

REPORT OF LAND SUITABILITY SURVEY FOR MACADAMIA NUT GROWING IN  
Western Kenya.

BY S.HIRAMA AND N.ONDABU. 30/9/1987.

I. INTRODUCTION.

According to the request of the Joint Steering Committee, a preliminary survey of land suitability for macadamia nut growing in Western Kenya was carried out from 16th to 18th September, 1987.

Western Kenya is composed of two provinces, Western province, which has three Districts i.e. Bungoma, Kakamega and Busia, and the Nyanza province which has four Districts i.e. Siaya, Kisumu, South Nyanza and Kisii.

Of the above seven districts the survey was carried out in three districts i.e. Bungoma, Kakamega and Kisii which are considered to have most high potentiality for macadamia growing. Survey for the other districts shall be carried out later in the future.

II. General Environment.

1. Bungoma District.

The Bungoma District is mainly situated on the Southern slopes and foot-hills of Mt. Elgon (4,321 m).

The altitudes of this district range from approximately from 1,500m to 2,400m. The annual mean temperature is about 15°C-18°C in higher places, 19°C-21°C in middle places and 21°C-22°C in lower places.

The average annual rainfall ranges 1,200mm to 1,800mm. Rainfall distribution is a unimodal type, its well-distributed, and differentiation in rainy seasons during the year is much less than the central highlands which have bimodal distribution type.

According to the farm management of Kenya, agro-ecological zones of this district include following eight zones:-

Tea-Diary Zone (LH-1), Coffee-Tea Zone (UM-1),

Main Coffee Zone (UM-2), Marginal Coffee Zone (UM-3),

Cotton-Maize Zone (UM-4), Sugarcane Zone (UM-1),

Marginal Sugarcane Zone (LM-2) and Cotton Zone (LM-3).

During past planting time of macadamia from 1964 to 1971, only a few seedling trees were planted in the Northern part of Webuye, but they are not producing nuts because they were not improved clonal varieties.

2. Kakamega District.

The land forms of Kakamega District may be divided roughly into the following two zones:-

- Upper midland zone of Eastern Kakamega with altitudes ranging from 1,500 to 1,900m and lower midland zone of Western Kakamega with altitudes ranging from 1,300m to 1,500m.

The agro-ecological zones of upper midland zone in eastern Kakamega consist of three zones i.e. sunflower maize zone (UM 4) of Northern part of Eastern Kakamega, tea-coffee zone (UM 1) of Southern Kakamega and mixed zone of main coffee zone (UM 2) and marginal coffee zone extend of narrow belt extend in between sunflower maize zone and coffee-Tea zone.

The marginal coffee zone (UM 3) attains good yield with additional irrigation.

The annual mean temperature in upper midland zone is about 18.5°C 20.9°C and 20.9°C-22.0°C in lower midland sugarcane zone. Average annual rainfall in upper midland ranging from 1,000mm to 2,000mm central to Southern part of this upper midland zone is too high, also it's too high in the lower midland sugarcane zone with between 1,800 and 2,000mm.

About thirty seedling trees are growing in the garden of the Kakamega Agricultural Research Station. They are all mature trees (about 18 years old) and very few trees producing very few small nuts because they are un-improved clonal varieties. In 1986, about twenty grafted seedlings of selected varieties were planted in the DAO's Nursery. They are growing well though proper training and pruning are needed.

### 3. Kisii District:

The Kisii District may be divided into a few main zones as follows:- Lower highland zones including Tea-Diary zone and pyrethrum zone with altitudes between 1,850m and 2,200m in Eastern part of Kisii District, Upper midland coffee-Tea zone in the Western part of Kisii district, and some small parts of lower midland sugarcane zone scattered along the slopes of the upper midland coffee-Tea zone.

Annual mean temperature is about 16.2°C-18.0°C in the lower highland zone of the Eastern part of this district and 18.0°C-20.5°C in the upper midland coffee-Tea zone of Western part of this district.

Annual rainfall is too high with 1,800-2,100mm in the central part of this district, however moderately high with 1,600-1,800mm in the lower places of upper midland coffee-Tea zone and 1,200-1,400mm in the lower highland pyrethrum zone.

It is suggested that the lower places of coffee-Tea zone are the high potential areas same as areas of coffee-Tea zone.

The rainy seasons of the year are not easy to distinguish because there are normally no real dry season in between, therefore rainfall distribution pattern is a real unimodal.

In the past, several macadamia seedling trees were planted in some areas, i.e. Manga and Ogembo Divisions. However, their yield are very low due to un-improved clonal varieties, and the sites like Manga division the altitude is too high therefore not suitable for growing macadamias.

The unit used in mapping land should be characterized by differences that significantly affect suitability classes, productivities, and management requirements.

Finally, estimate the approximately areas of each mapping unit and suitability class from the land suitability classification map.

TABLE 1: Relationship of land Suitability classes and major land limitations.

Land suitability	Sub-class	Climate & soil conditions	Major land limitations	Main Agro-Ecological zone
Class S-1	Highly suitable	Alt.1,500-1,750m Tem.18.8-20.6°C Rain 1,400-1,700mm	None	Main Coffee zone.
Class S-2	Moderately suitable	Alt.1,750-1,850m Tem.18.0-20.6°C Rain 1,800-2,000mm	Moderately high altitude and low temp.	Coffee-Tea zone
	S-2t			
	S-2r	Alt.1,400-1,550m Temp.18.8-20.6°C Rain 1,200-1,400mm	Moderately less precipitation	Lower places Main coffee-zone.
	S-2w	Alt. over 1,650m Tem.18.1-20.4°C Rain over 2,000mm	Too wet climatic condition	Tea-coffee zone.
	S-2s	Alt.1,350-1,500m Temp.20.6-21.5°C Rain 1,400-1,600mm	Moderately low fertility and shallow soil.	Marg. sugar cane zone
Class S-3	Marginal suitable			
	S-3t	Alt.1,800-1,900m Tem.17.5-19.5°C Rain over 2,000	Marginal high altitude and low temp.	Higher places of coffee-Tea zone.
	S-3r	Alt.1,450-1,600m Tem.18.8-20.6°C Rain 1,200-1,400mm	Marginal less precipitation	Marg. Coffee zone
	S-3s	Alt.1,350-1,500m Tem.18.8-20.6°C Rain 1,400-1,800mm	Marginal low fertility and shallow soil. sometimes excess rainfall.	Sugar cane zone
Class N	Not suitable			
	Nt	Alt. over 1,900m Tem.16.2-18.0°C Rain over 2,000mm	Too high alt. and low temperature	Tea-Diary zone
	Nr	Alt.1,200-1,400m Tem.21.2-22.4°C Rain 1,200-1,400mm	Low rainfall & low rainfall probability	Lower mid-land cotton zone.
	Ns		Shallow soil & very low fertility.	
	Nd		Water logging or poor drainage.	Bottom land

### III. Survey Methods.

1. Collecting and studying the climatic and soil physical data, maps and reports etc. of all agro-ecological zones in each district concerned with survey. These data and materials can be collected from the farm management Handbook of Kenya which was published by the Ministry of Agriculture.

2. To check the range of altitude, annual mean temperature and annual average rainfall of each agro-ecological zone within the district concerned with survey in order to judge the kind and degree of the climatic limitations for growing of macadamias which will reduce productivity and increase inputs.

3. To make sure the distribution of the kind and degree of soil physical limitations i.e. soil depth, drainage, general fertility and slopes etc. on the basis of soil map at scale 1:500,000 provided by the above mentioned Farm Management Handbook and field reconnaissance survey to judge the kind and degree of soil physical limitations in each agro-ecological zone.

4. Classification of the land according to its suitability was based on the kind and degree of climatic and soil physical limitations for growing macadamias.

In the land suitability classification, four suitable classes were used, viz:-

Class S-1: Highly suitable; few or no significant limitations for growing of macadamias that will not reduce productivity of benefit.

Class S-2: Moderately suitable; moderate limitations for growing of macadamias; the moderate limitations will moderately reduce productivity and benefits or increase required inputs to the extent that will be appreciably inferior to class S-1 land.

Class S-3: Marginally suitable; severe limitations for growing macadamias; the limitations will severely reduce productivity and benefits or increase required inputs that this expenditure will be only marginally justified.

Class N: Not suitable; very severe limitations or hazards as to preclude from successful growing of macadamias.

These four suitable classes and standard for systematic classification used for this purpose are temporarily arranged as Table 1.

5. Mapping and estimating the areas according to the suitability classes.

After studying and classifying the suitability of land according to the different land limitations, land suitability unit map is made. Agro-ecological zone map with a scale of 1:500,000 can be used as a base map for this purpose.

Table 2. Major land limitations and land suitability  
Classes of each mapping Unit.

No. of mapping unit	Agro-Ecological zone	Extent (ha)	Major land limitations	Land suitability for macadamias
Bungoma D.				
(1)	Tea-Diary Z	10,500	High alt. & cool	Not suitable
(2)	Coffee-Tea zone	17,500	Moderately high alt. & moderately cool temperature	S-2t moderately suitable
(3)	Main coffee Zone	25,000	None	S-1 High suitable
(4)1-2	Marg. coffee zone	27,500	Moderately less precipitation with add. fairly good yield	S-3r Marg. suitable
(5)	Sunflower-maize zone	12,500	Fairly less precipitation	Nr Not suitable
(6)-1	Sugar cane zone	13,000	Shallow soil & low fertility	S-3s Marg. suitable
(6)-2	"	3,750	Water logging & firm clay soil	Not suitable
(7)-1	Marg. sugar	30,000	Shallow soil & low fertility	S-3s Marg. suitable
(7)-2	"	15,000	Water logging & firm clay soil	Not suitable
(7)-3	"	12,500	Moderate fertility	S-2 moderately suitable.
(8)-1	Cotton zone	25,000	Shallow soil & low fertility, less precipitation.	Not suitable
(8)-2	Cotton Zone	12,500	Water logging & firm clay soil	Not suitable
Kakamega D.				
(1)-1	Tea-coffee zone	32,500	Too wet condition	Moderately suitable.
(1)-2	"	35,000	None	S-1 High suitable
(2)	Sunflower-Maize zone	62,500	Fairly less precipitation	Not suitable
(3)-1	Sugarcane zone	63,000	Low to very low fertility	Marg. suitable
(3)-2	"	11,250	Water logging & firm clay soil	Not suitable
(4)	Marg. sugar cane zone	32,500	Low fertility	Marg. suitable
Kisii D.				
(1)-1	Wheat/Maize pyrethrum Z	20,000	Too high alt. cool temp. & less precipitation.	Not suitable
(2)	Tea-Diary Z	65,000	Too High alt. & cool temp.	Not suitable
(3)-1	Coffee-Tea zone	55,000	Moderately high alt. moderately cool temp.	moderately suitable.
(3)-2	"	47,500	None	High suitable
(4)	Sugarcane Z	7,500	Moderately less	moderately suitable.

Table 3.

Distribution of land classified according to the suitability classes and sub-classes.

Land Suitability and major Limitations	Bungoma District	Kakamega District	Kisii District	Total
High suitable (S-1)	25,000(13%)	35,000(15%)	47,500(24%)	107,500
Moderately suitable(S-2)	30,000(16%)	32,500(14%)	62,500(32%)	125,000
a) Cool temperate (S-2t)	(17,500)	-	55,000	(72,500)
b) Low fertility or shallow soil (S-2s)	(12,500)	-	-	(12,500)
c) Less precipitation(S-2r)	-	-	(7,500)	(7,500)
d) Too wet climatic condition (S-2w)	-	(32,500)	-	(32,500)
Marg. suitable (S-3)	70,500(37%)	95,500(40%)	-	166,000
a) Low fertility or shallow soil (S-3s)	43,000	(95,500)	-	(138,500)
b) Less precipitation (S-3r)	(27,500)	-	-	(27,500)
Not suitable (N)	64,500(34%)	73,750(69%)	85,000(44%)	223,250
a) High altitude (Nt) and cool	(10,500)	-	(85,000)	(95,500)
b) Less precipitation(Nr)	(37,500)	(62,500)	-	(100,000)
c) Shallow soil or low fertility (Ns)	-	-	-	-
d) Water logging or poor drainage (Nd)	(16,500)	(11,250)	-	(27,750)
<b>T O T A L</b>	<b>190,000</b>	<b>236,750</b>	<b>195,000</b>	<b>621,750</b>

#### IV. Results and Conclusion.

Major land limitations and land suitability classes of each mapping unit in each district are shown in Table 2, and distribution of land suitability classes and sub-class are presented in Table 3. and figs.1,2, & 3.

1. Regarding highly suitable land, as shown in Table 2, Kisii district showed the largest area (47,500 ha), Kakamega District has intermediate area (35,000ha) and Bungoma District showed the smallest area (25,000 ha).

2. The area of moderately suitable land of Kisii District is the largest (62,500 ha), though it's land having moderately low temperature limitation due to little high elevations.

Kakamega and Bungoma Districts are almost same area (approx. 30,000-33,000 ha), however main limitations of these two districts are different i.e. low temperature due to high altitude in Bungoma district and very wet climatic conditions in Kakamega districts.

3. There are large areas of marginally suitable land in Bungoma district (70,500 ha) and Kakamega district (95,500 ha); though Kisii district has no marginal suitable land.

Main limitations of Kakamega district are shallow and low fertility soils and Bungoma district are cool temperatures in high altitudes and soil with shallow and low fertility.

4. The areas of unsuitable land of these three districts are almost same ranging from 75,000 ha. to 85,000 ha, however their kinds of limitations are different in Kisii district, less precipitation or water logging in Kakamega district, and too high altitude, less precipitation or water logging in Bungoma district.

5. All of these DAO's and Research Station concerned have high interest in Macadamia extension in Western Kenya, however they do not have enough experience, materials and finance to start new project. Therefore, it is suggested that should be established a specific promoting system from the government organizations concerned with this new project.

Table 4. Agro-Ecological Zone / Adaptable Varieties.

Agro-Ecological Zone (main leading crop)*	Altitude and Climatic Range* *			Climatic Yield poten- tiality.	Tentative recommendations
	Altitude	Ann. Mean Tempera- ture.	Ann. Mean rainfall		
(Upper Midland) Zone 1 (Coffee-Tea Zone)	1,750- 1,850m	17.5- 19.0°C	1,600- 1,800mm	Good to Fair	KMB-3 M. Hybrid or other varieties selected for higher elevations.
(Upper Midland Zone 2) (Main Coffee Zone)	1,600- 1,750m	18.5- 20.0°C	1,200- 1,600mm	Very good	KRG-1,3,4 MRG-20 EMB-1 - M. integrifolia.
(Upper Midland Zone 3) (Marginal Coffee Zone)	1,450- 1,600m	20.0- 21°C	1,000- 1,200mm	Good to Fair	Ditto, but irriga- tion is beneficial during the drought period.
			850- 1,200mm	Fair to Good	Ditto, but irriga- tion is more need- ed during the dis- tinct arid period to produce good crops.

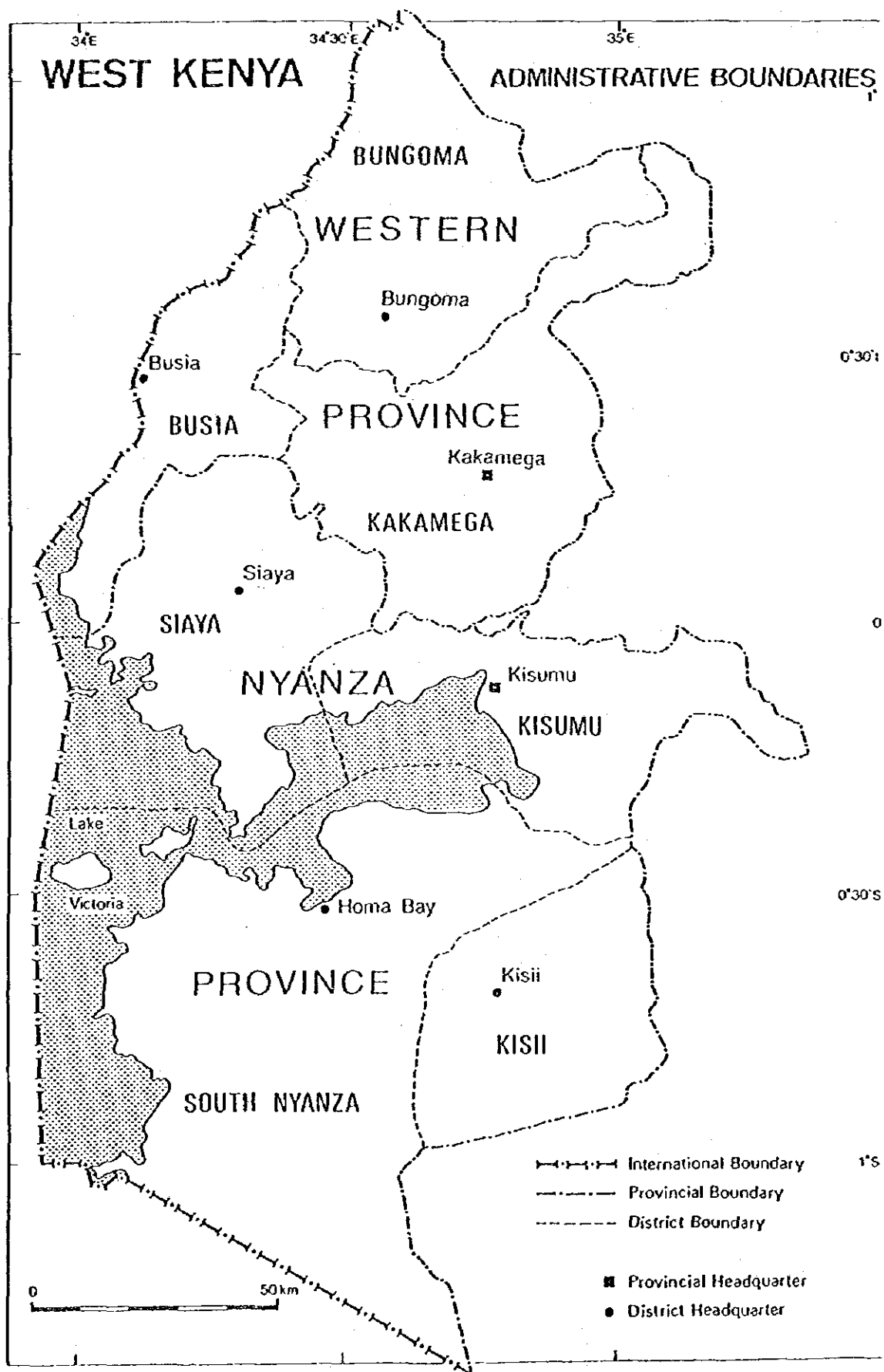
Note: \* Datas from Agro-Ecological Zone/Farm  
Management Handbook of Kenya, Ministry  
of Agriculture, 1983.

Submitted by: S. Hirama/N. Ondabu  
Breeders on Macadamia Research Programme.

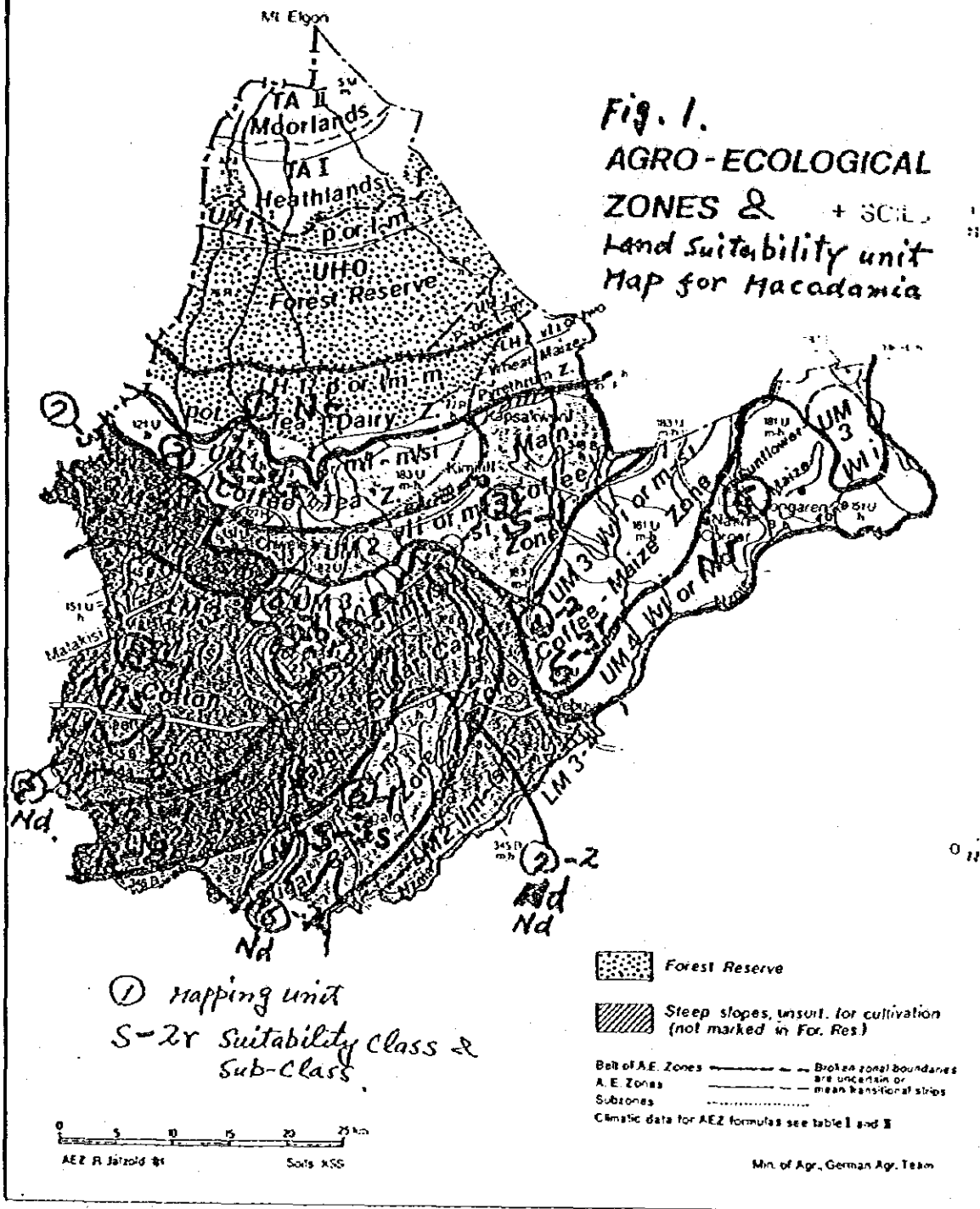


#### v. Acknowledgement.

We acknowledge with thanks the cooperation of Mr. W.W. Wapakal, the Director of Research Division, Ministry of Agriculture; Mr. S.K. Njuguna, the Director of National Horticultural Research Station at Thika; Dr. Apolld B., the Director of Western Agricultural Research Station at Kakamega; Mr. Solomo B. Anunda, Bungoma District Agricultural Officer; Mr. P.M. Mwiti, the Extension coordinator and I.M. Tabu, Crop Officer of Kakamega D.A.Os office; Mr. Asol R.N. Crop Officer and Mr. Everett Wafula, Farm Management Officer of Kisii D.A.Os office; and all District and Divisional Officers who assisted greatly in the implementation of this macadamia suitable land survey programme.



## BUNGOMA

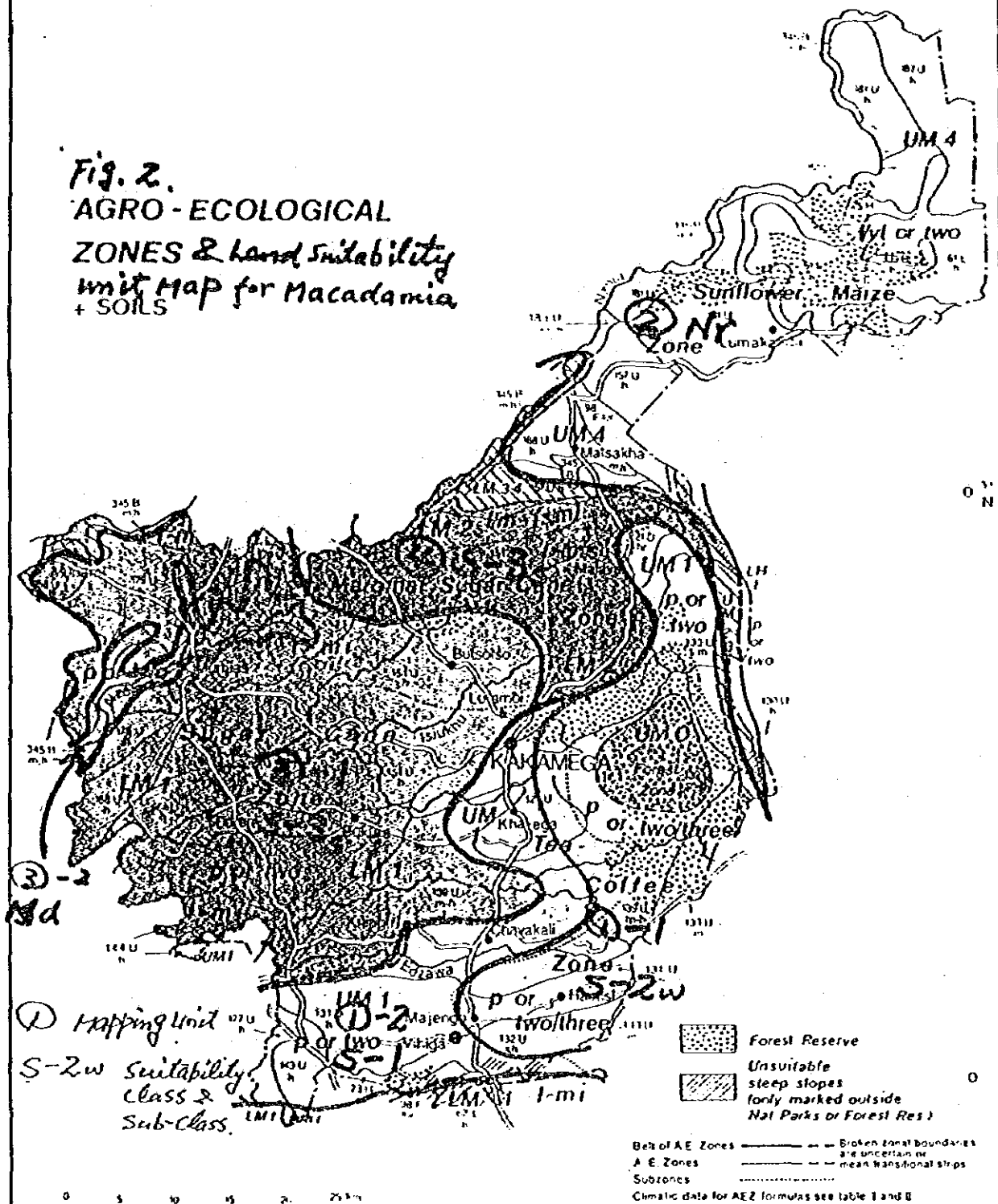


33° E

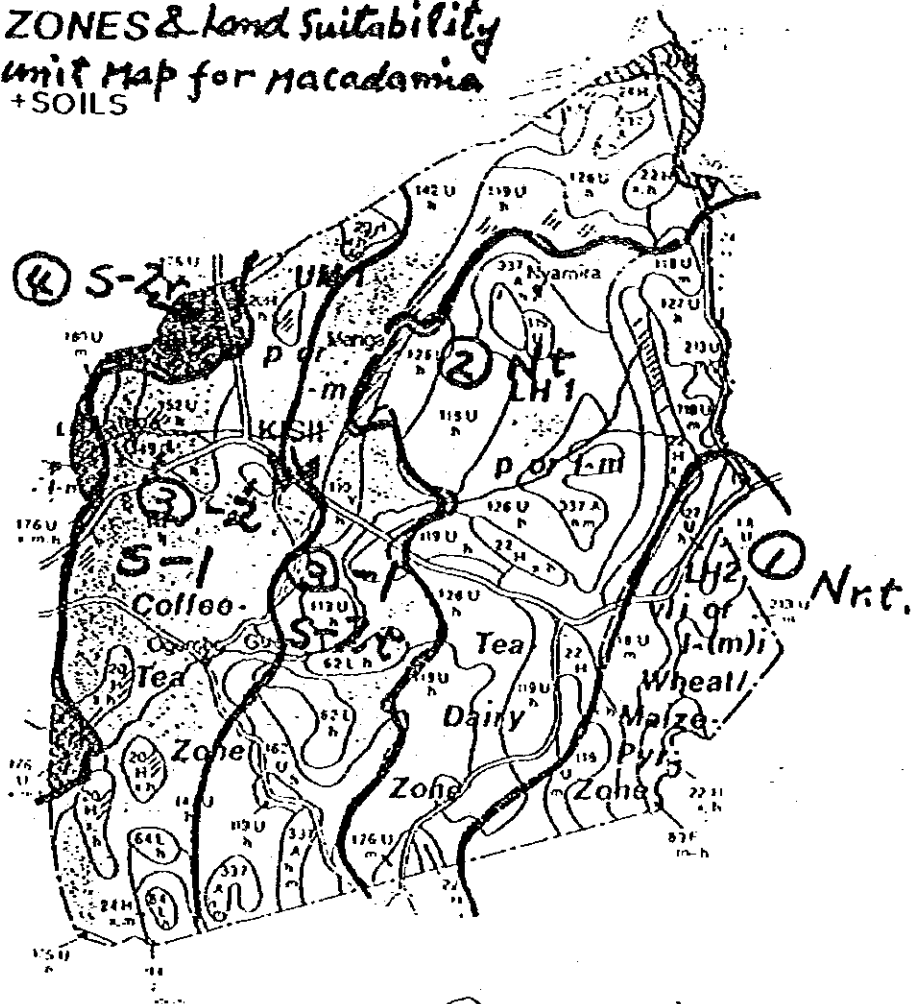
35° E

## KAKAMEGA

Fig. 2.  
AGRO-ECOLOGICAL  
ZONES & Land Suitability  
Unit Map for Macadamia  
+ SOILS



**Fig. 3**  
**AGRO-ECOLOGICAL**  
**ZONES & land suitability**  
**unit Map for Macadamia**  
**+ SOILS**



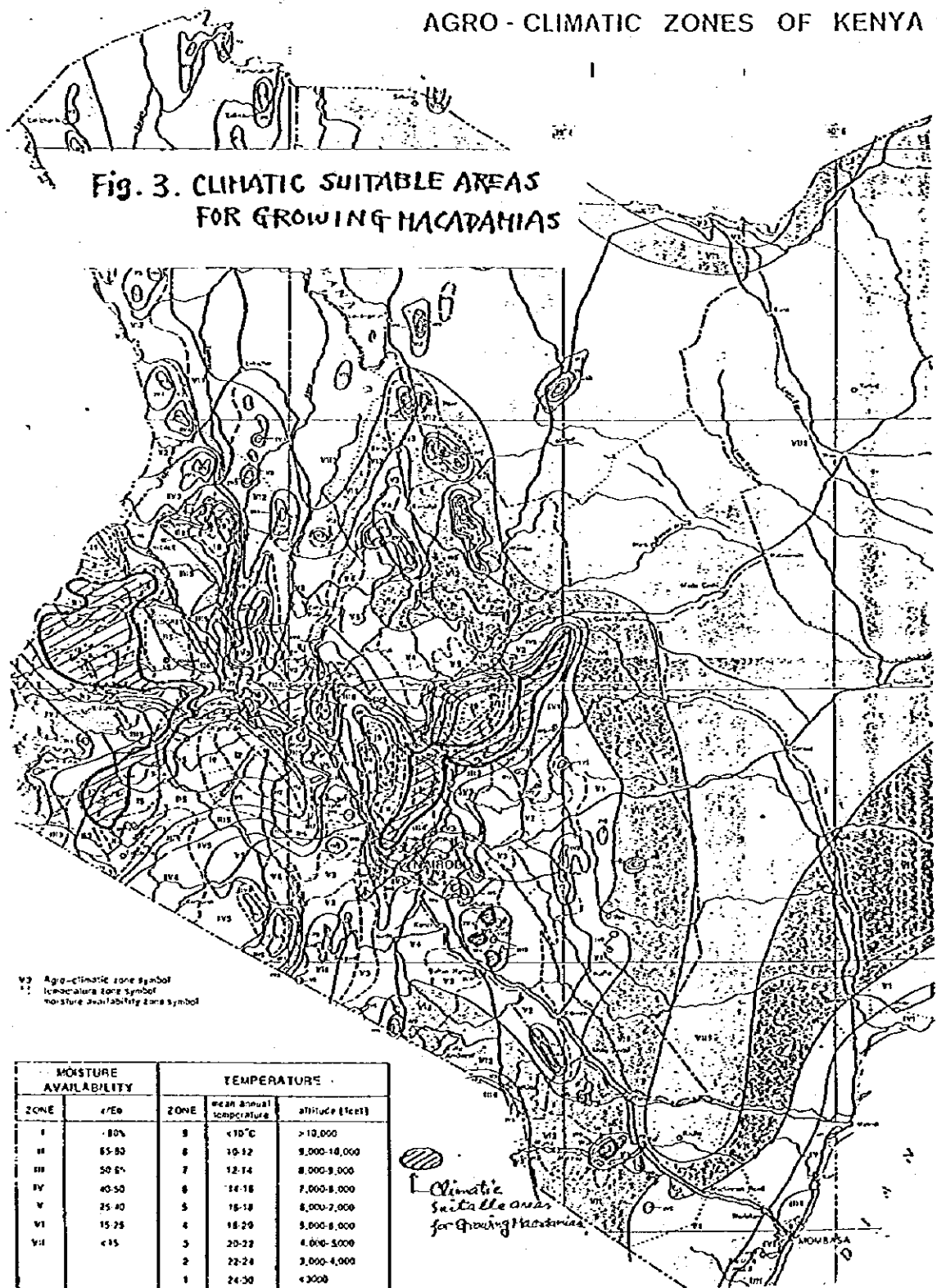
① Mapping unit  
 S-2t suitability class  
 & sub-class.

Unsuitable steep slopes

Belt of A. E. Zones ——— Broken zonal boundaries  
 A. E. Zones ——— are uncertain or  
 Subzones ——— mean transitional strips

Climatic data for AEZ formulas see table I and II

付属資料 5. 気象条件によるケニア国内マカダミア栽培適地図



付属資料 6. マカダミアの品質選抜基準

SELECTION STANDARDS OF MACADAMIA VARIETIES

ITEM	SUB-ITEM	
Tree	(1) Vigorosity	Should be vigor and hardy
	(2) Branches	Strong with medium wide crotch angles
	(3) Tree form	Not too spread and not "leggy"
Nuts	(1) Shape	Should be round or nearly round
	(2) Size	Should be medium (2.25-2.75 cm, side to side) and uniform
	(3) Weight	Should be average from 6.0 to 9.0 g or nuts per pound from 50 to 75
	(4) Shell-thickness	Should be less than 3.0 mm
	(5) Kernel recovery	Should be more than 32 percent on dry weight base
Kernels	(1) Shape	Should be round, plump and smooth : there should be no sharp, apical kernels
	(2) Size	Should be medium (18-21 mm, side to side) and uniform
	(3) Weight	Average weight should be 2 to 2.7 g on dry weight base
	(4) Color	White or cream, without dark circles or off-color tops
	(5) Quality	More than 90 percent of grade 1 kernels (moisture content less than 2 percent, have a specific gravity of 1.0 and float in tap water)
Bearing capacities	(1) Nuts per raceme	Should be average 10 to 20 nuts per raceme
	(2) Yield	Should be at least 50 kg of nuts in shell at 14/15 years of age in highly suitable land and 40 kg nuts at similar age in moderately suitable land for growing macadamias

付属資料 7. 研修関係資料

① 研修実施状況

★コース別実施時期と参加状況 62年度

期 間	対 象	コース別	参加人員
'87 5月17日～5月22日	DAO, DCO	1週間コース	17名
6月15日～6月20日	DCO, DHO	1週間コース	7名
7月5日～7月10日	DEO, LEO	2週間コース1回目	10名
7月19日～7月24日	DEO, LEO	2週間コース1回目	10名
8月23日～8月28日	DEO, LEO	2週間コース1回目	17名
9月13日～9月18日	DEO, LEO	2週間コース2回目	15名
10月4日～10月9日	DEO, LEO	2週間コース1回目	16名
10月25日～10月30日	DEO, LEO	2週間コース2回目	19名
11月15日～11月20日	DEO, LEO	2週間コース1回目	18名
11月25日～11月26日	DAO	D・A・Oセミナー	25名
12月6日～12月11日	DEO, LEO	2週間コース2回目	14名
1月10日～1月15日	DEO, LEO	2週間コース2回目	21名
1月31日～2月5日	DEO, LEO	2週間コース1回目	18名
2月14日～2月19日	DEO, LEO	2週間コース1回目	15名

★昭和63年度 研修実施状況

期 間	対 象	コース別	参加人員
4月10日～4月15日	DEO, LEO	2週間コース2回目	15名
5月15日～5月20日	DEO, LEO	2週間コース2回目	12名
7月10日～7月15日	DEO, LEO	2週間コース1回目	20名
9月4日～9月9日	DEO, LEO	2週間コース2回目	予定



② 研修受講者数

Macademia Extension Training Course Participant of each District.

( From May 1987 to July 1988 )

	1987						D.A.O					1988	
PROVINCE/DISTRICT	MAY 17-22	JUNE 21-26	JULY 5-10	JULY 19-24	AUG. 23-28	OCT. 4-9	NOV. 15-20	NOV. 25-26	FEB. 14-19	FEB. 31-5	JULY 10-15	TOTAL	
<b>CENTRAL PROVINCE</b>													
KIAMBU	1	-	-	-	1	-	1	1	-	-	1	5	
MURANGA	-	-	-	-	-	1	1	-	-	-	-	2	
NYERI	1	-	1	-	1	-	1	2	-	1	1	8	
KIRINYAGA	1	1	-	1	1	1	-	1	-	1	1	8	
NYANDARUA	-	-	-	1	-	1	1	1	1	1	1	7	
TOTAL	3	1	1	2	3	3	4	5	1	3	4	30	
<b>EASTERN PROVINCE</b>													
MERU	1	3	-	1	1	1	1	1	1	-	1	11	
EMBU	-	-	1	2	1	-	1	2	1	1	1	10	
KITUI	1	-	-	-	-	-	-	-	-	-	-	1	
MACHAKOS	2	-	1	-	1	1	1	1	-	1	1	9	
TOTAL	4	3	2	3	3	2	3	4	2	2	3	31	
<b>WESTERN PROVINCE</b>													
KAKAMEGA	-	-	1	1	1	1	1	1	1	2	1	10	
BUNGOMA	-	-	-	-	1	1	1	1	1	1	1	7	
BUSIA	1	-	1	1	1	-	-	1	1	1	1	8	
TOTAL	1	0	2	2	3	2	2	3	3	4	3	25	
<b>NYANZA PROVINCE</b>													
KISUMU	1	1	1	1	1	1	1	2	1	-	1	11	
KISII	1	1	-	-	1	1	-	2	-	1	1	8	
SOUTH NYANZA	2	-	-	-	-	1	1	1	1	-	-	6	
SIAYA	-	1	-	-	-	1	-	-	1	1	1	5	
TOTAL	4	3	1	1	2	4	2	5	3	2	3	30	
<b>RIFT VALLEY PROVINCE</b>													
NAKURU	1	-	-	-	1	1	-	2	1	-	-	6	
TRAN-ZOIA	-	-	-	-	1	1	1	1	1	1	1	7	
UASIN GISHU	-	-	-	-	-	-	-	-	-	-	-	0	
BARINGO	1	-	1	1	1	1	-	1	-	-	-	6	
KERICHO	1	-	-	-	1	-	1	1	-	1	1	6	
ELGEYO HARAKWET	-	-	-	-	-	-	-	-	-	-	-	0	
NANDI	-	-	-	-	-	-	-	-	1	-	-	1	
LAIKIPIA	-	-	-	-	-	-	-	-	-	1	1	2	
TOTAL	3	0	1	1	4	3	2	5	3	3	3	28	
<b>COAST PROVINCE</b>													
KWALE	1	-	1	1	1	1	1	1	1	-	-	8	
KILIFI	1	-	1	1	1	-	2	1	2	2	2	13	
LAHU	-	-	-	-	-	-	-	-	-	-	-	0	
TAITA/TAVETA	1	-	1	-	1	1	1	-	-	1	1	7	
HOMBASA	-	-	-	-	-	-	1	1	-	1	1	4	
TOTAL	3	0	3	2	3	2	5	3	3	4	4	32	
<b>NORTH EASTERN</b>													
CARISSA	1	-	-	-	-	-	-	-	-	-	-	1	
TOTAL	19	7	10	11	18	16	18	25	15	18	20	177	

### ③ 研修スケジュール

#### マカダミア普及研修コース・スケジュール

##### (上級コース)

時刻	日曜	月曜	火曜	水曜	木曜	金曜
9.00-19.00		開講式	ケニアにおけるマカダミアの生産	現地へ移動 ニエリ、ケルゴヤ、ムランガの各県	ケニアナッツカムパニーでの加工・販売	コースの評価 (実物鑑定競技)
10.00-10.30		ティーブレイク	ティーブレイク		ティーブレイク	ティーブレイク
10.30-13.00		マカダミア産業の紹介	マカダミアの害虫と病害防除実習。	(現地視察)	ケニアナッツカムパニーの工場訪問	スライドショー
13.00-14.00		昼食	昼食		昼食	閉会式
14.00-16.30	研修生到着 ブルーポストホテル	ケニアにおけるマカダミアの開発	繁殖		マカダミアに関するT&Vプログラム	

#### マカダミア 普及研修コース・スケジュール

##### (中級コースの第1回目)

時刻	日曜	月曜	火曜	水曜	木曜	金曜
7.00-8.00		朝食	朝食	朝食	朝食	朝食
9.00-10.00		オリエンテーション 開講式 マカダミア産業とその未来について	現地訪問 キアンブ、キリンガ両県	栽培(理論と実際)	ケニアナッツカムパニー訪問 加工と販売	マカダミアに関する普及方法
10.00-10.30		ティーブレイク		ティーブレイク	ティーブレイク	ティーブレイク
10.30-13.00		育種(理論)		焼き		第2回日の研修についての指示 コースの評価
13.00-14.00		昼食		昼食		閉講
14.00-16.30		育種(実際)		栽培と繁殖(理論と実際)	栄養 昆虫病理	
16.30-18.00	研修生到着 HDPのホステル	ティー	ティー	ティー	ティー	
18.00-20.00	夕食	夕食	夕食	夕食	夕食	

マカダミア普及研修コース・スケジュール

(中級コースの第2回目)

時 刻	日 曜	月 曜	火 曜	水 曜	木 曜	金 曜
7.00-8.00		朝食	朝食	朝食	朝食	朝食
9.00-10.00		オリエンテーション 開講式 第1回目の宿題 報告	育種と栽培について のフィールド ワーク	繁殖	繁殖の実際	討論 今後のマカダミア 普及活動について
10.00-10.30		ティーブレイク	ティーブレイク	ティーブレイク	ティーブレイク	ティーブレイク
10.30-13.00		宿題の報告	続き	繁殖の実際	続き	コースの評価 (実物鑑定競技)
13.00-14.00						閉講
14.00-16.30		討論会 (母樹園農家、 ケニアナッツカン パニー)	作物保護の実際	繁殖	スライドショー	
16.30-18.00	研修生到着 HDPのホステル	ティー	ティー	ティー	ティー	
18.00-20.00	夕食	夕食	夕食	夕食	夕食	

#### ④ 研修プログラム作成に当たって配慮した事項（田中専門家レポートから）

##### I. 研修参加時点のアンケート

研修実施計画作成に当たっては予め対象者の実情把握は行われているが、なお不十分な事項も多いので、以後の研修の参考とするため、参加者のマカダミアに対する関心度、普及活動経験年数、活動内容、普及機材の実情等について調査している。

##### II. 二週間コース参加者への宿題

第一週に宿題を課し、それぞれの地域におけるマカダミア栽培の実態を把握させ、第二週時に各自発表させる。この事は単に研修に参加し、講義を聴くだけであると、受動的な研修となるが、自ら行動して実態を把握させる事によって能動的な研修受講となる様に仕向けるのがねらいである。

##### III. 技術競技の導入による研修評価

それぞれの研修最終日に、鑑定競技（第一週）、審査競技（第二週）を実施する。これは、実際に実物又は絵を見せることや、競技をさせることによって研修生に興味を持たせると同時に指導者側としては、教えた事がどのくらい理解されたか、又何が理解されていないかを知り、競技の後の模範解答を懇切丁寧にやれば、反復して理解させる効果を持つ。

併せて研修生が現地での活動にこの方法を習得し、活用させることもねらいとする。

##### IV. マカダミア母樹園農家との対話

農家の貴重な体験談は、時には講師の講話より説得力を持ち、マカダミア栽培についての関心を一層強める。研修生が、以後の普及活動を行う上で役立つ。

##### V. 研修教材活用の準備

当プロジェクトの研修の講師は研究者が担当し、日頃の研究成果を基にして講義を行っているが、とかく安易な方法として黒板の利用と難しく書かれたパンフレットのみで講義中心となり勝ちであるので、研修担当の方で、できるだけ分かり易い絵や写真の導入を考えた教材を準備する必要がある。常時の写真撮影、研究成果をアレンジしたポスターの作成、スライド写真の編集等を実施している。又、ショールームの整備を常時行っている。

##### VI. 先進地の視察及び工場見学

マカダミア栽培が経営として成立つ条件を知るため、先進農家の実態と流通の現状を把握させる事をねらいとしている。

⑤ 研修二週間コース宿題事例

HORTICULTURAL DEVELOPMENT PROJECT

HOME ASSIGNMENT FOR PARTICIPANTS - MACADAMIA EXTENSION

TRAINING COURSE

- Q. 1. How many macadamia nut trees are in your area of work?
2. How many farmers in your area of work, own macadamia orchards?
3. What is the % arable land area (your area) is planted with macadamia?
4. How is macadamia expansion potential in terms of land availability?
5. What is the average yield per tree per farmer?
6. What common technical Questions do farmers ask about macadamia? List them.
7. Do you have farmers intending to expand macadamia production? How many? What are the limitations?
8. Which location in your district has the highest number of macadamia trees planted? (consult district crops officer).
9. In terms of climatical conditions, how is your area suitable for macadamia production?
10. Do you have access to FTC facilities for use with your staff or farmers?

⑥ 研修参集時のアンケート調査表及び集計結果

Name	
Designation	
Duty Station	

Questionnaires

Please fill up following questions.

Put a circle around each item where applicable.

I Are there any macadamia-nut trees in the area where you are in charge?

(i) Yes

(ii) No

II Do you know any growing techniques of macadamia-nut?

(i) I don't know any.

(ii) I know some of the techniques.

(iii) I would understand.

III Would you like to attend any course in macadamia-nut training?

(i) Yes I would

(ii) It might not be useful.

IV How long is your experience in Extension work?

i) 1 year

ii) 2 years

iii) 3 years

iv) 4 years.

v) 5 years

vi) 6 years.

V What is your Extension work?

i) Crop

ii) Horticultural

iii) Livestock.

iv) Home Economics

v) Land Development.

VI How many times do you visit F.T.C.? (One month)

i) 1 - 3

ii) 2 - 3

iii) 3 - 4

iv) 5

VII How many times do you meet with researchers? (One month).

- i) 1                      ii) 2                      iii) 3

VIII What is your means of transport when carrying out your work?

- i) Bicycle    ii) Motor Bike    iii) Motor car  
iv) Motor bus    v) Other (                      ).

IX What materials are you using during your extension work?

- i) Pamphlet    ii) Leaflet                      iii) Camera  
iv) Slide projector    v) Film projector    vi) Soil tester.  
vii) Black-Board    viii) copy machine  
ix) Other materials (                      ).

X If you have any opinion about HDP please write here.

Q.1. Any macadamia in your area?		YES	NO
	A.O.	2	2
	T.O.	5	5
	T.A.	25	15
	Total	32	22

	Don't know	Know some	Would understand
Q.2. Know any techniques of macadamia?			
A.O.	1	2	1
T.O.	0	7	3
T.A.	7	19	12
Total	8	28	16

	Yes I would	Not useful
Q.3. Like to attend any course?		
	A.O. 4	0
	T.O. 10	0
	T.A. 39	0
	<hr/>	
	Total 53	0

		1 year	2 year	3 year	4 year	5 year	6 year
Q.4. Experience in extension?	A.O.	2	2	0	0	0	0
	T.O.	3	2	1	2	0	1
	T.A.	7	7	4	3	1	17
	<hr/>						
	Total	12	11	5	5	1	18

		Crops	Hort.	Livestock	H/Econ.	Land Develop.
Q.5.	Your extension work?	A.O.	4	4	3	3
		T.O.	6	4	2	6
		T.A.	38	23	13	18
		Total	48	31	18	27

	1 - 3	2 - 3	3 - 4	5
Q.6. Visit to F.T.C. per month?	A.O. 2	1	0	0
	T.O. 4	3	0	0
	T.A. 18	8	0	0
	Total 24	12	0	0

		1	2	3
Q.7.	Meet with			
	Researchers per			
	month?			
	A.O.	2	0	1
	T.O.	7	0	0
	T.A.	11	4	1
	Total	20	4	2

		Bicycle	Motor bike	Motor car	Motor bus	Others (footing)
Q.8.	Your means of transport?	A.O.	0	1	4	0
		T.O.	1	0	1	1
		T.A.	15	1	0	1
		<hr/>				
		Total	16	5	7	5



Q.9. Materials used in extension?	Pamp let	Leaf let	Camera	Slide/ p	Film/ p	Soil/ Tester	B/ board	Copy mach	Others
A.O. 2	3		0	0	0	0	0	0	0
T.O. 3	1		0	0	0	0	3	0	5
T.A.18	17		0	0	0	0	7	0	25
Total	23	18	0	0	0	0	10	0	30

① 研修教材の整備 (準備)

1988年7月現在

教材名	目的	数量	内容等
研究園場のガイドボード	研究内容の理解の促進	課題11 品種100	マカダミアの研究園毎に設置 (施材利用)
ショーケース	研修者、視察者に対するマカダミアの展示	6基	果実、葉の品種別実物展示 3基 病害虫の展示 1基 接ぎ木の実物展示 1基 製品の展示 1基
展示用パネル	同上	30面	生産統計、品種、接ぎ木の写真、グラフ等
スライド	室内研修及び普及用	900枚	プロジェクトの紹介 30 マカダミアの栽培 57 専門分野の技術解説 700
マカダミアの情報紙	研修対象者テキスト	16000枚	No 1. プロジェクト紹介 No 2. 品種の解説 特集. マカダミアの栽培 No 3. 開花と受粉 No 4. 繁殖と接ぎ木 No 5. マカダミアの害虫 No 6. 施肥と管理 No 7. 流通市場
研究成果の展示パネル	室内研修用	30面	試験成績に基づくグラフ、表及び写真等
プロジェクトの案内	研修者、視察者用	1500部	園芸開発計画の紹介
記録写真アルバム	研修者、視察者用	20冊	専門分野別の記録写真
テキストブック	研修対象者用	1500部	カラー写真入り栽培指針

⑧ マカダミアの普及研修及びマカダミア情報紙の評価アンケートの集計結果

EVALUATION OF MACADAMIA EXTENSION TRAINING  
COURSE AND READERS OF INFORMATION ON  
MACADAMIA.

(1987 Training Course Participants)

Horticultural Development Project  
(Training Section)

April/1988

Name \_\_\_\_\_

Duty Station \_\_\_\_\_

Dear Participant

Post-investigation for MACADAMIA EXTENSION TRAINING COURSE.

Please answer and mark the following questions.

1. When did you attend this MACADAMIA EXTENSION TRAINING COURSE ?

- ① May 17th-22th.    ② Jun 15th-20th.    ③ Jul 5th-10th.    ④ Jul 19th-24th.  
⑤ Aug 23th-28th.    ⑥ Sep 13th-18th.    ⑦ Oct 4th-9th.    ⑧ Oct 25th-30th.  
⑨ Nov 15th-20th.    ⑩ Dec 6th-11th.

2. Was the Training useful for extension work after that ?

- ① Yes at present only.            ② At present and infuture.  
③ Infuture only.                ④ Not much.

3. What techniques are needed for MACADAMIA EXTENSION TRAINING COURSE, at present and infuture ?

- ① Propagation only.    ② Agronomy aspect.    ③ Soil & Nutrition.  
④ Plant protection.    ⑤ Breeding.    ⑥ Marketing.    ⑦ Other(            ).

4. Which Particular Training course do you need infuture ?

- ① Propagation only    ② Agronomy aspect.    ③ Soil & Nutrition.  
④ Plant protection.    ⑤ Breeding.    ⑥ Marketing.    ⑦ Other(            ).

5. What is farmers opinion about macadamia in your working area ?

----- Please answer independently. -----

PERCENTAGE RECOVERY FOR EACH COURSE AND EACH PROVINCE

COURSE TERM	EASTERN	CENTRAL	WESTERN	NYANZA	COAST	R/VALLEY	N/EAST
MAY 17-23rd 1987	1	3	1	4	2	3	1
LETTERS SENT	1	3	1	4	3	3	1
%RECOVERY	25	66.6	100	100	66.6	100	100
JUNE 15-20th 1987	1	1	-	1	-	-	-
LETTER SENT	3	1	-	3	-	-	-
%RECOVERY	33.3	100	-	33.3	-	-	-
JULY 5-10th & Sep.13-18	2	-	1	1	1	-	-
LETTERS SENT	2	1	2	1	3	1	0
% RECOVERY	100	0	50	100	33.3	0	-
JUL.19-24th & SEP.13-18	2	2	1	1	2	-	-
LETTERS SENT	3	2	2	1	2	1	-
%RECOVERY	66.6	100	50	100	100	0	-
AUG.23rd-28 & OCT25-30	3	3	3	1	3	4	-
LETTERS SENT	3	4	3	2	3	4	-
%RECOVERY	100	50	100	50	100	100	-
OCT 4-9th & DEC.6-11TH	2	2	1	1	2	3	-
LETTERS SENT	2	3	2	4	2	3	-
%RECOVERY	100	66.6	50	25	100	100	-
NOV.15-20th	-	1	2	2	5	2	-
LETTER SENT	3	4	2	4	5	2	-
%RECOVERY	0	25	100	50	100	100	-
1. TOTAL RECOVERY	12	12	9	11	15	12	1
2. TOTAL LETTERS SENT	20	16	12	19	18	14	1
3. TOTAL RECOVERY %	60	75	75	57	83	85.7	100

ANSWERS RECOVERY FOR POST INVESTIGATION  
 -----  
 FOR MACADAMIA EXTENSION TRAINING COURSE.  
 -----

2. Was the Training useful for extension work after the course?

(1) Yes at present only (2) At present and in future

2

49

(3) Infuture only

25

(4) Not much

3

3. What techniques are needed for macadamia Extension Training course at present and in future?

(1) Propagation only (2) Agronomy Aspect

38

42

(3) Soil and plant Nutrition (4) Plant protection

25

23

(3) Breeding

20

(6) Marketing

19

(7) Others

10

4. Which particular training course do you need in future?

(1) Propagation only (2) Agronomy aspects.

26

27

(3) Soil and plant Nutricion (4) Plant Protection

22

18

(5) Breeding

19

(6) Marketing

13

(7) Others

0

5. What is farmers opinion on macadamia in your working are?

(See overleaf)

(1) COMMENTS ON POST INVESTIGATION FOR MACADAMIA  
EXTENSION TRAINING COURSE.  
-----

The macadamia extension training courses were conducted successfully. According to the course participants, the training is useful both at present and in future but others tend to think to the best of their knowledge, that the training will only be useful in future. (This is because, most parts of the country, even those potential for macadamia cultivation, do not have any macadamia at present so until the macadamia is established in these areas the training acquired will not be of much use.

The most important and needed techniques of macadamia at present and in future are

- (1) The Agronomy aspects which includes all the husbandry the crop requires.
- (2) Propagation of the crop with the most emphasis laid on vegetative propagation i.e grafting.
- (3) Soil and plant Nutrition.
- (4) For any crop to thrive as expected it has to be protected from pests and diseases.
- (5) For more fields, local adaptability etc a lot of Breeding has to be done on the crop.
- (6) Marketing is the last stage for any agricultural produce. If the marketing is organised very little is expected from farmers for that particular crop.

Majority of the readers (participants) would like to attend a course in different fields of the crop management. This is in priority of.

- (1) Agronomy aspects. No crop will do well without the agronomy aspects (crop husbandry). Without this it will just be another wild tree growing in the bush.
- (2) Propagation which is the base of the crop.
- (3) Soil and the plant Nutrition.
- (4) Plant protection mainly from pests and diseases.
- (5) Breeding of the crop
- (6) The last after all the above is marketing of the produce. This is the most sensitive and delicate stage of any agricultural produce and it has to be handled with a lot of care.

NO	FARMERS OPINIONS	NO OF READER
1.	Lack of planting material	17 /
2.	Improper market and marketing system	7
3.	Farmers interested in starting macadamia cultivation	23 /
4.	Problem of improving the existing varieties ie(Topworking)	3
5.	Farmers are not aware of the crop ie macadamia	12
6.	There is need for more education to farmers.	2
7.	Low opinion on macadamia	2
8.	Macadamia does not pay well as coffee	1
9.	Land is a limiting factor.	2



## COMMENTS ON FARMERS' OPINION ABOUT MACADAMIA IN VARIOUS DISTRICTS

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As we all know farmers are the backbones of none farmers, this is an obvious reason why their opinions, views and suggestions must be adhered to.

In case of macadamia its a new crop which after its introduction in Kenya was received with positive attitude. It was not until after its maturity farmers developed a very low opinion on it. This was due to lack of market and very low yield so it was regarded as a useless crop. This is the reason why it might take time to change the farmers attitude towards the crop. Even though they are now accepting it back as another income generating cash crop and this is due to the intensive research done on the crop and its improvement.

Majority of the farmers are willing to start macadamia cultivation with the new improved varieties. The availability of seedlings is the biggest drawback. This is because we only have two centres in the country producing these improved varieties. These are Kenya Nut Company (K.N.C) and Horticultural development Project (H.D.P) at National horticultural research station (N.H.R.S.) Thika.

Farmers are also faced with the problem of improving the existing varieties. This is mainly done by topworking. A complicated method which farmers cannot perform themselves.

As stated earlier, this is a new Nut tree in the Country. Therefore, some farmers in some Districts are not even aware of existence of the crop. Others, have not even had a chance to see it. This is why farmers need to be educated on the crop, which is only possible by establishing tried Orchards in all macadamia potential areas. This will enhance the farmers to see for themselves what is macadamia and what they should about it.

Some farmers still maintains the low opinions they has developed during the initial stages of macadamia introduction. Something should be done to change their low opinion may be through more education. Others still believe that macadamia can never pay better than coffee which is the major cash crop in Kenya. Indeed farmers know very little or nothing at all in Agricultural economics. Once a farmer gets a boom of income from coffee, he/she will not remember the inputs involved, his/her interest is the output. So the extension staff should put themselves to the task of educating the farmers on input output relationship. This way they will know that macadamia is more paying than coffee.

Macadamia is tree needs less attention and can be planted along the fence or even inside the homestead as a shade tree. So with macadamia there is no limitation on land. Only 5-10 trees are enough to add to a farmers income.

Marketing is the most important. For any farmer to boost production of macadamia there has ready and organised market to satisfy the farmers needs. This is a task of Kenya Nut Company (K.N.C) and area concerned e.g. Kisii and Kirinyaga, and Taita/Taveta.

However it is hoped that this situation is being solved by the K.N.C.

Name \_\_\_\_\_

Duty Station \_\_\_\_\_

★ Reader's questionnaire on INFORMATION ON MACADAMIA

Please answer and mark it following question

1. Did you read INFORMATION ON MACADAMIA ?

- ① Yes I did.    ② Sometimes.    ③ I did not.

2. What impression do you have it ?

- ① Very good for reference.    ② Good for some reference.  
③ Interesting.    ④ Not interesting.

3. Which publication was good for your special reference ?

- ① No 1.    ② No 2.    ③ No 3.    ④ No 4.    ⑤ No 5.    ⑥ Special number.

4. Do you find this INFORMATION necessary so that it can sent to you in future ?

- ① Without fail.    ② When necessary.    ③ Sometimes.    ④ Not necessary.

5. What is your opinion about INFORMATION ON MACADAMIA ?

- ① Good technical news.    ② Good entertainment news.    ③ Include more pictures.

6. Which kind of technical information will be need your future extension work ?

- ① Fertilizer application.    ② Insect control.    ③ Planting time.    ④ Others.

H.D.P Thika    DECEMBER / 1937.

# REPORT FROM VARIOUS DISTRICTS

PROVINCE	DISTRICT	NO OF READERS	NO OF LETTERS SENT	% RESPONSE
CENTRAL	NYERI	2	4	50
	KIAMBU	1	4	25
	MURANGA	2	2	100
	KIRINYAGA	3	6	50
	NYANDARUA	2	2	100
TOTAL		10	18	AV% 56
EASTERN	ENBU	4	5	80
	NERU	4	7	57.1
	NACHAKOS	5	6	83.3
TOTAL		13	18	AV% 72
WESTERN	KAKANEGA	4	4	100
	BUNGOMA	2	3	66.7
	BUSIA	4	4	100
TOTAL		10	11	AV% 90.9
RIFT VALLEY	NAKURU	3	3	100
	NANDI	-	0	-
	UASIN-GISHU	-	1	0
	TRANS-ZOIA	3	3	100
	BARINGO	3	5	60
	KERICHO	3	3	100
TOTAL		12	15	AV% 80
NYANZA	KISII	3	4	75
	KISENU	2	5	40
	SIAYA	2	2	100
	SOUTH NYANZA	3	5	60
TOTAL		10	16	AV% 62.5
COAST	MOHABA	1	2	50
	KWALE	5	6	83.3
	KILIFI	4	5	80
	TAITA/TAVETA	4	5	80
	C.A.R.S.	1	1	100
TOTAL		15	19	AV% 78.9
NORTH EASTERN GARISSA		1	1	100
TOTAL		1	1	AV% 100
		71	98	72%

ANSWERS RECOVERY ON READERS QUESTIONNAIRE ON  
INFORMATION ON MACADAMIA

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1. Did you read information on macadamia ?  
 (1) Yes I did 70 (2) Some times 3 (3) I did not 1
2. What impression do you have on it  
 (1) Very good for reference 47 (2) Good for some reference 18  
 (3) Interesting 10 (4) Not interesting 0
3. Which publication was good for your special reference  
 (1) NO 1 18 (2) NO 2 26 (3) NO 3 23 (4) NO 4 47 (5) NO 5 33  
 (6) Special Number 13
4. Do you find this information necessary so that it can be send to you in future?  
 (1) Without fail 59 (2) When necessary 10 (3) Sometimes 2  
 (4) Not necessary 0
5. What is your opinion on information on macadamia?  
 (1) Good technical news 69 (2) Good entertainment news 1  
 (3) Include more pictures 8
6. Which kind of technical information will be of need in your future extension work?  
 (1) Fertilizer application 33 (2) Insect 37 (3) Planting time 21

- (4) Others
- (i) Propagation and cultural practises
- (ii) Marketing news
- (iii) Training and pruning
- (iv) Crop husbandry
- (v) Ecological requirements.
- (vi) Field management
- (vii) Locally recommended varieties
- (viii) Grafting

#### COMMENTS ON ANSWERS FOR READERS QUESTIONNAIRE ON INFORMATION ON MACADAMIA

Majority of the readers have had a chance to read copies of this information on macadamia. With the majority having had read NO4 and NO5.

The information gave them the impression that its a good information for reference of whatever they learnt during their macadamia extension course term. To that effect they would request more information in future for more reference without fail or when necessary.

The opinion behind their minds on this information is that it provides good technical news about macadamia. The most required technical information in their future extension work is fertilizer application and insect control.

Commenting on the answers given by readers, these publications should be produced regularly and dispatched to the extension staff on macadamia growing areas and other areas potential for macadamia cultivation. This is in order to keep them constantly in touch with new research findings on all aspects of macadamia cultivation and therefore be able to advice the farmers accordingly

⑨ 研修コースについての研究者（カウンターパートの意見）

COMMENTARY ON MACADAMIA EXTENSION TRAINING COURSE:

Since the project (Horticultural Development Project) took off, many courses, short and long alike have been carried out with an ultimate objective of establishing macadamia in at least all potential areas. Within a very short period of time tremendous strides have been achieved which I'm sure are highly appreciated within and outside the project.

The training section which has been working tirelessly in initiating and implementing training programmes needs apart on the back for their commendable job. They have been the trigger of the face-lift the project has now. Little could have been done had they not planned well in advance and scheduled the courses most conveniently.

Who can deny the fact that by availing teaching aids like slides, pictures, show cases, videos and other material did make the courses more comprehensive! They indeed assisted lecturers to disseminate their knowledge more homely to participants whom I'm sure enjoyed and comprehended more than one can say.

A honourable tribute goes to whoever conceived the idea of creating awareness of macadamia to all D.A.O's, A.O's, H.C.O's, T.O's, T.A's, J.T.A's, and all those who have attended the courses. In essence these are the backbone of the success to be expected in extending macadamia industry within the country. It was indeed an appreciable approach as these people make the bridge or rather the channel through which the message could pass from the source (Research) to the recipient (farmer).

Taking participants to the field to verify the field situation was particularly a positive thinking as it gave the participants a clear picture for a proper understanding as a basis of harmonising communication machinery for the benefit of the farmer.

Through such training, macadamia has now gained a lot of publicity however, it is quite regrettable that the gap between the message and the practical part of providing the planting material is quite wide. This creates an urgent call for establishing clonal orchards and nurseries within reach in areas of high potentiality.

It is my sincere hope that the same spirit will continue particularly in giving both material and moral support to training section so that they can deliver goods home and make a name for this project.

Observations by:

- W. Nyakundi,

Propagation.

## ⑩ Embu District におけるマカダミアの普及について (田中専門家レポートから)

### 1 概 略

エンブ県 (Embu District) は、ケニア山麓に位置する標高約1700mを中心とする地域であり、マカダミア栽培適地として主要な地域の一つである。1983年から農業省との協議により、主要マカダミア栽培地5か所を選定して、農業協力隊員を配置し、その業務の中にマカダミアの普及業務を含めるよう合意されていたが、外国人専門家追放キャンペーンによりケニア側から要請書が出されず、現在ただ一人の隊員がエンブ県に配属されている。

1986年3月 大野和徳農業隊員がケニアに着任、現地訓練の後5月～10月までの6か月間NHRSへ短期赴任し、マカダミアの技術研修を主とした園芸作物全般の研修を受けた後、同年11月からエンブ県へ転勤、県農業局長=DAO (District Agri. Officer) の下で、県園芸担当官=DHO (District Hort. Officer) のカウンターパートとしてEmbu地域の農家を対象としてマカダミアを主体とした園芸作物の普及業務に従事し、それと同時に県立育苗場 (District Nursery) においてマカダミア育苗場の建設と、接ぎ木技術指導、及び訓練、即普及を目的とした研修 (Training and Visit System=T. and V. System) における地域農業普及員 (主としてTechnical Assistant=TA) に対する講義、スライド紹介、さらに高接ぎ更新技術の紹介などを実施した。

### 2 育苗場と接ぎ木苗の生産管理

大野隊員の赴任により県立育苗場内にマカダミア部門の設置、育苗場所属の技術職員 (TA) 2名、雇員 (Sabosdioat Staff=SS) 15名の内、TA. 1名、SS 若干名を対象に接ぎ木苗生産及び育苗場管理の技術指導を実施している。

1987年1月に、遮光施設 (shade house) と播種床 (seed bed) を作成、マカダミアの種子を購入し、第1回目2000粒を播種し、発芽率は約55% (12月末現在) であった。第2回目は500粒播種し、50%の発芽率をえた。これらの苗木は現在順調に生育しており、1988年3月ごろから接ぎ木用台木として、利用可能となるであろう。

1987年9月～10月にかけて、農家から入手した実生苗を利用して、60本の接ぎ木 (割接ぎ) を行い、1987年12月現在で30本 (50%) の活着を見た。

これらの苗木は、1988年10月の小雨季に定植予定である。

### 3 県 (District) 側の考え (意見)

マカダミアは当初、子実の生産が開始されても販売先が無く、著しく農家の生産意欲を減退させたが、マカダミアプロジェクトによる技術開発や、ケニヤナッツカンパニーの全国的集荷やキャンペーンによって農家の栽培意欲は盛り上がってきている。現在、農家の優良接ぎ木苗に対す

る要望は多いが、十分な苗木の供給ができていない。園芸開発プロジェクトで実施されている研修コースに普及員を派遣しているが、マカダミアはまだT, and V. Systemに組みこまれていないので、組織的な普及は困難である。そこで大野隊員の計画により、接ぎ木、育苗施設の建設を行い、いささかなりと農家の要望に応えようと考えている。

#### 4 農家の要望（意見）

主にコーヒーを栽培している農家とその生産費の高いこと、コーヒー買取価格の変動の大きい事等からコーヒーより生産費が安く、価格の安定しているマカダミアの栽培を希望している。1987年度、大野農業隊員のところまで相談に来た農家は50人以上であり、その全ては優良接ぎ木苗の購入希望であったことから、潜在的需要はかなりの本数に上ると想定される。しかし、生産物の集荷場所がコーヒーソサエティーの地域集荷場を利用していることから農家に対する支払が遅れたり、必要以上の手数料を農家から徴収する場合があります、不満を持っている農家が多い。

#### 5 大野和徳隊員の見解と将来の見通し

現状では大野隊員が中心となって業務を遂行しており、TAやSS(Subordinate staff) に対して技術指導を行っている。育苗施設の規模は年間接ぎ木苗生産約1000本であり、農家の需要を満たすことは無理であるが、農家の栽培意欲を失わせない程度には苗の供給は可能と考えている。しかし、大野隊員の助手であり、大野隊員が帰国した後引継いで接ぎ木育苗、育苗場管理をしていかなければならないTAが、技術、知識を吸収しようとする意欲がなく、技術移転は思うように進んでいない。SSのなかには技術を進んで知ろうとする者がいるが、上司の理解と援助が無ければ実質的な活動は不可能である。

大野隊員は3月に帰国し、後任隊員は派遣されないことから、その後起こるであろうと思われる問題点は次の通りである。

- (1) 台木用種子を購入するための予算を得ること。
- (2) 穂木、種子を入手するための輸送手段を得ること。
- (3) 育苗場管理（他の果樹と同様の管理では優良マカダミア接ぎ木苗を得ることは難しい）

以上のような諸問題が考えられるが、園芸開発プロジェクト（HDP）で研修をうけた技術職員（TA）が、県農業長官（DAO）あるいは園芸専門員（DHO）とともに、真剣に対応すれば上記の問題の解決は可能と思われる。

同隊員の言によればやはり農家の要望は多く、特に苗木の注文が強かったようである。そこで大野隊員は本プロジェクトの協力を得ながら苗木生産施設の整備に八方手を尽くし、年間約3,000本の苗木を供給できる程度の施設整備に協力した。また同時に、同施設に働く職員3名を当プロジェクトへ一週間研修に派遣する手続を行った。



# INFORMATION ON *Macadamia*

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## The Marketing and Collection of macadamia Nut in-shell



Macadamia in-shell Nut is produced by the farmers or producers & processed by the factory of Kenya Nut Co. Ltd (K.N.C.) at Thika.

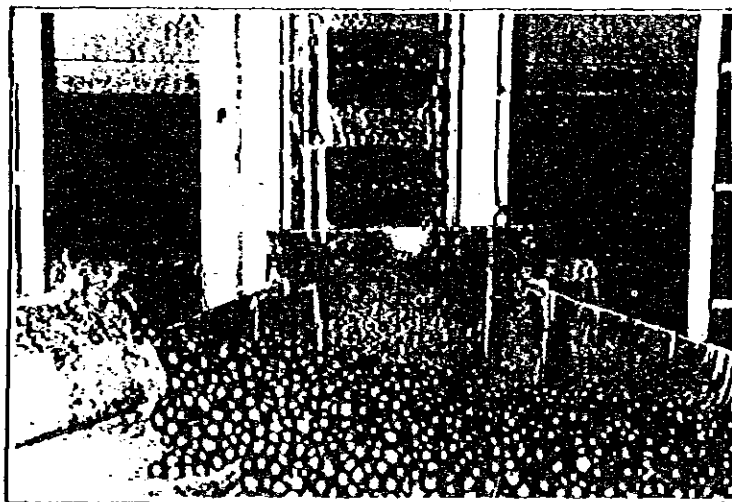
The Company has four methods of purchasing and collecting in-shell macadamia nuts as described below. According to the above Company, the information of purchasing and collecting of these in-shell Nuts is as follows:

**1. Through co-operative societies:—**

Most of the macadamia trees in Kenya are growing in the coffee zones in areas between Aberdare Range & Mt. Kenya. The factory purchases in-shell nuts from over 420 coffee factories of the coffee societies in the areas which are covered by a complete yearly programme, issued to the societies at the beginning of each year.

Depending on the programme, each coffee factory is regularly visited by the company's purchase team once or twice a month. Member farmers are advised to bring their nuts to their respective factories one day earlier before the company's scheduled visit, thereby minimizing moisture loss.

Nuts are collected in the company's sisal bags either by the purchase team or the collection team.



**2. Through appointed agents:—**

In areas where the co-operative are inactive in collection of macadamia nuts, the company appoints agents who collect the nuts in their demarcated areas. The company collects macadamia nuts from these agents for delivery to the factory at Thika.

**3. Individual and estates sales at the factory:—**

Some of the individuals and estates close to the factory, deliver their macadamia nuts directly to the factory.

#### **4. Individual and estates sales by consignment to Thika:—**

Some individuals and estates which are far from Thika — usually in areas where the purchase programme does not cover. They consign their in-shell macadamia nuts to Thika by rail. On payment for their nuts the transport cost is reimbursed at the same time.

##### **Price**

The statutory price of in-shell macadamia nut in 1988 is Ksh 6/- per kilogram.

##### **Payment**

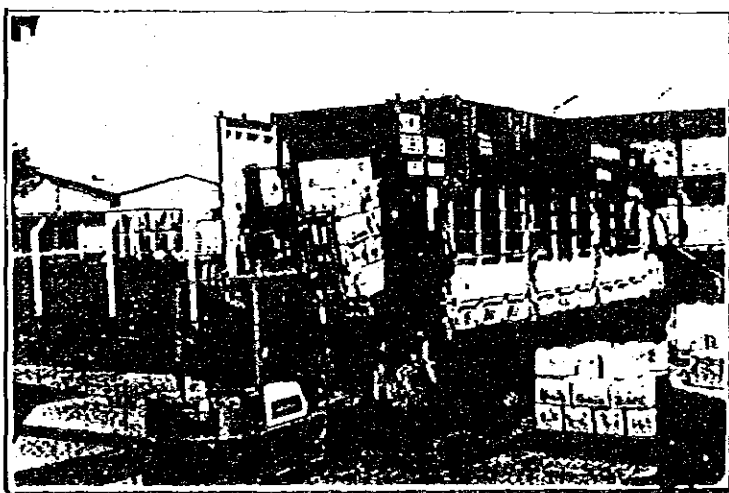
Payment for macadamia nuts sold to the company through the above methods, is normally made by cheque within one week after purchase. Societies and agents who received the payments are strongly advised to pay individual farmers immediately after the receipt of the cheques from the company.

##### **Commission**

The societies and agents are paid separately 10% commission which covers their operation and handling expenses.

##### **Remarks**

Farmers are very much encouraged to collect the nuts daily and strongly advised not to shake the trees, which would result in quantity and quality loss by both farmers and Kenya Nut Co. Ltd. Collection of in-shell macadamia nuts by middle men who would definitely underpay farmers is also discouraged.



Loading processed macadamia for Export.

# Project News;

(1) Mr. Toshimitsu Iwasaki a propagation Expert worked on macadamia Nut Propagation from 1979 to Feb. 29th 1988 when he left for Japan after successfully developing the macadamia propagation technique. We wish to take this opportunity to thank him and wish him well in his endeavors elsewhere.



(2) Mr. Yoshiro Kadera an expert in Promology worked on macadamia Agronomy in the Project from March 1986 to 30th June 1988. In the course of his stay in the Project he established experiments on Agronomical aspects of macadamia and hoped to come up with standard management of the macadamia. The experiments are still under observation by Kenyan Scientist. We wish him well in his endeavors elsewhere.

## N/B

The Horticultural Development Project has done the following in Rift Valley and Western Kenya.

- (1) Detailed survey and Recommendation in Bungoma, Kakamega, Kisii, established adaptability trial at mabanga F.T.C. Bungoma 16-18/9/1987 by Mr. N. Ondabu and S. Hiram.
- (2) Trial Orchards were established at Kaimosi F.T.C., Kakamega Research, Bukura Institute of Agric., Kisii F.T.C., Kabianga F.T.C. (Kericho) and Busia F.T.C. by S. Hiram, N. Ondabu, L. Wasilwa and W. Mokaya from April — June 1988.

## Editor's Comments

*This edition outlines the marketing channels taken by Kenya Nut Company in order to collect in-shell Nuts from farmers, pay them promptly and the pricing offered*

Thanks to Kenya Nut Company for the Co-operation which enabled this seventh edition to be a success.  
Also I extend my sincere thanks to the long term experts Mr Y. Kadera and Mr T. Iwasaki (A.T.)

20th July 1988 Kenya-Japan Horticultural Development Project  
(Training Section)  
N.H.R.S. P.O. Box 220, THIKA, Tel: 21593-5







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