes to continue with this type of trial, care has to be taken with land preparation, as emphasized by Mr. Wonkyi Appiah, to eliminate weeds before sowing, as is done in plantings before *Pueraria* is sown.

b) Herbicides

36. An experimental treatment was applied in January 1989 in field K 19/85, with 3 herbicides applied at different concentrations.

1/-	Brushing of interrows/weeding of paths		control
2/-	PARACOL	5 ml/gallon of water	
3/-	"	15 ml/gallon of water	
4/-	GARLON (TRICLOPYR)	150 ml/10 l + 1 wk after PARACOL	5 ml/gallon
5/-	"	150 ml/10 l + 1 wk after PARACOL	15 ml/gallon
6/-	"	75 ml/10 l + 1 wk after PARACOL	5 ml/gallon
7/-	"	75 ml/10 l + 1 wk after PARACOL	15 ml/gallon
8/-		75 ml/10 l	
9/-		150 ml/10 l	
10/-	GARDOPRIM (OXYFLUORFEN + PROPYZAMIDE + TERBUTHYLAZINE)	25 ml/gallon	
11/-	"	50 ml/gallon	

37. The weeds were gathered in the harvesting path and the circles in 0.6 x 1 m rectangles, with spaces between them, dried and weighed. A report is being drawn up (protocol, procedure, results).

OIL PALM AND COCOA INTERCROPPING

38. In July 1988, the interrows of plots E (102 oil palms/ha), A (114 oil palms/ha) and B or C (148 oil palms/ha) of 4 replications of Expt K 5-1, were planted with cocoa. At the same time, cacao-trees were planted in place of the "omitted 5th rows" of oil palms in fields K 4, K 8, K 10 and K 13. Three plots of 48 cacao trees were planted in each alley, then sub-divided with and without shade from plantains, whose growth is very irregular. The operation was repeated in 1989 in the same fields.

39. This experiment was visited by experts from the Cocoa Research Institute, who took quarterly growth measurements (stem circumference 6 cm above the ground and height). They say they are generally satisfied with the appearance of the cacao-trees. It would be useful to draw up a note interpreting these initial observations, with the following summary tables:

Expt K 5-1

Block	I			II			IV			V		
Density	E	B	A	E	B	A	E	B	A	E	B	A
Nb of cocoa planted												
Nb of replacements												
Nb of missing												
Nb of cocoa affected by the harvest												
Mean height												
Mean girth												
Mean spread of oil palm												
Frond length												

Fields K 4 - K 8 - K 10 - K 13 - 1988 and 1989

Replicates	1		2		3	
Shade by plantains	(-)	+	(-)	+	(-)	+
Nb of cocoa planted						
Nb of replacements						
Nb of missing						
Mean height						
Mean girth						
Nb of plantains planted						
Nb of remaining plantains						

40. Bellani pyrometers have been ordered, to measure solar radiation reaching the cacao-trees [1].

41. In Expt. K 5-1, failing the Leaf Area Index, the leaf length has to be measured (L 25 or L 33, rachis + petiole), or the horizontal distance between a point on the ground immediately below the tip of the longest leaf and the stem, along 4 perpendicular radii.

INTERCROPPING WITH FOOD CROPS

42. It is not possible to conduct intercropping trials with food crops because of theft at Kusi and, according to Dr. Wonkyi Appiah, setting up trials on smallholdings is fraught with difficulties. Undertaking such research therefore comes up against serious practical problems. Fortunately, there does not currently appear to be any rivalry between oil palm and food crops among smallholders, who generally agree to plant oil palm exclusively. Land availability pressure is therefore still low in the region, hence intercrop research is not really a priority. If smallholders put in a request, the Twifo Oil Palm Project (T.O.P.) agrees to a maize intercrop in the year following planting.

IV - PROJECT SUPPORT PROGRAMMES

RELATIONS WITH GOPDC

43. Experiments GH CP 1 and GH CP 2 on the GOPDC plantation at Kwae were visited once in 1989 and tree height was measured [4-5]. These measurements have yet to be analyzed. The leaf content results of these experiments in January 1989 have been supplied to OPRI.

RELATIONS WITH FAO

44. Dr. A.N.A. Edwards, from the University of Lagos (Nigeria) and FAO consultant, visited the Kusi station in November 1989, to explain the purpose of a 6-month survey on *Chromolaena odorata*, as per the following protocol.

1/ Conduct a survey on *C.O.* and establish the extent and severity of its distribution.

2/ Produce a distribution map for Africa.

3/ Assess the economic importance on agricultural production.

4/ Assess the knowledge base and make an inventory of institutions and research bodies already working on the weed.

5/ Assess the potential for a coordinated and harmonized regional research network for *C.O.*

6/ Prepare a report and an agenda for a regional research control programme for *C.O.*

OPRI's final position on this was still unknown at the beginning of December.

V - TRAINING

This subject is dealt with in a separate letter.

VI - EQUIPMENT

This subject was dealt with in the section entitled EQUIPMENT, paragraphs 8 and 9.

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(1) The "power" is defined as the difference $(1 - \beta)$, where β is the 2nd degree risk which evaluates the probability of not detecting a true difference.

(2) Can the Statistics Services provide the theoretical basis for this method ?

O P R I

QUARTERLY REPORT

JULY-SEPTEMBER 1989

3.2. AGRONOMY

3.2. AGRONOMY

3.2.1. Relations Between Climate Soils and Production.

3.2.1.1. Climatic Studies

Only about 30 of the total of 53 stations for which data was compiled had complete records. The monthly and annual water deficit calculations in the case of stations with complete records have been completed.

Pressure of work on staff prevented the visit to regional and district meteorological offices for the completion of records of stations with incomplete data, and to the Meteorological Headquarters for data on more stations.

3.2.1.2. Oil Palm Water Supply

(a) Results of analysis on yield data (up to 1988) and height sent to the Statistical Section have not been received. Yield data for 1986 - 1988 have been compiled to be included in the analysis. (K13)

(b) Following the preliminary discussions on the soil survey with the Soil Research Institute, a formal quotation for carrying out a detailed soil survey taking into consideration the legitimate boundaries of the Institute was received from the Soil Research Institute. Subsequent to this the Soil Research Institute have been advised of the World Bank procedure to follow to enable the quotation to be further processed for part payment, according to conditions, to be made to enable this project to begin. The Institute will also need to arrange accommodation for a Soil Research Institute Staff of 20 for the 60 days of the survey.

(c) Inventory of soils on lower slopes and in bottom land providing a good water supply for all palm cultivation.

Subsequent to the Section's request to the Soil Research Institute (SRI) for available pedological reports south of lat. 8° N, and their cost to enable eventual purchase, the discussions with SRI which followed revealed that although the whole of the Southern part of Ghana has been surveyed, this has

not been compiled into location pedological reports. The SRI have been contacted to be contracted to compile a detailed inventory with information on physical and chemical properties of soils in the forest zone with reference to slope and suitability for oil palm. Although the request was in the same letter mentioned in 3.2.1.2. (b), no quotation has been submitted in respect of this project.

In discussions (formal) with the Geological Survey Department information relating to estimates of available land on lower slopes and valley bottom lands in the forest zones and aerial photography which will be of relevance to the project was requested for. We have been advised by the Geological Survey Department to contact one Senior Lecturer of the Geology Department of the University of Ghana for this project in view of the fact that their Geologists are engaged on rather urgent national projects. The Senior Lecturer has been contacted and discussions have been held with regards to project requirements and references. A search fee of ¢20,000 has been requested for to enable a quotation to be made but that will have to be formalized.

The slow pace of this project has been due to the fact that informal discussions have had to be formalized for record purposes, and the problems of bureaucracy and the postal system.

3.2.2. Mineral Nutrition

Two sites located at field K23, cleared in the early part of the year were demarcated for fertilizer trials similar to the G.O.P.D.C. fertilizer trials on Bekwai and Temang Soil type series. The plots were planted with D x P ex OPRI in August. Observations on general appearance after transplanting were made. Soil samples in relation to demarcated treatment plots have been taken to be sent to the Soil Research Institute for soil nutrient analysis.

3.2.3. Crop Techniques

Results and observations compiled for the 19 leguminous cover crops in 1988 have been evaluated. Further Measurements and observations are still continuing. Measurements have also began on the legume garden planted out in April 1989.

3.2.4. Water Run Off Control

A site with the required characteristics was selected in Field K23. A demonstration plot comparing alternate rows of individually terraced plants against a control along a slope as a water conservation method, was set up in August 1989. No measurements were taken on this plot in this quarter.

3.2.5. Oil Palm Cocoa Intercropping

Vegetative data, height and girth on the cocoa planted under different spacings of Experiment K5 and in the omitted fifth rows during the period up to June 1989 have been compiled on the basis of levels of shading for analysis. Measurements have been continued in August 1989.

Vacancies, to ensure a full cocoa stand in the 1988 planting, were filled. The need to repeat the cocoa intercropping in the omitted fifth row has been stressed. Bigger plots were cleared and planted in July 1989. First vegetative measurements of height and girth have been taken.

3.2.6. Project Support Programme

i) GOPDC Fertilizer Trials: The first height measurements on both trials have been compiled for analysis. A second measurement was taken by the end of the quarter for inclusion in the analysis.

ii) Comparative Trial of GOPDC AND OPRI extension work material. The two trials are at GOPDC, Kwae and the duplicate at OPRI were planted according to the accepted treatments and experimental design during the quarter.

iii) Measurements were continued on the first comparative trial of OPRI and GOPDC material planted out at OPRI only in 1988 in field K22.

3.2.7. Agro-economic Analysis of Expt. K5 (Spacing Density Thinning) and Expt. K3-5 (Fertilizer) Trials.

Expt. K5: Trial results, discussions and agro-economic analysis have been prepared for the period 1973 - 1986. Reblocking with respect to given fixed ranges of data or given number of palms/plot within an increasing data range for the parameter cumulative yield 1977 - 1986 have been analysed for comparison with unblocked results.

Expt. K3-5: The duty schedule of the Statistician at Cocoa Research has been such that we have had to collect the experimental data for this trial from him together with his corrected software package to enable it be processed by our Statistical Service.

3.2.8. Staff Situation :

One Research Officer and three other staff from the Agronomy Section resigned from the Institute during the quarter.

3.2.9. Principal Officers: Dr T. E. Ofori-Asamoah and Mr B. N. Nuertey. Research Officers.

3.3. ENTOMOLOGY AND PATHOLOGY

3.3.1. Introduction

The objective of the Entomology section is to identify, study the biology of the major pests of the oil palm and draw up efficient management strategies that would reduce their numbers to tolerable levels.

3.3.2. Activities

The on-going projects in the Section during the reporting period were:

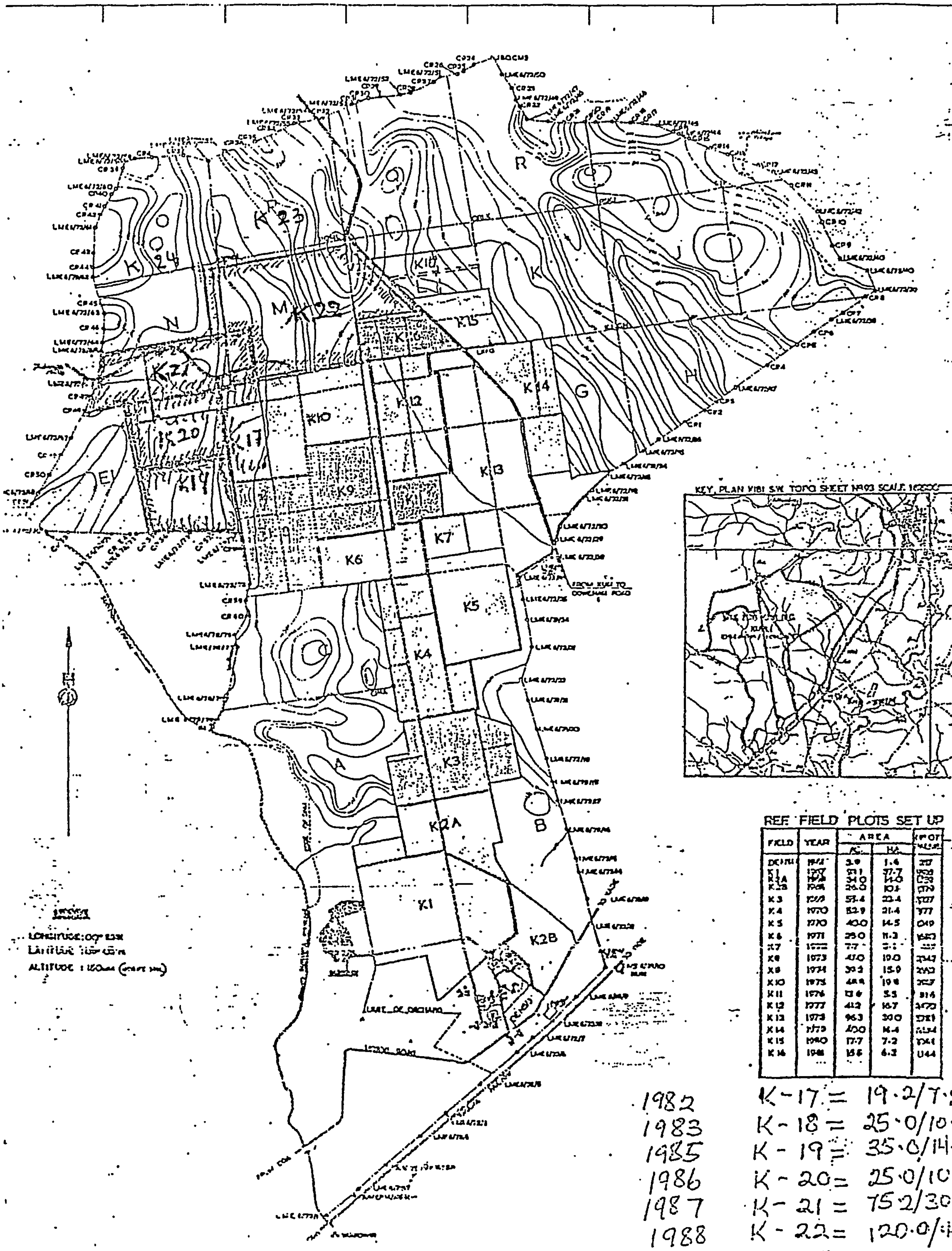
1) Biological studies on Coelaenomenodera minuta
2) Studies on pollinating insects and the rate of fruit set.
3) Routine phytosanitary inspection of the nursery and the entire plantation of the Institute.

A research proposal for the control of the Cape St. Paul Wilt disease of Coconut was prepared and presented to the National Coconut Development Committee in August 1989.

OIL PALM RESEARCH CENTRE-KUSI

-LAND USE-

AREA-1084.642 HECTARES OR 2,680.214 ACRES OR 4.188 SQ. MILES.



REF FIELD PLOTS SET UP

FIELD	YEAR	AREA AC.	AREA HA.	SPOT
DEMO	1962	3.9	1.6	[illegible]
K1	[illegible]	93.1	37.7	[illegible]
K2A	[illegible]	34.0	14.0	[illegible]
K2B	[illegible]	26.0	10.4	[illegible]
K3	[illegible]	55.4	22.4	[illegible]
K4	1970	52.9	21.4	[illegible]
K5	1970	40.0	14.5	[illegible]
K6	1971	28.0	11.3	[illegible]
K7	[illegible]	7.7	[illegible]	[illegible]
K8	1973	47.0	19.0	[illegible]
K9	1974	39.2	15.9	[illegible]
K10	1975	48.9	19.8	[illegible]
K11	1976	13.6	5.5	[illegible]
K12	1977	41.2	16.7	[illegible]
K13	1978	96.3	39.0	[illegible]
K14	1979	40.0	16.4	[illegible]
K15	1980	17.7	7.2	[illegible]
K16	1981	15.6	6.3	U44

1982 K-17 = 19.2/7.8
1983 K-18 = 25.0/10.
1985 K-19 = 35.0/14.
1986 K-20 = 25.0/10
1987 K-21 = 75.2/30
1988 K-22 = 120.0/4
1989 K-23/24 = 106

O P R I

PROGRESS REPORT

JULY 1988 - MAY 1989

2 - AGRONOMY SECTION

2.

2.1. Relation between climate soils and production

a) Climatic studies -

Rainfall Data compiled for the 53 stations have been re-listed on the basis of complete and incomplete records during the periods of study and data complation.

The regional and district meteorological offices will be visited to enable the completion of records of stations will incompleted records if available.

b) Caloulations of monthly and annual water deficits are being done in the case of stations with complete records.

b) Oil Palm Water Supply -

Vegetative measurement, height, on all the palms of the selected plots at Field K-13 has been taken and presented to the Statistical Service for the necessary analysis to be done. In addition the yield data over a 4 year period already compiled has also been presented to be treated similarly as a comparative basis.

Preliminary discussions have been held again with the Soil Research Institute for a detailed soil survey map taking into consideration the legitimate boundaries of the Institute. Costs are yet to be presented.

c) Inventory of soils on lower slopes and in bottomlands providing a good water supply.

Discussions have been held with the Soil Research Institute as to the availability of pedological reports that will be of value to this programme. The Soil Research Institute has been requested to list these available reports and their costs to be purchased eventually by the Oil Palm Research Institute.

Discussions have also been held with the Geological Survey Department as to the availability of data to allow for a better estimation of total area of valley bottomlands in the Sourthern part of the country. The issue of aerial photographer data was also discussed.

2.2 MINERAL NUTRITION

Following the discussions during the 1988 visit of the Consultant, the associated vegetative map of Field K-20, tree inventory with details and replacements, identification of useful palms/plot, growth measurement and leaf samples for analysis/plot were obtained proceding the receipt of the Consultant 1988 Report.

The results (apart from leaf analysis which was not done) indicated that the field could not be used to set up a fertilization trial to replace K3-5.

Two sites have been located in Field K-23, cleared this year 1989, to duplicate or to modify the trials set up on Bekwai and Temang soil series at GOPDC, Kwae.

Planting will be in June.

Leaf samples have been obtained from all the year plots of the Centre from 1967 and will be sent for analysis soon to enable proposals on fertilization rates to be made this year.

2.3. CROP TECHNIQUES

Results and observations for the 19 legume cover crops planted last year are being compiled for evaluation.

Sixteen different legume cover crops were planted out in larger plots in April 1989 to serve as a seed multiplication plot and for further replicated observations.

2.4. WATER RUN OFF CONTROL

Possible sites have been surveyed in Field K23, 1989 for selection to set up demonstrative plots of planting on the contour, individual teracing and or other methods of water run off control against a control planting method.

2.5. OIL PALM COCOA INTER CROPPING

Vevetative measurements height and girth on the Cocoa planted under different spacings of Expt. K5 and in the omitted fifth rows were carried out in again in January and in May 1989. Data is being compiled on the basis of the levels of shading for analysis.

The smaller plot sizes in the trial with the omitted fifth row has necessitated a repetition of this trial with larger plot sizes. Planting will be in June 1989.

2.6. PROJECT SUPPORT PROGRAMME:

a) The Agronomy Section staff, following the guided tour of the 2 GOPDC fertilizer trials at Kwae have taken a first height measurement on all the useful palms of these trials. Initial data is being compiled for analysis by the statistical service and duplicate results will also be sent to IRHO for analysis.

b) Comparative Trial of Oil Palm Research Institute and IRHO extension work materials.

In 1988 it was jointly agreed by both the IRHO and the OPRI that a collaborative breeding and agronomic project to compare only selected D x P crosses from the 1988/89 nurseries of both Institutes be set up in 1988. The experimental design provided by the IRHO was found acceptable by the OPRI although plot sizes were larger.

The relatively flat sites have been chosen, one at OPRI and the other at GOPDC by the Agronomy Section. Materials have been chosen by the Breeding Sections of both Institutes and planting will commence according to treatment after lining and pegging has been completed.