Tree Species in Pilot Forest

5th May 1992

Kenya/Japan

Social Forestry Training Project

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FORWARD

This booklet incorporates comprehensive information on the performance of exotic and indigenous tree species that have been evaluated in Kwa-Vonza location trial plantation site in Kitui District. The information is presented by Cards and cover relevant bio-physical data on individual species, phenological development and opportunities for raising given species from seedlings to the plantation stage.

We are confident that all serious readers will find this booklet useful in their work. But you are all challenged to use it as a working tool. In this regard, you are requested to record your experiences and to document any missing information and to forward such material to the authors. It is particularly fitting to recognize the outstanding support that has been provided by Mr. Hiroji Okabe, the Chief Advisor to the project in putting this document together. Special appreciation go to JICA for supporting both the project and the production of this booklet. We urge all Kenyan communities to plant trees in their holdings and to support the development of social forestry countrywide for improved conservation of the environment and biodiversity.

J. A. Odera

DIRECTOR, KEFRI

ACKNOWLEDGEMENT

I wish to acknowledge professional support provided to the project by Professor Sumihiko Asakawa of Tamagawa University, Japan, who visited the project on several occasions as a short-term silvicultural expert; Mr. Yoshihiko Watanabe, Pilot Forest Leader, Kitui Team, who prepared many basic reports used in the final text; Mr. Mitsuo Takahashi and other Japanese experts who have worked in the Pilot Forest. To them, my thanks are due. I also wish to thank Mrs. Caroline Sikuku for typing the cards.

In preparing this document a lot of information has been drawn from different sources, particularly the following:

A: Noad T.C. and Birnie A. Trees of Kenya, 1989

B: Teel Wayne; A Pocket Director of Trees and Seeds in Kenya, Kenya Energy Non-Governmental Organizations, 1988.

C: Nettai-Shokubutzu Kenkyukai: Nettai-Shobutzu-Yoran 2nd Ed. 1986.

D: Carlowitz Peter G.; Multipurpose Tree and Shrub Seed Director, ICRAF, First Ed. May, 1986.

E: Kokwaro J.O.; Medicinal Plants of East African Literature Bureau, First Published 1976.

F: Gachathi F.N.; Kikuyu Botanical Dictionary, First Published 1989.

G: National Academy of Sciences; Firewood Crops, Washington D.C. USA, 1990

H: Kenya Forestry Research Institute; A Guide to Trees Planting in Kenya, 1990.

I: Von Maydell Hans-J; Trees and Shrubs of The Sahel, GTZ, 1986.

May 5, 1992

Hiroji Okabe
Chief Advisor of
Social Forestry Training
Project.

S U M M A R Y

The Kenya/Japan Social Forestry Training Project is composed of two sub-projects: The Social Forestry Training Scheme and The Pilot Forest Scheme. The Pilot Forest Scheme has been implemented since November, 1986, under the Special Measure Fund from the Government of Japan through Japan International Co-operation Agency (JICA). The project has established about 340 ha of trial plantations from 1986 to 1991. The aims of the pilot forest activities are to evaluate suitable tree species for planting in the semi-arid environment in Kitui district and to develop improved tree planting techniques for satisfactory survival and crop development in the area. It is also expected that the result of the trial plantation will act as a model and growth point for social forestry development in the semi-arid land areas.

From its inception in 1987 to 1989, the project has raised seedlings of over 50 different tree species in Tiva nursery, the majority of which have been planted in the pilot forest site. Recognising that the trial embraces pioneer planting of indigenus and exotic species, it is important to study and document their characteristics in order to understand their growth patterns and habits. It is for this commitment that the available information has been presented by cards for each species. Although this booklet covers only those species that have been studied in the pilot forest scheme, the information will not only be useful to the pilot forest but the result of this work will indoubtedly be beneficial to the development of tree planting in the semi-arid land areas in Kenya and elsewhere.

Introduction

Compiling this booklet of tree species cards, the reporter aims at collecting some data which will be useful to plant trees in and around Kwa-vonza location/division, Kitui District, in which Pilot Forest Scheme is carried on as a sub-project of Kenya/Japan Social Forestry Training Project. However, limiting only data which are useful in Kwa-vonza location, located in semi-arid area, the reporter should limit to make cards, as only some tree species will be able to be planted and grown in and around there, he collected data of tree species risen up at Tiva Nursery, nursery for Pilot Forest of The Project. Consequently, some tree species listed up this booklet are not always adequate to plant in and around Kwa-vonza location. There are some adequate tree species to plant there, however, many species are not adequate.

As the reporter wants only to collect data of tree species without his opinion, he is afraid of some contradiction in each data. Because of some data got under certain conditions, if the condition would change, the conclusion would also change. However, the reporter wants only to collect data, even though there are some useful data bases.

The following are notes for using the booklet.

1. The reporter made a form at first, then he filled each item, therefore there are many blank spaces in the cards, the reporter is expecting to fill the blank spaces in the near future. However in item of utilization 1 basic data (9) in card, the reporter omitted soil conservation, wind breaker, soil improvement, water control, etc, because these utilizations are common in every tree species.
2. In item of climatic condition (1 Basic data, (5)), as the climatic condition is a very important factor for exotic tree species to the success in plantation, the reporter collected climatic data for the species from the following five books:

a) Preferred climate types

Preferred climate types are quoted "A Pocket Dictionary of Tree and Seeds in Kenya" (Teel Wayne, 1988). According to the above mentioned book, the climate zones, based on agro-climatic zones, are divided into seven zones based on precipitation and potantial evaporation. And also it identifies nine temperature zones. Since the precipitation and the temperature zone overlap, this creates 33 separate agro-climate zones. Pilot Forest belongs to V-2 in the agro-climatic zone.

b) The climate adaptability

The climate adaptabilities are quoted from "Multipurpose Tree and Shrub Seed Directory" (Carlowitz Peter G., 1986). Many things are quoted from this book for compiling these cards collection.

c) The Kenya's Ecological Zone

The Kenya's Ecological Zones are quoted from "A Guide to Tree Plantation in Kenya" (Kenya Forestry Research Institute, 1990). According to the booklet, the ecological zones are divided into seven zones by precipitations. Ecological zone I to VII have been excluded because currently there is hardly any tree planting taking place in these zones. The remaining five occasions are aimed at receiving annual precipitation as follows:

Ecozone	II	Over 1400 mm
	III	800 to 1400 mm
	IV	400 to 800 mm
	V&VI	Less than 400 mm

Pilot Forest belongs to Ecozone III or IV.

(d) Environmental Requirements.

The environmental requirements are quoted from:

"Firewood Crops" (National Academy of Science, 1990)

(e) Site Requirements.

Site requirements are quoted from:

"Trees and Shrubs of the Sahel" (Von Maydell Hans-J, 1986).

3. In 4(9) of Card, if there are planted year of 1988 and 1989, survival rate and height researched in October 1990 of planted 1988, in November 1990 planted 1989 mainly.

CONTENTS

The species mainly planted in Pilot Forest

No.	Species	Family	Origin
01	Acacia abyssinica	Mimosaceae	Indigenous
02	A. albida	ditto	ditto
03	A. auriculiformis	ditto	Australia
04	A. gerrardii	ditto	Indigenous
05	A. holoselicea	ditto	Australia
06	A. nilotica	ditto	Indigenous
07	A. pendula	ditto	Australia
08	A. polyacantha	ditto	Indigenous
09	A. salicina	ditto	Australia
10	A. senegal	ditto	Indigenous
11	A. tortilis	ditto	ditto
12	A. xanthophloea	ditto	ditto
13	Acrocarpus fraxinifolius	ditto	India, South-East Asia
14	Albizia amara	ditto	Indigenous
15	A. anthelmintica	ditto	ditto
16	Azadirachta indica	Meliaceae	India, Sri-Lanka
17	Balanites aegyptiaca	Balanitaceae	Indigenous
18	Cassia siamea	Caesalpinacae	South-East Asia, India
19	C. spectabilis	ditto	Tropical America
20	Casuarina equisetifolia	Casuarinaceae	Indigenous
21	Croton megalocarpus	Euphorbiaceae	Indigenous
22	Dalbergia melanoxylon	Papilionaceae	ditto
23	Delonix regia	Caesalpinaceae	Madagascar
24	Eucalyptus camaldulensis	Myrtaceae	Australia
25	E. citriodora	ditto	ditto

No.	Species	Family	Origin
26	E. paniculata	ditto	ditto
27	E. tereticornis	ditto	ditto
28	Gmelina arborea	Verbenaceae	South Asia, India
29	Grevillea robusta	Proteaceae	Australia
30	Leucaena leucocephala	Mimosaceae	Central America
31	Melia azedarach	Meleaceae	Western Asia, Himalayas
32	M. volkensii	ditto	Indigenous
33	Moringa stenopetala	Moringaceae	ditto
34	Parkinsonia aculeata	Casalpinaceae	Tropical America
35	Prosopis juliflora	Mimosaceae	South-Western America
36	Schinus molle	Anacardiaceae	Peru Andes
37	Sesbania grandiflora	Papilionaceae	Tropical America
38	S. sesban	ditto	Indigenous
39	Tamarindus indica	Caesalpinaceae	ditto
40	Terminalia brownii	Combretaceae	ditto
41	T. catappa	ditto	Andaman Island, India
42	T. mentalis	ditto	Indigenous
43	T. prunioides	ditto	ditto
44	T. spinosa	ditto	ditto
45	Trichilia roka	Meliaceae	ditto

Card No. 1

Species: Acacia abyssinica

Cf. A:163, B:60, C:-, D:-, E:-, F:61, G:-, H:-, I:-

1 Basic data

(1) Family name : Mimosaceae
(2) Vernacular name : Mugunga, Mugaa(Kikuyu)
(3) Origin : Indigenous
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
I,4	Kakamega(part)	1100-1700	1200-2000	18-20	1500-1850
I,5-6	Kericho	1100-1700	1200-2200	14-18	1850-2450
I,7	Mountain	1100-1700	1200-2200	12-14	2450-2750
II,4-7	Limuru	1000-1600	1300-2100	12-14	1500-2750
III,5	Nairobi(part	800-1400	1450-2200	16-18	1850-2150
III,6-7	ELdoret	800-1400	1450-2200	12-16	2150-2750

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) : No data

c. Preferable ecological zone (H) : No data
d. Environmental requirements(G) : No data
e. Site requirements (I) : No data

(5) Distribution in Kenya : Occurring at the edges of highland forest down to Limuru and Muguga and wooded grassland from 1,800 to 2,400 m, common in Western Province(A)

(6) Soil characteristics :
(7) Shade tolerance :
(8) Mature tree's height : 16 to 20 m(A).
(9) Mature tree's diameter :
(10) Utilization : Ornamental(A), Fodder(B)
(11) Others : Nitrogen-fixation

2 Seed

(1) Month of flowering :
(2) Month of collection :
(3) Method of collection :
(4) Method of preparation : Seed is quite small and highly subject to beetle attack while in the pod on the tree. Damaged seeds should be separated by floating. Undamaged seeds should be dried in the sun to kill the remaining larvae(B).

(5) Method of storage : Store in a cool, dry insect-free place, and viability should be good a long period(B)
(6) Number of seeds per a pod :
(7) Usual germination rate :
(8) Number of seeds per kg. or 1 :
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment : Seed can be nicked or soaked 24 hours prior to sowing(B).
(2) Types of seedling
a. Potted seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined

(3) Sowing month at Tiva Nursery : May to June
(4) Growing speed in the nursery : Fast
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : (i) In 1988 strip, clearing, 1m width slashing and 2m remaining, but not cut down useful trees more than 5cm in D.B.H.
(ii) In 1989, strip clearing, 2m width slashing and 1m remaining, the same as (i) for useful trees.

(3) Number of seedlings per ha : (i) In 1988, 1,000 seedlings/ha planted.
(ii) In 1989, 830 seedlings/ha planted.
(4) Size of planting hole : (i) In 1988, 45cm x 45cm.
(ii) In 1989, 65cm x 65cm.
(5) Weeding : Weeding is very important, at least 2 times per year, if possible 3 times.
(6) Damage :
(7) Growing speed : Medium to fastgrowing(B), Fairly fast growing(A).
(8) Management :
(9) Some data from forestation site

Planted	Compart.	Areas	Survival rate				Height	
			Jul.89	Nov.89	Oct.90	Oct.91	Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1988	I-G	0.59	15.5	1.5		-		
1989	B-I-4(L)	0.61			30.5	6.5	49	56

Note: Hole size is 65cm x 65cm

(10) Some data from extension

(11) Others

Card No.02

Species: Acacia albida

Cf. A:163, B:61, C:- D:14, 130, 156, E:123, F:-, G:-, H:11, I:100

1 Basic data

(1) Family name : Mimosaceae
(2) Vernacular name : Olasiti(Masai), Mukababu(Taveta)
(3) Origin : Indigenous
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
IV, 1	Lamu	600-1100	1550-2200	24-30	0- 900
IV, 2-3	Lake Victoria/ Thika	600-1100	1550-2200	20-24	900-1800
V, 1-2	Taveta/Isiolo	450- 900	1650-2300	22-30	0-1200
V, 3	Kajiado(part)	450- 900	1650-2300	20-22	1200-1800
VI, 1-2	Magadi/Garba	300- 500	1900-2400	22-30	0-1200
VII, 1-3	Wajir	150- 350	2100-2500	20-30	0-1800

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature		
		Dry months	No. of DP	Mean	Lowest	Highest
Subhumid	600-1500	4- 8	1		>18	
Semi-arid; hot	250- 600	8-10	1 or 2	>18		
Arid, hot desert	<250	11-12	1	>18		
Arid, warm to cold	<250	11-12	1	>18		
Humid sub-tropics	>1200	-	None		-3<t<18	>22
Temperate maritime	>1200	-	None		-3<t<18	10-20

Note; Prec. : Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No. of DP : Number of dry period per year

c. Preferable ecological zone(H):

Eco. zone	Rainfal(mm)	Altitude(m)	Soil type	Rotation
IV	400-800	1,000-1,400	Sandy to sandy-clay soils to riverine Clay/sandy soil	Short

d. Environmental requirements(G): No data

e. Site requirement: This species is very adaptable, growing under precipitation of less than 300 mm upto 1,800 mm and survives extended dry period (even for several years), as well as several weeks of inundation(I).

(5) Distribution in Kenya : 550 - 1800m. Riverine in dry area or where the water table is near the surface.(A)

(6) Soil characteristics : It occurs permeable sandy or silty soils where the water table is accessible to the tree roots, and this species is not dependent on local rainfall once it is established. It does not grow well on lateritic soil or with impeded drainage (A,B). Loam and sand in soil texture, neutral(6.5 - 7.5) in reaction, well drained in drainage, salinity.(D)

(7) Shade tolerance :

(8) Mature tree's height :

(9) Mature trees' diameter :

(10) Utilization : Fodder, building(A), fuelwood/charcoal, house-hold utensils, poles/posts, timber(D).
Site improvement, forage, tools, tannin (from bark) but less suitable as fuelwood or for charcoal(I).

(11) Others : Nitrogen-fixation.

2 Seed

(1) Month of flowering :

(2) Month of collection : November-December in Kibwezi

(3) Method of collection : To collect pods under a tree, or fall them to the ground by rocking or hitting by pole then collect them.

(4) Method of preparation : After dry pods, then put in to a sack and hit by a pole.

(5) Method of storage : Seeds will store almost indefinitely dry, cool storage free of insect.(B)

(6) Number of seeds per pod :

(7) Number of seeds per kg. or 1. : 11,000 Seeds/kg.(B)
20,400 - 40,000 Seeds/kg.(D),
11,500 seed/kg(I).

(8) Usual germination rate : 45 - 75 %

(9) Provenance :

(10) Others :

3 Seedling

(1) Applied seed pretreatment: The seed can be nicked or soaked in water 24 hours.(B) Soak in concentrated H2So4 for 20 - 30 minutes(D)

(2) Types of seedling
a. Potted seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined

(3) Sowing month at Tiva Nursery : May
(4) Growing speed in the nursery : Quite fast

(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : (i) In 1987, total clearing, but not cut down useful trees more than 5cm in D.B.H.
(ii) In 1988, strip clearing, 1m width slashing and 2m width remaining, the same as (i) for useful trees.
(3) Number of seedlings per ha : (i) In 1987, 1,000 seedlings/ha planted.
(ii) In 1988 1,000 seedlings/ha planted.
(4) Size of planting hole : (i) In 1987, 45cm x 45cm.
(ii) In 1988, 45cm x 45cm.
(5) Weeding : Weeding is very important, at least 2 times per year, if possible 3 times.
(6) Damage : Young plants in the nursery and in plantations may be killed by locusts and rats (I).
(7) Growing speed : Fast
(8) Management : Possible of coppicing and pollarding(D). Direct seeding is advantageous because it is economical and there is no risk of damaging the quickly developing taproot by transplanting. Transplanting of wildlings cannot be recommended because of the long roots(I).

(9) Some data from forestation site

Planted Year	Compart.	Area	Survival rate				Height	
			Jul.89	Nov.89	Oct.90	Oct.91	Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
87		1.11	-	-	-	-	-	-
88	II-D	2.09	48.0	5.0	-	-	-	-

(10) Some data from extension

(11) Others
It is deep-rooted and does not compete with crops for surface moisture.(B)
Be careful water condition in plantation site.
This species is used for agroforestry. For agroforestry, 50-100 seedlings will be planted per ha(B).

Card No.03

Species: Acacia auriculiformis

Cf. A:, B:, C:142, D:14, 130, 156, E:, F:, G:34, H:-, I:-,

1 Basic data

(1) Family name : Mimosaceae
(2) Vernacular name : -
(3) Origin : Queensland, Australia
(4) Climatic condition
a. Preferred climatice type(B) : No data
b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature	
		Dry months	No. of DP	Mean	Lowest	Highest
Permanently humid	>1500	-	None		>18	
Monosoonal, short dry season	>1500	<4	1(short)		>18	
Subhumid	600-1500	4-8	1		>18	

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry period per year

c. Preferable ecological zone(H) : No data
d. Environmental requirements(G) :
Temperature: Annual temperature range from 26 deg.C. to over 30 deg.C.
Altitude : It is suitable for a forest plantation crop at altitudes up to about 600m.
Precipation: Its natural habitat has an average annual rainfall varying 1,500 to 1,800 mm and a dry season of 6 months. Well adapted to drought.
Soil : It will grow in a wide range of deep or shallow soil including sand dunes, mica schist, clay, limestone, podsoles, laterite, and lateric soil. There is a case that the trees grow on alkaline sand dunes (pH 9.0) as well as on acid soil (pH 3.0) from uranum mining.

e. Site requirements(I) : No data

(5) Distribution in Kenya :
(6) Soil characteristics : Sandy soil, alkaline(pH >7.5) in reaction, seasonal water logging, well drained in drainage, shallowness (<50 cm)(A).
(7) Shade tolerance : Shade intolerance.
(8) Mature tree's height : 30m (C)
(9) Mature tree's diameter : 60cm (C)
(10) Utilization : Industrial purposes, fuelwood/charcoal, ornamental, gum, tannin/dyes, wood-pulp, furniture, building poles, fence posts, short fiber pulp(D)

(11) Others : Nitrogen-fixation

2 Seed

(1) Month of flowering :
(2) Month of collection :
(3) Method of collection : To go up a tree and take pods.
(4) Method of preparation :
(5) Method of storage :
(6) Number of seeds per pod :
(7) Number of seeds per Kg. or 1. : 30,000 - 89,200 seeds/kg.(D).
(8) Usual germination rate : 40 - 80%(D)
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment: Soak in hot water for 12 hours, soak in concentrated H2So4 for 20 to 30 minutes or immerse in boiling water(D). Immerse seeds in boiling water and leaving them to cool and soak for 24 hours(G).

(2) Types of seedling
a. Potted seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : April
(4) Growing speed in the nursery : Fast growing
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : In 1988, strip clearing, 1m width in slashing and 2m remaining, but not cut down useful trees more than 5 cm in D.B.H.
(3) Number of seedlings per ha : In 1988, 1,000 seedlings/ha
(4) Size of planting hole : In 1988, 45cm x 45cm
(5) Weeding : Weeding is very important, at least 2 times per year, if possible 3 times.
(6) Damage :
(7) Growing speed : Fast growing
(8) Management : Coppicing(D)
(9) Some data from forestation site

Planted Year	Compart.	Areas	Survival rate				Height	
			Jul.89	Nov.89	Oct.90	Oct.91	Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1988	I-F	0.92	74.5	43.5	29.0	14.0	75	246

(10) Some data from extention
(11) Others :

Because of its ability to grow on very poor soil, it has been introduced into countries such as Indonesia, Malaysia, India, Tanzania and Nigeria(G). Easily established by direct seeding(G).

Card No.04

Species: Acacia gerrardii

Cf. A:165, B:62, C:-, D:16, 157, E:124, F:- G:-, H:-, I:-

1 Basic data

(1) Family name : Mimosaceae
(2) Vernacular name : Muthii, Kithi(Kamba),
(3) Origin : Indigenous
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
II, 3	Migori(part)	1000-1600	1300-2100	20-22	1200-1800
II, 4-5	Limuru(part)	1000-1600	1300-2100	16-20	1500-2150
III, 3	Kisumu/ Murang'a(part)	800-1400	1450-2200	20-22	1200-1800
III, 4-5	Nairobi	800-1400	1450-2200	16-20	1500-2150
IV, 3	Lake Victoria /Thika(part)	600-1100	1550-2200	14-20	1500-2450
V, 3-4	Kajiado	450- 900	1650-2300	18-20	1200-1850
V, 5-6	Maralal/Naivasha	450- 900	1650-2300	14-18	1850-2450

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) : No data
c. Preferable ecological zone(H): No data
d. Environmental requirements(G): No data
e. Site requirements(I) : No data

(5) Distribution in Kenya : Widely distributed in wooded grassland from 1,300 m to 2,100 m(A). The species grows well in moist to swampy sites in riverine area(B). There are many trees around Tiva Nursery.
(6) Soil characteristics : Moist soil.
(7) Shade tolerance :
(8) Mature tree's height : 15m, occasionally shrubby(A).
(9) Mature tree's diameter :
(10) Utilization : Fodder, medicine(D), fuelwood. The bark is used for the treatment of coughs and sore throat(E).
(11) Others : Nitrogen-fixation

2 Seed

(1) Month of flowering :
(2) Month of collection : September in Kibwezi
(3) Method of collection : To collect pods under a tree, or fall them on the ground by rocking or hitting by pole then collect them.

(4) Method of preparation : After dry pods, then put in to a sack and hit by a pole.
(5) Method of storage : Store in a cool, dry and insect-free place(B).
(6) Number of seeds per pod :
(7) Number of seeds per Kg. or 1. :
(8) Usual germination rate :
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment:
(2) Types of seedling
a. Potted seedling : Operational
b. Stump : Possible
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : February to April
(4) Growing speed in the nursery : Fast
(5) Note for watering : Be careful to much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : (i) In 1988, strip clearing, 1m width slashing and 2m remaining, but not cut down useful trees more than 5cm in D.B.H.
(ii) In 1989, strip clearing, 2m width slashing and 1m remaining, the same as in (i) for useful trees.
(3) Number of seedlings per ha : (i) In 1988, 1,000 seedlings/ha planted.
(ii) In 1989, 830 seedlings/ha planted.
(4) Size of planting hole : (i) In 1988, 45cm x 45cm
(ii) In 1989, 65cm x 65cm
(5) Weeding : Weeding is very important, at least 2 times per year, if possible 3 times.
(6) Damage :
(7) Growing speed : Fast. They said that with adequate ground water the tree is fast growing(B).
(8) Management : It has good agroforestry potential in its range(B).

(9) Some data from forestation site

Planted Year	Compart.	Areas	Survival rate Jul. 89	Nov. 89	Oct. 90	Oct. 91	Height Oct. 90	Oct. 91
		ha	%	%	%	%	cm	cm
1988	I-F	1.42	85.0	77.0	43.5	39.0	34	34
	I-H	2.42	87.0	79.5	71.5	68.0	66	81
	I-J-3	2.60	87.0	-	47.5	34.0	27	30
	I-P-2	0.40	85.0	-	43.8	35.6	34	36
	II-J-2	1.01	83.5	47.5	62.0	53.5	45	49
Sub-total		7.85	(88.5)	(68.0)				
1989	B-1-3(L)	0.36			92.0	84.5	48	59

Note: (L): Hole size is 65cm x 65cm

(10) Some data from extension

(11) Others

- The farmers in the Kwa-vonza Location prefer this species as their family use for fuelwood and charcoal.

Card No.05

Species: Acacia holocericea

Cf. A:, B:, C:, D:16, 158, E:, F:, G:-, H:-, I:-

1 Basic data

(1) Family name : Mimosaceae
(2) Vernacular name : -
(3) Origin : Australia
(4) Climatic condition
  a. Preferred climatic type(B) : No data
  b. Climate adaptability(D) : No data
  c. Preferable ecological zone(H) : No data
  d. Environmental requirements(G) : No data
  e. Site requirement(I) : No data
(5) Distribution in Kenya :
(6) Soil characteristics :
(7) Shade tolerance :
(8) Mature tree's height :
(9) Mature tree's diamter :
(10) Utilization : Mulching, live fencing, ornamental, wood-pulp, timber, fuelwood/charcoal fodder, food(fruits)(D).
(11) Others :

2 Seed

(1) Month of flowering : February in Kitui.
(2) Month of collection : July in Kitui.
(3) Method of collection :
(4) Method of preparation :
(5) Method of storage :
(6) Number of seeds per kg. or 1. : 72,000 seeds/kg(D).
(7) Usual germination rate :
(8) Provenance :
(9) Others :

3 Seedling

(1) Applied seed pretreatment:
(2) Types of seedling
  a. Potted seedling : Operational
  b. Stump : Not examined
  c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : January
(4) Growing speed in the nursery : Slow growing
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :

(2) Land Preparation : (i) In 1988, strip clearing, 1m width slashing and 2m remaining, but not cut down useful trees more than 5cm in D.B.H.
(ii) In 1989, strip clearing, 2m width slashing and 1m remaining, the same as in (i) for useful trees.

(3) Number of seedlings per ha : (i) In 1988, 1,000 seedlings/ha planted.
(ii) In 1989, 830 seedlings/ha planted.

(4) Size of planting hole : (i) In 1988, 45cm x 45cm
(ii) In 1989, 65cm x 65cm.

(5) Weeding : Weeding is very important, at least 2 times per year, if possible 3 times.

(6) Damage : Eaten by dik-diks.

(7) Growing speed : Not so fast growing in the Pilit Forest.

(8) Management :

(9) Some data from forestation site

Planted Year	Compart.	Areas	Survival rate				Height	
			Jul.89	Nov.89	Oct.90	Oct.91	Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1988	I-G	0.68	22.0	4.0	0.5	-	60	-
1989	B-I-2(L)	0.49			42.5	13.5	32	75

Note: (L): Hole size is 65cm x 65cm

(10) Some data from extension

(11) Others

Card No.06

Species: Acacia nilotica

Cf. A:159, B:64, C:- D:18, 131, 159, E:125, F:-, G:98, H:-, I:123

1 Basic data

(1) Family name : Mimosaceae
(2) Vernacular name : Musewa(Kamba), Mugungu(Swahili), Falcon's clow acacia(English).
(3) Origin : Indigenous
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
III, 1	Kwale	800-1400	1450-2200	24-30	0- 900
III, 2-3	Kisumu/Murang'a	800-1400	1450-2200	20-24	900-1800
III, 4	Nairobi(part)	800-1400	1450-2200	18-20	1500-1850
IV, 1	Lamu	600-1100	1550-2200	24-30	0- 900
IV, 2-3	Lake Victoria/Thika	600-1100	1550-2200	20-24	900-1800
IV, 4	Rumuruti/Narok(part)	600-1100	1550-2200	18-20	1500-1850
V, 1-2	Taveta/Isiolo	450- 900	1650-2300	22-30	0-1200
V, 3-4	Kajiado	450- 900	1650-2300	18-22	1200-1850
VI, 1-2	Magadi/Garba Tula	300- 550	1900-2400	22-30	0-1200
Vi, 3-4	Kirimun	300- 550	1900-2400	18-20	1200-1850
VII, 1-2	Wajir	150- 350	2100-2500	22-30	0-1200

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature		
		Dry months	No. of DP	Mean	Lowest	Highest
Subhumid	600-1500	4-8	1		>18	
Semi-arid, warm to cold	250-600	8-10	1 or 2	<18		
Arid, hot desert	<250	11-12	1	>18		
Humid sub-tropics	<1200	-	None		-3<t<18	>22
Temperate maritime	>1200	-	None		-3<t<18	10-22

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (>50 mm) per year
No of DP : Number of dry period per year

c. Preferable ecological zone(H): No data
d. Environmental requirements(G):
Temperate :These trees withstand extremes in temperature, but are frost tender when young.
Altitude :The trees will grow at elevation up to 500 m in the Himalayas.
Rainfall :In general, the various subspecies can survive in very arid site, but thrive under irrigation.

Soil :It grows on variety of soil, even poor ones. It prefers alluvium, but grows well on heavy, black cotton and clay soil as well.

e. Site requirements: This species grows with annual rainfalls between 250 and 1,000 mm and tolerates temperature of more than 50 deg.C, but no frost(I).

(5) Distribution in Kenya : Wildly distributed from 200 m to 1,800m, common near river banks(A).

(6) Soil characteristics : Loam in soil texture, neutral (pH 6.5 - 7.5) or alkaline(pH > 7.5) in reaction, well drained or seasonal water logging in drainage (D).

(7) Shade tolerance : Young seedlings require full sun and frequent weeding(G). Careful weed control in plantations is necessary(I).

(8) Mature tree's height : 15m(B) to 20m(A).

(9) Mature tree's diameter :

(10) Utilization : Fuelwood/chacoal, fooder, tannin and gum, bee-forage, furniture, timber(D). The bark is used for treatment of sore throat and coughs, the leave is used as a treatment for chest pains or pneumonia, root is used for treatment of indigestion or stomach trouble ETC(E).
The hard, taugh wood is resistant to termites, impervious to water(G).
Roasted seed serve as spice. In some regions, young pods are eaten as a vegetable.

(11) Others : Nitrogen-fixation. Termite resistant and water repellant(B).
It has a flattish or umbrella-shaped crown and is easily identified by its bright-yellow, sweet-scented flower heads, its sweel-smelling gray or black pods, and paired whitish spines at the base of each leaf. There are several subspecies of this plant(G).

2 Seed

(1) Month of flowering : February in Kaveta.

(2) Month of collection : August or September in Kaveta.

(3) Method of collection : To collect pods under a tree, or fall them on the ground by rocking or hitting by pole then collect them.

(4) Method of prepatation : Put dried pods into a mortar and knock by a pestel, then sellect by wind.

(5) Method of storage : Sort and store as with other acacia(B).

(6) Number of seeds per pod:

(7) Number of seeds per kg. or 1. : 7,000 - 11,000 seeds/kg.(D).

(8) Usual germination rate : 60 -90%(D)

(9) Provenance :

(10) Others : It is often attacked in the pods by bruchid beetles and is sometimes difficult to clean(B).

3 Seedling

(1) Applied seed pretreatment: Fresh seed needs no pretreatment but older seed should be soaked 24 hours or nicked(B). Immerse in boiling water, allow to cool, soak in cold/tepid water for 24 hours or soak in concentrated H2So4 for 5 - 15 minutes(D).

(2) Types of seedling
a. Potted seedling : Operational
b. Stump : Possible
c. Bare root : Not examine

(3) Sowing month at Tiva Nursery : April to May

(4) Growing speed in the nursery : Fast

(5) Note for watering : Be careful to much watering.

(6) Note for other things :

4 Plantation

(1) Site condition :

(2) Land Preparation : (i) In 1988, strip clearing, 1m width slashing and 2m remaining, but not cut down useful trees more than 5cm in D.B.H.
(ii) In 1989, strip clearing, 2m width slashing and 1m remaining, the same as in (i) for useful trees.

(3) Number of seedlings per ha : (i) In 1988, 1,000 seedlings/ha planted.
(ii) In 1989, 830 seedlings/ha planted.

(4) Size of planting hole : (i) In 1988, 45cm x 45cm
(ii) In 1989, 65cm x 65cm.

(5) Weeding : Weeding is very important, at least 2 times per year, if possible 3 times.

(6) Damage :

(7) Growing speed : Rather fast growing.

(8) Management : Lopping is applicable(D).

(9) Some data from forestation site

Planted Year	Compart.	Areas	Survival rate			Height	
			Jul.89	Nov.89	Oct.90	Oct.91	Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1988	I-L-2	0.27	89.0	-	76.7	74.4	69	68
1989	B-I-1(L)	0.73			97.0	91.9	50	56

Note: (L): Hole size is 65cm x 65cm.

(10) Some data from extension : The farmers in the Kwa-vonza location chose this species for their family use as fuelwood, medicine and shade.

(11) Others : Direct sowing is possible but young plants do not compete well with grasses or weeds(B).
Acacia nilotica belongs to the African

acacia which have been and still are the object of disagreement concerning their taxonomy, especially their classiffication into subspecies and varieties.
At present, 9 subspecies/varieties are recognized(I).
Widespread in tropical and subtropical Africa and Asia, extending as far eastwards as India. An exceedingly variable species in which 9 subspecies have been delimited, mainly on differences in the shape, size and degree of pubescence of pods. Most fruiting speciments can be placed quite readily, but some do create difficulties. Seven of the subspecies occur in Africa. (A conspectus of the African Acacia species; P 106; Ross, J.H. Oct. 1979 Botanical Research Institute, Republic of South Africa.)

Card No.07

Species: Acacia pendula

Cf. A:, B:, C:147, D:18, 131, 159, E:, F:, G:-, H:-, I:-

1 Basic data

(1) Family name : Mimosaceae
(2) Vernacular name : -
(3) Origin : Queensland, New South Wales, Australia.
(4) Climatic condition
a. Preferred climatic type(B) : No data.
b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature		
		Dry months	No. of DP	Mean	Lowest	Highest
Semi-arid, hot	250-600	8-10	1 or 2	>18		
Semi-arid, warm to cold	250-600	8-10	1 or 2	<18		
Humid sub-tropics	>1200	-	None		-3<t<18	<22
Temperate maritime	>1200	-	None		-3<T<18	10-22

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (>50 mm) per year
No of DP : Number of dry period per year

c. Prefarable ecologizal zone(H) : No data
d. Environmental requirements(G) : No data
e. Site requirements(I): No data

(5) Distribution in Kenya :
(6) Soil characteristics : Clay soil, alkaline(pH>7.5) in reaction(D)
(7) Shade tolerance :
(8) Mature tree's height :
(9) Mature tree's diameter :
(10) Utilization : Furniture, turnery, wheel spokes, fuel wood, posts, fodder, converted timber, ornamental(D).
(11) Others :

2 Seed

(1) Month of flowering :
(2) Month of collection :
(3) Method of collection :
(4) Method of preparation :
(5) Method storage :
(6) Number of seeds per pod :
(7) Number of seeds per kg. or 1. : 43,000 - 48,000 seeds/kg(D).
(8) Usual germination rate : 45 - 80%(D).
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment: Immerse in boiling water, allow to cool(D).

(2) Types of seedling
- a. Potted seedling : Operational
- b. Stump : Not examined
- c. Bare root : Not examined

(3) Sowing month at Tiva Nursery :

(4) Growing speed in the nursery :

(5) Note for watering : Avoid too much watering.

(6) Note for other things :

4 Plantation

(1) Site condition :

(2) Land Preparation : In 1989, strip clearing, 2m width slashing and 1m remaining but not cut down useful trees more than 5 cm in D.B.H.

(3) Number of seedlings per ha : In 1989, 830 seedlings/ha.

(4) Size of planting hole : In 1989, 65cm x 65cm.

(5) Weeding : Weeding is very important, at least 2 times per year, if possible 3 times.

(6) Damage :

(7) Growing speed : Slow

(8) Management :

(9) Some data from forestation site

Planted Year	Compart.	Areas		Survival rate			Height	
				Jul.89	Nov.89	Nov.90	Oct.91	Nov.90	Oct.91
		ha	%	%	%	%	cm	cm
1989	A-I-7	0.32	(No.10426 5?)	-	58.3	37.1	21	19
	A-I-8	0.28	(No.11223)	-	39.6	0.7	26	10
	A-I-9	0.24	(No.11225)	-	18.3	5.0	17	5
Sub-total		0.84						

Note : Hole size is 65cm x 65cm

(10) Some data from extension

(11) Others

Card No.08

Species: Acacia polyacantha

Cf. A:167, B:64, C:, D:14, 132, E:126, F:61, G:-, H:11, I:131

1 Basic data

(1) Family name : Mimosaceae
(2) Vernacular name : Musewa, Kivovoa(Kamba) Mkengewa(swahili), Falcon's claw Acacia(English)
(3) Origin : Indigenous
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climate type	Prec.	Evap.	Temp.	Alt.
II, 1	Ramisi	1000-1600	1300-2100	24-30	0- 900
II, 2-3	Migori	1000-1600	1300-2100	20-24	900-1800
III, 1	Kwale	800-1400	1450-2200	24-30	0- 900
III, 2-3	Kisumu/Murang'a	800-1400	1450-2200	20-24	900-1800
IV, 1	Lamu	600-1100	1450-2200	24-30	0- 900
IV, 2-3	Lake Victoria/ Thika	600-1100	1550-2200	18-20	1500-1850
V, 1-2	Taveta/Isiolo	450- 900	1650-2300	22-30	0-1200
V, 3-4	Kajiado	450- 900	1650-2300	18-22	1200-1850
VI, 12	Magadi/Garba Tula	300- 550	1900-2400	22-30	0-1200
VI, 3-4	Kirimun	300- 550	1900-2400	18-22	1200-1850

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature	
		Dry months	No. of DP	Mean	Lowest	Highest
Humid	600-1500	4-8	1		>18	
Semi-arid	250- 600	8-10	1 or 2	-		
Hihgland sub-humid	500-1200	2-6	1		-3<t<18	>10

Note; Prec. : Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry period per year

c. Preferable ecological zone(H):

Eco Zone	Rainfall(mm)	Altitude(m)	Soil type	Rotation
IV	400-800	1,000-1,400	Sandy to sandy-clay soils to riverine clay/sandy soils	Short

d. Environmental requirement(G): No data.
e. Site requirement(I): Prefers sites with a high ground water table. Generally salitary in the Sahel. Indicates entrophic and fresh soils, but occasionally also on stony slopes and compact soil.

(5) Distribution in Kenya : Widely distributed from 200m to 1,800m(A).

(6) Soil characteristics : Common near river bank(A). Loam, acid, well drainaged and seasonal water logging(d)

(7) Shade tolerance : Not tolerant to shade

(8) Mature tree's height : 20m.

(9) Mature tree's diameter :

(10) Utilization : Useful for fuelwood/charcoal, fence posts, tool handles and farm implements (A,B,D). Used for sore on the head or body of a young child. The roots are also used for treatment of the snake bite(E).

(11) Others : This species is dry area riverine acacia which extends into swampy and moist areas in western Kenya.(B) Nitrogen-fixation(D).

2 Seed

(1) Month of flowering : January in Kaveta

(2) Month of collection : June in Kaveta

(3) Method of collection : To collect pods under a tree, or fall them on the ground by rocking or hitting by pole then collect them.

(4) Method of preparation : After dry pod, then put them into a sack and hit by pole.

(5) Method of storage : Store in a cool, dry and insect-free place.

(6) Number of seeds per pod :

(7) Number of seeds per Kg. or 1. : 29,300 - 32,000 Seeds/Kg.(D)

(8) Usual germination rate : 55 - 85%(D)

(9) Provenance :

(10) Others :

3 Seedling

(1) Applied seed pretreatment: Immerse in boiling water, stratify(D)

(2) Types of seedling

a. Potted seedling : Operational

b. Stump : Possibleined

c. Bare root : Not examined

(3) Sowing month at Tiva Nursery : March to April

(4) Growing speed in the nursery : Fast

(5) Note for watering : Avoid too much watering.

(6) Note for other things :

4 Plantation

(1) Site condition :

(2) Land Preparation : (i) In 1987, total clearing, but not cut down useful trees more than 5cm in D.B.H.

(ii) In 1988, 1m width slashing and 2m remaining, the same as in (i) for useful trees.
(iii) In 1989, 2m width slashing and 2m remaining, the same as (i) for useful trees.

(3) Number of seedlings per ha : (i) In 1987, 1,000 seedlings/ha planted.
(ii) In 1988, 1,000 seedlings/ha planted.
(iii) In 1989, 830 seedlings/ha planted.

(4) Size of planting hole : (i) In 1987, 45cm x 45cm.
(ii) In 1988, 45cm x 45cm.
(iii) In 1989, mostly 65cm x 65cm.

(5) Weeding : Weeding is very important, at least 2 times per year, if possible 3 times.

(6) Damage : Some trees are attacked by bore.

(7) Growing speed : Very fast.

(8) Management : Possibility of coppicing(D).
Copices natural reproduction(I).

(9) Some data from forestation site

Planted Year	Compart.	Areas	Survival rate Jul.89	Nov.89	Oct.90	Oct.91	Height Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1987		2.47	77.0		59.5	63.0	267	369
		2.93	44.5		34.0	32.0	234	191
		1.81	55.0		23.5	24.0	115	164
Sub-total		7.21						
1988	I-J-1	3.57	17.5	3.0	-	-	-	-
	II-C	3.50	79.5	45.5	51.0	48.0	41	49
	II-F-3	2.75	73.0	54.6	12.0	-	35	-
	II-J-4	4.75	60.0	66.0	17.0	-	24	-
Sub-total		14.60		(57.4)	(40.9)			
1989	A-1-3(L)	0.80			97.5	94.5	72	101
	B-2-1(SW)	0.39			95.5	80.5	38	40
	B-3-1(SW)	0.23			82.3	60.4	35	19
	D-4-2(SW)	0.32			92.5	84.5	30	39
	E-2-5(L)	0.57			79.0	44.0	36	61
	F-4-1	0.09			60.9	17.4	16	40
Sub-total		2.40						

Note (L): Hole size is 65cm x 65cm.
(SW): Spotweeding

(10) Some data from extension : This species is chosen for family use as fuelwood by farmers in the Kwa-vonza Location.

(11) Others : Several varieties in different regions(I).

Card No.09

Species: Acacia salicina

Cf. A:, B:, C:147, D:19, 132, 160, E:-, F:-, G:-, H:-, I:-

1 Basic data

(1) Family name : Mimosaceae
(2) Vernacular name : Native willow(English).
(3) Origin : Australia
(4) Climatic condition
a. Preferred climatic type(B) : No data
b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature		
		Dry months	No. of DP	Mean	Lowest	Highest
Semi-arid, hot	250-600	8-10	1 or 2	>18		
Semi-arid, warm to cold	250-600	8-10	1 or 2	<18		

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry periods per year

c. Preferable ecological zone(H): No data
d. Environmental requirements(G): No data
e. Site requirements(I): No data

(5) Distribution in Kenya :
(6) Soil characteristics : Loam in soil texture(D)
(7) Shade tolerance :
(8) Mature tree's height :
(9) Mature tree's diameter :
(10) Utilization : Fodder, ornamental, fence posts, fuel/charcoal(D).
(11) Others : Nitrogen-fixation(D).

2 Seed

(1) Month of flowering :
(2) Month of collection :
(3) Method of collection :
(4) Method of preparation :
(5) Method of storage :
(6) Number of seeds per pod :
(7) Number of seeds per kg. or 1. : 21,000 - 40,200 seeds/kg(D).
(8) Usual germination rate :
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment: Immerse in boiling water, allow to cool (D).

(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined

(3) Sowing month at Tiva Nursery :
(4) Growing speed in the nursery :
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : In 1989, strip clearing, 2m width slashing and 1m remaining, but not cut down useful trees more than 5cm in D.B.H.
(3) Number of seedlings per ha : In 1989, 830 seedlings/ha
(4) Size of planting hole : In 1989, 65cm x 65cm
(5) Weeding : Weeding is very important, at least 2 times per year, if possible 3 times.
(6) Damage :
(7) Growing speed :
(8) Management :
(9) Some data from forestation site

Planted Year	Compart.	Areas	Survival rate			Height	
			Jul.89	Nov.89	Nov.90	Oct.91	Nov.90	Oct.91
		ha	%	%	%	%	cm	cm
1989	A-1-1*(L)	0.27			28.0	12.9	15	17
	B-5-1**(L)	0.49			67.0	22.0	30	15
Total		0.76						

Note *: Seed No. 15465, **: Seed No. 16293,
(L): Hole size is 65cm x 65 cm

(10) Some data from extension

(11) Others

Card No.10

Species: Acacia senegal

Cf. A:161, B:65, C:148, D:19, 160, E:126, F:-, G:102, H:11, 13, I:133

1 Basic data

(1) Family name : Mimosaceae
(2) Vernacular name : Mung'ole(kamba), Kikwata(Swahili), Sudan gum arabic, Three-thorned acacia(English)
(3) Origin : Indigenous
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
VI, 1	Lamu	600-1100	1550-2200	24-30	0- 900
IV, 2-3	Lake Victoria/Thika	600-1100	1550-2200	20-24	900-1800
V, 1-2	Taveta/Isiolo	450- 900	1650-2300	22-30	0-1200
V, 3	Kajiado(part)	450- 900	1650-2300	20-22	1200-1800
VI, 1-2	Magadi/Garba Tula	300- 550	1900-2400	22-30	0-1200
VI, 3	Kirimun(part)	300- 550	1900-2400	20-22	1200-1800
VII, 1-2	Wajir	150- 350	2100-2500	22-30	0-1200

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) : No data
c. Preferable ecological zone(H)

Eco.Zone	Rainfall(mm)	Altitude(m)	Soil type	Rotation
IV	400-800	1,000-1,400	Sandy to sandy-clay soils to riverine clay/sandy soils	Short 15-25yrs
V-VI	Under 400	1,000-1,400	Sandy clay to sandy loam soils	Short

d. Environmental requirements(G):

Temperature :Average temperatures are between 14 deg.C and 43 deg.C in Sudan.
Altitude :It grows from 100 m to 1,700 m in East Africa.
Rainfall :It can grow under subdesert conditions when annual rainfall is as low as 200 mm, with 8 - 11 dry months in the year, but prefers 300 - 400 mm.
Soil :The tree will grow naturally in sand; it also grows in clay, except where the rainfall is high enough to cause water-logging(800 mm or more).

e. Site requirements(I): No data

(5) Distribution in Kenya : Widespread in dry grassland in Northern Province, Machakos and Kajiado(A).
(6) Soil characteristics :
(7) Shade tolerance : The seedlings need weeding for the first 2 years(G). It is necessary to weed more years in Pilot Forest.
(8) Mature tree's height : Shrub or to 12 m(A).
(9) Mature tree's diamter :

(10) Utilization : Industrial purposes, fuelwood/charcoal, live fencing(D), gum arabic (high quality one used as a good stabilizer, glue, starch used for clothing and other industrial applications (B), or a valuable additive used in beer, confectionery, pharmaceuticals and other industries(A)).

(9) Mature tree's height : Shrub or to 12 m(A).

(10) Mature tree's diameter :

(11) Others : This species is drought-resistant, valuable in dryland agroforestry and for erosion control(A).
Nitrogen-fixation
It is often the only species to survive in dry areas. This species is ideal for reclamation of refractory site and sifting sand dunes(G).

2 Seed

(1) Month of flowering :

(2) Month of collection : February and July in Tiva, Kitui.

(3) Method of collection : To stand on the lader or something like that, then drow the branch carefully by stick with a hook and take pods.

(4) Method of preparation : After dry pods, then put them into a sack and hit by pole.

(5) Method of storage :

(6) Number of seeds per pod :

(7) Number of seeds per kg. or 1. : 10,200 - 33,000 seeds/kg.(D)

(8) Usual germination rate :

(9) Provenance :

(10) Others :

3 Seedling

(1) Applied seed pretreatment: Soak concentrated H2So4 for 20 - 30 minutes, soak cold/tepid water for 36 hours(D).
Overnight soaking is effective(G).

(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined

(3) Sowing month at Tiva Nursery : May

(4) Growing speed in the nursery :

(5) Note for watering : Avoid too much watering.

(6) Note for other things :

4 Plantation

(1) Site condition :

(2) Land Preparation : In 1988, strip clearing, 1m width slashing and 2m remaining,

but not cut down useful trees more than 5cm in D.B.H.

(3) Number of seedlings per ha : In 1988, 1,000 seedlings/ha planted.

(4) Size of planting hole : In 1988, 45cm x 45cm

(5) Weeding : Weeding is very important, at least 2 times per year, if possible 3 times.

(6) Damage :

(7) Growing speed : Slow.

(8) Management : Coppicing(G).

(9) Some data from forestation site

Planted Year	Compart.	Areas	Survival rate				Height	
			Jul.89	Nov.89	Oct.90	Nov.91	Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1988	I-F	0.65	90.5	67.0	51.5	46.0	24	20
	II-J-3	1.00	78.5	78.0	47.0	36.0	19	16
Sub-total		1.65						

(10) Some data from extension : The farmers in Kwa-vonza Location like this species as fuelwood.

(11) Others : Young trees require protection from grazing animals as they are highly palatable(B).
Typical tree of the Sahel from Senegal to the Red Sea, varieties occurring in East and South Africa.

Card No.11

Species: Acacia tortilis

Cf. A:169, B:67, D:19, 132, 160, E:-, F:-, G:106, H:11, 13, I:145

1 Basic data

(1) Family name : Mimosaceae
(2) Vernacular name : Mulaqa, kilaa (Kamba), Mgunga(Swahili), Umbrella thorn(English)(A,B).
(3) Origin : Indigenous
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
III, 1	Kwale	800-1400	1450-2200	24-30	0- 900
III, 2-3	Kisumu/Murang'a	800-1400	1450-2200	20-24	900-1800
IV, 1	Lamu	600-1100	1550-2200	24-30	0- 900
IV, 2-3	Lake Victoria/Thika	600-1100	1550-2200	20-24	900-1800
IV, 4	Rumuruti/Narok(part)	600-1100	1550-2200	18-20	1500-1850
V, 1-2	Taveta/Isiolo	450- 900	1650-2300	22-30	0-1200
V, 3-4	Kajiado	450- 900	1650-2300	18-22	1200-1850
VI, 1-2	Magadi/Garba Tula	300- 550	1900-2400	22-30	0-1200
VI, 3-4	Kirimun	300- 550	1900-2400	18-22	1200-1850
VII, 1-2	Wajir	150- 350	2100-2500	22-30	0-1200

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature		
		Dry months	No. of DP	Mean	Lowest	Highest
Semi-arid hot	250-600	8-10	1 or 2	>18		
Semi-arid, warm to cold	250-600	8-10	1 or 2	<18		
Arid, hot desert	<250	11-12	1	>18		
Humid sub-tropics	>1200	-	None		-3<t<18	>22
Temperate maritime	>1200	-	None		-3<t<18	18-22

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry periods per year

c. Preferable ecological zone(H):

Eco.Zone	Rainfall(mm)	Altitude(m)	Soil type	Rotation
IV	400-800	1,000-1,400	Sandy to sandy-clay soils to riverine clay/sandy soils	Short
V-VI	Under 400	1,000-1,400	Sandy clay to sandy loam soils	Short

d. Environmental requirements(G):

Temperature: This species grows well in hot, arid climates with maximum temperatures as high as 50 deg.C. Plants less than 2 years old are easily damaged by frost and require protection.

Altitude : This species is best adapted to the lowlands.

Rainfall : This species thrives where rainfall is up to 1,000mm.

Soil : The tree favours alkaline soils. It grows fairly well in shallow soil, less than 0.25 m deep, though it develops long lateral roots that can become a nuisance in nearby fields, paths, and roadway.

e. Site requirements(I): Forms open, pure stands on glacis, on blownout eroded sites, skeleton soils, latoritic gravel, etc. Frequently on "sal fellugineux tropical plants". Prospers well on deep alkaline soil, on sandy loam, occasionally also on fossil dunes. Intolerant of inundations.

(5) Distribution in Kenya : Very widely distributed up to 1,800 m in woodland, grassland and semi-desert areas; conspicuous in Northern Province, often along rivers, also found in Nairobi National Park(A).

(6) Soil Characteristics : Sand or loam in soil texture, Alkaline(pH > 7.5) or neutral (pH 6.5 - 7.5) in reaction, well drained soil(D). It prefers alkaline soil and tolerates shallow, rocky types(B).

(7) Shade tolerance :

(8) Mature tree's height : 20 m(A), 4 - 15 m(G).

(9) Mature tree's diameter :

(10) Utilization : Fuelwood/charcoal, fodder, tannin/dyes, live fencing, timber, bee-forage, ornamental, soil conservation(D).

(11) Others : Nitrogen-fixation(D), almost always evergreen(A). Sometimes with several trunks that spray upwards and outwards, fountain-like, that support a flat-topped umbrella of feathery foliage(G). Its thorns are a distinguishing feature; there are two kinds - long, straight, and white, and small, brownish and hooked(G). There are four distinct sub-species in different ecological zones, in East Africa.(G). However, according to "A Conspectus of the African Acacia species" (Ross. J.H. 1979) there are 6 sub-species in Kenya.

2 Seed

(1) Month of flowering :
(2) Month of collection : August in Bura
(3) Method of collection : To collect pods under a tree, or fall them on the ground by rocking or hitting by pole then collect them.
(4) Method of preparation : After dry pods, then put them into a sack and hit by pole.
(5) Method of storage : Under normal conditions the seeds can be stored for a long time but must be protected against insects(I).
(6) Number of seeds per pod :
(7) Number of seeds per Kg. or 1. : 12,000 - 16,000 seeds/kg.(D).
15,000 - 20,000 seeds/kg.(I).
(8) Usual germination rate :
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment: Strictly, soak in cold/tipid water for 24 hours, acid treatment(D).
The seeds are dipped in hot water and soaked overnight to ensure quick and uniform germination. Seeds can also be treated with concentrated H2So4(G).
(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Possible
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : February
(4) Growing speed in the nursery : Fast
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : (i) In 1986, total clearing, but not cut down useful trees more than 5cm in D.B.H.
(ii) In 1987, total clearing, the same as in (i) for useful trees.
(iii) In 1988, strip clearing, 1m width slashing and 2m remaining, the same as in (i) for useful trees.
(iv) In 1989, strip clearing, 2m width slashing and 1m remaining, the same as in (i) for useful trees.
(3) Number of seedlings per ha : (i) In 1986, 1,000 seedlings/ha planted.
(ii) In 1987, 1,000 seedlings/ha planted.

(iii) In 1988, 1,000 seedlings/ha planted.
(iv) In 1989, 830 seedlings/ha planted.

(4) Size of planting hole : (i) In 1986, 45cm x 45cm.
(ii) In 1987, 45cm x 45cm.
(iii) In 1988, 45cm x 45cm.
(iv) In 1989, 65cm x 65cm.

(5) Weeding : Seedlings require initial weeding to facilitate faster growth(G). Very important, at least 2 times per year, if possible 3 times.

(6) Damage : Trees are susceptible to attack by caterpillars, beetles, and blight diseases that infest other Mimosaceae in an area. Wild herbivores graze new shoots and young seedlings(G).

(7) Growing speed : If well managed it grows relatively fast on dry sandy soil(B).

(8) Management : Coppicing, lopping, pollarding(D).

(9) Some data from forestation site

Planted Year	Compart.	Areas	Survival rate				Height	
			Jul.89	Nov.89	Oct.90	Oct.91	Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1986		0.15						
1987		0.52						
1988	I-P-2	1.85	54.0	68.5	38.5	37.4	26	22
1989	C-1-6(L)	0.60			71.5	49.0	20	23

Note (L): Hole size is 65cm x 65cm

(10) Some data from extension : The farmers in Kwa-vonza Location chose this species for their family use as charcoal, fodder, fuelwood, pole and fencing.

(11) Others

Card No.12

Species: Acacia xanthophloea

Cf. A:169, B:, D:20, 160, E:-, F:-, G:-, H:7, I:-,

1 Basic data

(1) Family name : Mimosaceae
(2) Vernacular name : Fever tree, Naivasha thorn(English)
(3) Origin : Indigenous
(4) Climatic condition
a. Preferred climatic type(B) : No data
b. Climate adaptability(D) : No data
c. Prefarable ecological zone(H):

Eco.Zone	Rainfall(mm)	Altitude(m)	Soil type	Rotation
III-Highland	800-1,400	1,000-2,000	Riparian soil	Medium

d. Environmental requirement(G): No data
e. Site requirements(I): No data

(5) Distribution in Kenya : Gregarious in high ground water areas beside lakes or rivers from 600 to 2,000 m, often in black cotton soil, now widely planted in and around Nairobi(A).
(6) Soil characteristics :
(7) Shade tolerance :
(8) Mature tree's height : 25 m(A)
(9) Mature tree's diameter :
(10) Utilization : Posts, Fuelwood/Charcoal, fodder, bee-forage, ornamental(D)
(11) Others : Nitrogen-fixation
Older trees become brittle, and being shallow rooted in soft ground tend to fall or drop large branches in high winds(A)

2 Seed

(1) Month of flowering :
(2) Month of collection :
(3) Method of collectio :
(4) Method of preparation :
(5) Method of storage :
(6) Number of seeds per pod :
(7) Number of seeds per Kg. or 1. :
(8) Usual germinal rate : 30%(D)
(9) Provenance :
(10) Others :

3 Seedling

(1) Aplied seed pretreatment :
(2) Types of seedling
a. Pot seedling : Operational

b. Stump : Not examined
c. Bare root : Not examined

(3) Sowing month at Tiva Nursery : May
(4) Growing speed in the nursery : Fast
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : (i) In 1987, total clearing, but not cut down useful trees more than 5cm in D.B.H.
(ii) In 1988, 1m width slashing and 2m remaining, the same as in (i) for useful trees.
(iii) In 1989, 2m width slashing and 1m remaining, the same as in (i) for useful trees.
(3) Number of seedlings per ha : (i) In 1988, 1,000 seedlings/ha planted.
(ii) In 1988, 1,000 seedlings/ha planted.
(iii) In 1989, 830 seedlings/ha planted.
(4) Size of planting hole : (i) In 1987, 45cm x 45cm.
(ii) In 1988, 45cm x 45cm.
(iii) In 1989, 65cm x 65cm.
(5) Weeding : Weeding is very important, at least 2 times per year, if possible 3 times.
(6) Damage :
(7) Growing speed : Very fast growing.
(8) Management :
(9) Some data from forestation site

Planted Year	Compart.	Areas	Survival rate Jul. 89	Nov. 89	Oct. 90	Oct. 91	Height Oct. 90	Oct. 91
		ha	%	%	%	%	cm	cm
1987		1.98						
		3.50						
Sub-total		5.48						
1988	II-H-2	3.57	76.0	45.0	37.5	36.0	75	97
1989	C-1-5(L)	0.41			68.0	43.8	57	67

Note (L): Hole size is 65cm x 65cm

(10) Some data from extension

(11) Others

Card No.13

Species: Acrocarpus fraxinifolius

Cf. A:49, B:68, C:-, D:21, 142, 161, E:-, F:-, G:-, H:-, I:-

1 Basic data

(1) Family name : Mimosaceae
(2) Vernacular name : Indian ash, shinle tree(English)
(3) Origin : India, South East Asia
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
I, 3-4	Kakamega	1100-1700	1200- 200	18-22	1200-1850
I, 5	Kericho(part)	1100-1700	1200- 200	16-18	1850-2150
II, 3	Migori(part)	1000-1600	1300-2100	20-22	1200-1800
II, 4-5	Limuru(part)	1000-1600	1300-2100	16-20	1500-2150
III, 3	Kisumu/Murang'a(part)	800-1400	1450-2200	20-22	1200-1800
III, 4-5	Nairobi	800-1400	1450-2200	16-20	1500-2150

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature	
		Dry months	No. of DP	Mean	Lowest	Highest
Monsoonal, short, dry season	>1500	<4	1(short)		>18	
Humid sub-tropics	>1200	-	None		-3<t<18	>22
Temperate maritime	>1200	-	None		-3<t<18	10-22
Highland sub-humid summer rainfall	500-1200	2-6	1		-3<t<18	>11

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry periods per year
M : Month

c. Preferable ecological zone(H) : No data
d. Environmental requirement(G) : No data
e. Site requirements(I) : No data

(5) Distribution in Kenya : Originally introduced in coffee and tea plantations as a shade tree and now widely planted around Nairobi and in better rainfall areas at medium altitudes(A).
(6) Soil characteristics : Loamy soil, neutral, (6.5 - 7.5) in reaction, well drained in drainage(D).
(7) Shade tolerance :
(8) Mature tree's height : 60m in dense forest or 50m in open setting(B).

(9) Mature tree's diamter :
(10) Utilization : Fuelwood/charcoal, shade and shelter, ornamental, light construction, furniture, boxes, fence posts, bee-forage(D).
(11) Others : A clean, straight trunks and bright red young foliage(A), nitrogen-fixation.

2 Seed

(1) Month of flowering :
(2) Month of collection : July to September(B). March in Kaveta.
(3) Method of collection : To collect pods, or fall them on the ground by rocking or hitting by pole then collect, or go up to a tree and take pods.
(4) Method of preparation : After dry pods, then put them into a sack and hit by pole.
(5) Method of storage : The seeds store well for long periods in cool dry places(B).
(6) Number of seeds per pod :
(7) Number of seeds per Kg. or 1. : 28,950 - 50,000 seeds/Kg.(D)
(8) Usual germination rate : 70 - 100%(D).
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment: None pretreatment, immerse in boiling water, allow to cool(D)
(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : April to June
(4) Growing speed in the nursery : Fast
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : In 1989, strip clearing 2m width slashing and 1m remaining, but not cut down useful trees more than 5cm in D.B.H.
(3) Number of seedlings per ha : In 1989, 830 seedlings/ha planted
(4) Size of planting hole : In 1989, 65cm x 65cm
(5) Weeding : Weeding is very important, at least 2 times per year.
(6) Damage :
(7) Growing speed :
(8) Management : Fast growing

(9) Some data from forestation site

Planted Year	Compart.	Areas	Survival rate				Height	
			Jul.89	Nov.89	Nov.90	Oct.91	Nov.90	Oct.91
		ha	%	%	%	%	cm	cm
1989	D-1-5(L)	0.65			58.5	2.0	51	130

Note(L): Hole size is 65 x 65 cm

(10) Some data from extension

(11) Others

Card No.14

Species: Albizia amara

Cf. A:173, B:, D:133, 162, E:-, F:-, G:-, H:-, I:-

1 Basic data

(1) Family name : Mimosaceae
(2) Vernacular name : Bitter albizia(English)
(3) Origin : Indigenous
(4) Climatic condition
a. Preferred climatic type(B) : No data
b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature	
		Dry months	No. of DP	Mean Coldest	Hottest
Sub-humid	600-1500	4-8	1	>18	

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry periods per year

c. Preferable ecological zone (H) : No data
d. Environmental requirement(G) : No data
e. Site requirements(I) : No data

(5) Distribution in Kenya : Widely distributed in wooded grassland and lower to medium altitudes, also indigenous in India, Sri Lanka, and much of Eastern and Central Africa(A).
(6) Soil characteristics : Loam or sand in soil texture, neutral (pH 6.5 - 7.5) in reaction, well drained soil, shallowness, salinity(D).
(7) Shade tolerance :
(8) Mature tree's height : 10 m but often smaller(A).
(9) Mature tree's diameter :
(10) Utilization : Timber, carvings, fuelwood, fodder, wood-tool/utensils, cosmetic/hygenic(D).
(11) Others : Nitrogen-fixation.

2 Seed

(1) Month of flowering :
(2) Month of collection :
(3) Method of collection :
(4) Method of preparation :
(5) Method of storage :
(6) Number of seeds per pod :
(7) Number of seeds per Kg. or 1. :
(8) Usual germination rate :
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment:

(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery :
(4) Growing speed in the nursery : Slow.
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : In 1989, strip clearing, 2m width slashing and 1m remaining, but not cut down useful trees more than 5cm in D.B.H.
(3) Number of seedlings per ha : In 1989, 830 seedlings/ha planted.
(4) Size of planting hole : In 1989, 65cm x 65cm.
(5) Weeding : Weeding is very important, at least 2 times per year.
(6) Damage :
(7) Growing speed :
(8) Management : Coppicing, lopping and pollarding are available(D).
(9) Some data from forestation site

Planted Year	Compart.	Areas	Survival rate				Height	
			Jul.89	Nov.89	Nov.90	Oct.91	Nov.90	Oct.91
		ha	%	%	%	%	cm	cm
1989	D-1-2(L)	0.93			93.5	75.0	23	27

Note (L): Hole is 65cm x 65cm.

(10) Some data from extension

(11) Others

Card No.15

Species: Albizia anthelmintica

Cf. A:, B:, C:, D:162, F:66, 67, G:-, H:-, I:-

1 Basic data

(1) Family name : Mimosaceae
(2) Vernacular name : Muguta(Kikuyu)(F), Kuoa, Muoa, Muowa(Kamba)(E)
(3) Origin : Indigenous
(4) Climatic condition
  a. Preferred climatic type(B) : No data
  b. Climate adaptability(D) : No data
  c. Preferable ecological zone(H) : No data
  d. Environmental requirements(G) : No data
  e. Site requirements(I) : No data

(5) Distribution in Kenya : A common shrub of the dry bushland(F).
(6) Soil characteristcs :
(7) Shade tolerance :
(8) Mature tree's height : 8 m(F).
(9) Mature tree's diameter :
(8) Utilization : Fodder, medicine(D). Decoction of bark or root used as an anthemlmintic mainly for tapeworm, and as a purgative(Correct dossage is essential). It is also used for treating malaria (E).
(11) Others : Nitrogen-fixation

2 Seed

(1) Month of flowering : August in Tiva
(2) Month of collection : October in Tiva
(3) Method of collection : To go up to tree and take pods.
(4) Method of preparation : After dry pods, then put them into a sack and hit by a pole.
(5) Method of storage :
(6) Number of seeds per pod :
(7) Number of seeds per Kg. or 1. :
(8) Usual germination rate :
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment:
(2) Types of seedling
  a. Pot seedling : Operational
  b. Stump : Not examined
  c. Bare root : Not examined
(3) Sowing month at Tiva Nursery :
(4) Growing speed in the nursery : Slow
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : In 1989, strip clearing 2m width slashing and 1m remaining, but not cut down useful trees more than 5cm in D.B.H.
(3) Number of seedlings per ha : In 1989, 830 seedlings/ha planted.
(4) Size of planting hole : In 1989, 65cm x 65cm
(5) Weeding : Weeding is very important, at least 2 times per year.
(6) Damage :
(7) Growing speed :
(8) Management :
(9) Some data from forestation site

Planted Year	Compart.	Areas	Survival rate			Height	
			Jul.89	Nov.89	Nov.90	Oct.91	Nov.90	Oct.91
		ha	%	%	%	%	cm	cm
1989	D-1-4(L)	0.99			81.0	66.5	15	19

Note (L): Hole size is 65cm x 65 cm.

(10) Some data from extension

(11) Others

Card No.16

Species: Azadirachta indica

Cf. A:143, B:73, C:250, D:28, 135, 167, E:-, F:-, G:114, H: 9, 11, I:173

1 Basic data

(1) Family name : Meliaceae
(2) Vernacular name : Mkilifi, Mwarubaini(Swahili), Neem tree(English)
(3) Origin : India, Sri-Lanka, Burma
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
III, 1	Kwale	800-1400	1450-2200	24-30	0- 900
III, 2-3	Kisumu/Murang'a	800-1400	1450-2200	20-24	900-1800
IV, 1	Lamu	600-1100	1550-2200	24-30	0- 900
IV, 2-3	Lake Victoria/Thika	600-1100	1550-2200	20-24	900-1800
V, 1-2	Taveta/Isiolo	450- 900	1650-2300	22-30	0-1200
V, 3	Kajiado(part)	450- 900	1650-2300	20-22	1200-1800
VI, 1-2	Magadi/Garba Tula	300- 550	1900-2400	22-30	0-1200
VI, 3	Kirimun(part)	300- 550	1900-2400	20-22	1200-1800

Note; Prec. :Average annual rainfall, mm
Evap. :Average annual potential evaporation, mm
Evap. :Mean annual temperature, (deg.C)
Alt. :Altitude, M

b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature		
		Dry months	No. of DP	Mean	Lowest	Highest
Sub-humid	600-1500	4-8	1		>18	
Semi-arid,hot	259- 600	8-10	1 or 2	>18		
Semi-arid, warm to cold	250- 600	8-10	1 or 2	<18		
Arid, hot desert	<250	11-12	1	>18		

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry period per year
M : Months

c. Preferable ecological zone(H) :

Eco-Zone	Rainfall(mm)	Altitude(m)	Soil type	Rotation
III (Low-land)	800-1,400	0-1,400	Sandy to sandy-loam	Short
IV	400-800	0-1,400	Sandy to sandy-clay soils to riverine clay/ sandy soils.	Short

d. Environmental requirements(G) :
Temperature: This species survives in great heat, even shade temperature up to 45 deg. C.
Altitude : It will grow at altitudes from 50 m to 1,500 m.

Rainfall : This species is most successful in arid tropical and sub-tropical zones having a mean average annual rainfall of 450-1,150 mm. It is useful even where the rainfall is less than 500 mm, for it can tolerate long dry seasons.

Soil : The tree is undemanding and grows well on most soils, including dry, stony, clay and shallow soils. The optimum pH is 6.2 or above, although the tree will grow well at pH 5.

e. Site requirements: Very drought resistant, heat resistant but sensitive to cold. No particular site requirements; tolerates slight salinity. Grows better than other species on dry, stony and shallow, and nutrient-deficient soils without ground water contact. Optimum pH 6.2. Suitable for the improve ment of degraded, nutrient-poor soils. Generally deep-rooted, means also has lateral roots that may extend radically to 15m. Intolerant to frequent inudation and lateritic out crops.

(5) Distribution in Kenya : Widely planted at the coast for fueld, timber and shade, and increasingly used in agroforestry in exhausted soil(A).

(6) Soil characteristics : Sandy soil, Alkaline(pH >7.5), neutral (6.5 - 7.5) in reaction, well drained in drainage(D).

(7) Shade tolerance : Shade intolerant.
Weeds do no affect growth(I).

(8) Mature tree's height : 18 m(A).

(9) Mature tree's diameter :

(10) Utilization : Fuelwood/charcoal, medicinal, industrial timber, poles, fodder, gum, shade/ ornamental, building poles, fence posts, insect repellent, green manure, tannin, live fencing, bee-forage, food-fruits, essential oil, cosmetic/hygine, timber(D).
Leaves, with a protein content of 15%, could be used as fodder for camels, sheep and goats. The seed cake is said to be toxic to sheep and other live-stock(I).

(11) Others : This species is a deep-rooted medium-sized tree, usually evergreen, except in periods of extreme drought(G).

2 Seed

(1) Month of flowering :

(2) Month of collection : February to March in Kibweg.

(3) Method of collection :

(4) Method of preparation : The fruit pulp must be removed and the seed drier before transportation(B).

(5) Method of storage : Viability is very short lasting, a maximum of two months(B). Intermediate storage in moist sand(I).
(6) Number of seeds per fruit:
(7) Number of seeds per Kg. or 1. : 4,400 - 6,300 seeds/kg.(D).
1,600 - 1,700 seeds/kg.(I).
(8) Usual germination rate : 35 - 65%(D)
(9) Provenance :
(10) Others : Only swollen seeds should be used(I).

3 Seedling

(1) Applied seed pretreatment: None pretreatment.
(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined

(3) Sowing month at Tiva Nursery : February to March
(4) Growing speed in the nursery : Slow in Tiva
(5) Note for watering : Avoid too much watering.
(6) Note for other things : Seedlings ought to be 30-50 cm high(I).

4 Plantation

(1) Site condition :
(2) Land Preparation : (i) In 1986, total clearing, but not cut down useful trees more than 5cm in D.B.H .
(ii) In 1987, total clearing, the same as in (i) for useful trees.
(iii) In 1988, strip clearing, 1m widhth slashing and 2m remaining, the same as in (i) for useful trees.
(3) Number of seedlings per ha : (i) In 1986, 1,000 seedlings/ha planted.
(ii) In 1987, 1,000 seedlings/ha planted.
(iii) In 1988, 1,000 seedlings/ha planted.
(4) Size of planting hole : (i) In 1986, 45cm x 45cm
(ii) In 1987, 45cm x 45cm
(iii) In 1988, 45cm x 45cm
(5) Weeding : Weeding is very important. This species is intolerant to grass competition and needs thorough weeding, especially in dry areas(G).
(6) Damage : Imperfectly drained soils taproots tends to rot and the trees gradually die off(G).
(7) Growing speed : Fast growing(G), but slow growing in the pilot forest.
(8) Management : Coppicing, lopping and pollading are available(D).

(9) Some data from forestation site

Planted Year	Compert.	Areas	Survival rate				Height	
			Jul.89	Nov.89	Oct.90	Oct.91	Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1986		0.22						
1987		0.24						
1988	I-L-1	0.76	57.0	-	44.4	28.5	10	12

(10) Some data from extension

(11) Others

In West Africa, coppicing is usually done on an 8 years rotation, with the original spacing between the plantation trees most commonly 2.4m x 2.4m. In Ghana, fast rotation yield was 103 - 137 m3 of fuelwood per Ha(G).

Direct seeding is possible as well as propagation by cutting(I).

This species is primarily suited for single tree plantation within compounds, villages, etc., along roadsides, canals, markets, and on fields with agricultural crops.

Card No.17

Species: Balanites aegyptiaca

Cf. A:27, B:74, C:239, D:28, 135, 168, E:43, F:-, G:-, H:11, I:(179)

1 Basic data

(1) Family name : Balanitaceae
(2) Vernacular name : Mjunju(Swahili), Mulului(Kamba), desert date(English).
(3) Origin : Indigenous
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
III,1	Kwale	800-1400	1450-2200	24-30	0- 900
III, 2-3	Kisumu/Murang'a	800-1400	1450-2200	20-24	900-1800
III, 4-5	Nairobi	800-1400	1450-2200	16-20	1500-2150
IV, 1	Lamu	600-1100	1550-2200	24-30	0- 900
IV, 2-3	Lake Victoria/Thika	600-1100	1550-2200	20-24	0-1800
IV, 4-5	Rumuruti/Narok(part)	600-1100	1550-2200	16-20	1500-2150
V, 1-2	Taveta/Isiolo	450- 900	1650-2300	22-30	0-1200
V, 3-4	Kajiado	450- 900	1650-2300	18-22	1200-1850
V, 5	Maralal/ Naivasha(part)	450- 900	1650-2300	16-18	1850-2150
VI, 1-2	Magadi/Garba Tula	300- 550	1900-2400	24-30	0-1200
VI, 3-4	Kirimun	300- 550	1900-2400	18-22	1200-2150
VII, 1-2	Wajir	150- 350	2100-2500	22-30	0-1200

Note; Prec. :Average annual rain fall, mm
Evap. :Average annual potential evaporation, mm
Temp. :Mean annual temperature, (deg.C)
Alt. :Altitude, m

b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature	
		Dry months	No. of DP	Mean	Lowest	Highest
Subhumid	600-1500	4-8	1		>18	
Semi-arid	250- 600	8-10	1 or 2			
Arid, hot desert	<250	11-12	1	>18		
Highland subhumid	500-1200	2-6	1		-3<t<18	>10

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry periods per year
M : Month

c. Preferable ecological zone (H) :

Eco-Zone	Rainfall(mm)	Altitude(m)	Soil type	Rotation
IV	400- 800	500-1,400	Sandy to sandy-clay soils to riverine clay/sandy soils.	Short

d. Environmental requirements(G) : No data.
e. Site requirement: Ecologically a very flexible species. Due to its deep tap root and thick bark it is very drought-

resistant and not damaged by grass fire. Grows on very different soils with annual rainfalls between 200 and 800 mm. Usually found mixed with Acacia seyal, A. tortilis and other species (e.g. Sclerocarya birrea) but also forming almost pure stand(I).

(5) Distribution in Kenya : Distributed savanna grassland from sea level to 2,000 m, often in sandy or black-cotton soil(A).

(6) Soil characteristics : Heavy, loam and sand soil texture, alkaline (pH>7.5), neutral(pH:6.5 - 7.5) in reaction, seasonal water logging well drained in drainage, Salinity(D). High grass competes for light and thus impedes regeneration(I).

(7) Shade tolerance :

(8) Mature tree's height : 6 m or occasionally 12 m(A).

(9) Mature tree's diameter : A stem diameter of 30 cm.

(10) Utilization : Fuelwood/charcoal, timber, medicinal, poles, fodder, food(oil, fat, fruit), live fencing, pesticide, mulching(D). Roots used for abdominal pains, as purgative, and as an anthelmintic. Molten gum from the wood is mixed with maize meal porridge and eaten to treat chest complaints(E). Wood carving, farm tools. The bark is used as a fish poison, and the fruit, although harmless to man and warm-blooded mammals, produces a potent emulsion which kills both the freshwater snails that carry bilharzia and the water-fleas that carry guinea-worm disease(A).

(11) Others : Evergreen tree. This tree is greatly valued in the driest areas of Kenya both for its fruit and its uses for stick(A). Wood is heavy and termite resistant(A). Seedlings are intensively browsed by all herbivores(I).

2 Seed

(1) Month of flowering :

(2) Month of collection : February in Tika, Kitui

(3) Method of collection :

(4) Method of preparation :

(5) Method of storage : The seed stores well for up to one year, if the outer fruit is removed and kept clean and dry, away from insect attack(B).

(6) Number of seeds per fruit:

(7) Number of seeds per Kg. or 1. : 1,000 seeds/Kg.(D).

(8) Usual germination rate :

(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment: Seeds should be soaked in hot water for 12 to 18 hours or scarified to overcome dormancy(I).
(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : May
(4) Growing speed in the nursery : Slow growing
(5) Note for watering : Be careful to much watering.
(6) Note for other things : Reproduction mainly by direct seeding but also by root suckers and cuttings(I).

4 Plantation

(1) Site condition :
(2) Land Preparation : (i) In 1987, total clearing, but not cut down useful trees more than 5cm in D.B.H
(ii) In 1988, 1m width slashing and 2m remaining, the same as in (i) for useful trees.
(3) Number of seedlings per ha : (i) In 1987, 1,000 seedlings/ha planted.
(ii) In 1988, 1,000 seedlings/ha planted.
(4) Size of planting hole : (i) In 1987, 45cm x 45cm
(ii) In 1988, 45cm x 45cm
(5) Weeding : Weeding is very important, at least 2 times per year.
(6) Damage :
(7) Growing speed :
(8) Management : Coppicing, lopping and pollarding are applicable(D).
(9) Some data from forestation site

Planted Year	Compart.	Areas	Survival rate Jul.89	Nov.89	Oct.90	Oct.91	Height Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1987		1.47						
		2.27						
		0.72						
Sub-total		4.91						
1988	I-P-1	4.17	41.0	3.5	-	-	-	-

(10) Some data from extension
The farmers in the Kwa-vonza location seem to be supplied by this species with fruits, fodder, fuelwood, charcoal and timber.

(11) Others

Card No.18

Species: Cassia siamea

Cf. A:57, B:78, C:162, D:35, 136, 178, E:-, F:-, G:120, H:9, I:221

1 Basic data

(1) Family name : Caesalpinaceae
(2) Vernacular name : -
(3) Origin : Sounth-east Asia, India and Sri Lanka(B).
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
II, 1	Ramisi	1000-1600	1300-2100	24-30	0- 900
II, 2-3	Migori	1000-1600	1300-2100	20-24	900-1800
III, 1	Kwale	800-1400	1450-2200	24-30	0- 900
III, 2-3	Kisumu/Murang'a	800-1400	1450-2200	20-24	900-1800
IV, 1	Lamu	600-1100	1550-2200	24-30	0- 900
IV, 2-3	Lake Victoria/Thika	600-1100	1550-2200	20-24	900-1800
V, 1-2	Taveta/Isiolo	450- 900	1650-2300	22-30	0-1200
V, 3	Kajiado	450- 900	1650-2300	20-22	1200-1800

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature	
		Dry months	No. of DP	Mean	Lowest	Highest
Subhumid	600-1500	4-8	1		>18	
Semi-arid, hot	250- 600	8-10	1 or 2	>18		
Humid sub-tropics	>1200	-	None		-3<t<18	>22
Temperate maritime	>1200	-	None		-3<t<18	10-22
Highland sub-humid	500-1200	2-6	1		-3<t<18	>10

Note; Prec. Average annual rainfall, m
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry period per year

c. Preferable ecological zone (H) :

Eco-Zone	Rainfall(mm)	Altitude(m)	Soil type	Rotation
III,(Low-land	800-1,400	0-1,400	Sandy to sandy-loam	Short

d. Environmental requirements(G):
Temperature: This species cannot withstand cold but thrives in tropical heat.
Altitude : It is generally lowland species.

Rainfall : This species grows in a wide range of climates: humid, sub-humid, dry, and arid. However, it is most prevalent in monsoonal areas where annual rainfall is 1,000 mm or more and dry season lasts 4 or 5 months. In drier area (those with 500 - 700 mm annual rainfall), the tree will grow after its second or third year only if its roots have access to deep soil moisture.

Soil : The tree grows best in deep, well-drained, relatively rich soils. It can tolerate soils containing luterite and limestone, provided drainage is not impaired.

e. Site requirement(I): Prospers with 1,000 - 1,500 mm of annual rainfall but grows also with barely 500 mm. Tolerates even extended drought, however in the Sahel only with sufficient soil water supplies and in the southern most part if the roots have access to deep soil moisture. Requires deep soil which are sufficiently fresh, not too poor, not skeleton.

(5) Distribution in Kenya : This species is commonly found in Kenya(B).

(6) Soil characteristics : Loam or sund in soil texture, acid(pH < 6.5) or neutral(6.5 - 7.5) in reaction, well drained(D).

(7) Shade tolerance : Weak in shade

(8) Mature tree's height : 15 m(G).

(9) Mature tree's diameter :

(10) Utilization : Fuelwood/charcoal, poles/posts, timber, bee forage, ornamental(D).

(11) Others : The tree is fairly resistant to termite(G).
Suitable for shelterbelt plantation but not as shade tree in agroforestry project (root competition)(I). This species is more resistant than Cassia spectabilis in draught.

2 Seed

(1) Month of flowering : January in Kitui region

(2) Month of collection : September up to October in Tiva, Kibwege.

(3) Method of collection : To go up to a tree and take pods.

(4) Method of preparation : After dry pods, then put them into a sack and hit by a pole.

(5) Method of storage : Seeds store for up to one year, but germination percentage steadily decreases during the course of the year(B).

(6) Number of seeds per pod :

(7) Number of seeds per Kg. or 1. : 30,000 - 45,000 seeds/Kg.(D).

(8) Usual germination rate : 50 - 85%(D)
(9) Provenance :
(10) Others : Under normal conditions, seeds remain viable for 2 - 3 years(I).

3 Seedling

(1) Applied seed pretreatment: No pretreatment if seeds are fresh. soak in concentrated H2So4 for 5 - 15 minutes, or in cold/tepid water for 48 hours, immerse in boiling water, allow to cool(D).

(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Stumps are available
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : January to March
(4) Growing speed in the nursery : Slow
(5) Note for watering : Avoid too much watering.
(6) Note for other things : Young plants are very fire-sensitive; various parasites may damage the root system(I).

4 Plantation

(1) Site condition :
(2) Land Preparation : (i) In 1986, total clearing, but not cut down useful trees more than 5cm in D.B.H.
(ii) In 1987, total clearing, the same as in (i) for useful trees.
(iii) In 1988, strip clearing, 1m width slashing and 2m remaining, the same as in (i) for useful trees.
(iv) In 1989, strip clearing, 2m width slashing and 1m remaining, the same as in (i) for useful trees.
(3) Number of seedlings per ha : (i) In 1986, 1,000 seedlings/ha planted.
(ii) In 1987, 1,000 seedlings/ha planted.
(iii) In 1988, 1,000 seedlings/ha planted.
(iv) In 1989, 830 seedlings/ha planted.
(4) Size of planting hole : (i) In 1986, 45cm x 45cm.
(ii) In 1987, 45cm x 45cm.
(iii) In 1988, 45cm x 45cm.
(iv) In 1989, partly 65cm x 65cm.
(5) Weeding : Weeding is necessary for the first year or second(G). Weeding is needed for long in Pilot Forest.

(6) Damage : The trees are susceptible to attack by scale insects(B). The young trees are browsed by livestock and wildlife and must be protected(G).

(7) Growing speed : Fast in suitable soil condition.

(8) Management : Coppicing and lopping are available(D).

(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate Jul. 89	Survival rate Nov. 89	Survival rate Oct. 90	Survival rate Oct. 91	Height Oct. 90	Height Oct. 91
		ha	%	%	%	%	cm	cm
1986		0.59						
		1.91						
Sub-total		2.60						
1987		2.75						
1988	I-E-3	1.94	67.0	20.0	14.0	-	34	-
	II-H-5	2.49	82.2	77.0	76.0	73.5	79	124
Sub-total		4.43						
1989	B-2-2	0.49			95.5	52.5	46	63
	C-1-4(L)	0.49			96.0	79.0	52	80
Sub-total		0.98						

Note (L): Hole size is 65cm x 65cm.

(10) Some data from extension

(11) Others

Plantation can be established by direct seedlings(G).

Card No.19

Species: Cassia spectabilis

Cf. A:57, B:-, C:-, D:35, 178, E:-, F:-, G:-, H:-, I:-

1 Basic data

(1) Family name : Caesalpinaceae
(2) Vernacular name : Mwenu(Kikuyu)
(3) Origin : Tropical America
(4) Climatic condition
  a. Preferred climatic type(B) : No data
  b. Climate adaptability(D) : No data
  c. Preferable ecological zone (H) : No data
  d. Environmental requirement(G) : No data
  e. Site requirements(I): No data

(5) Distribution in Kenya : Widely planted up to 2,000 m in Kenya(A).
(6) Soil characteristics : Flourishing even in poor or black-cotton soil, but not at its best if site is too dry(A). Indeed in suitable moisture and fertile soil this tree grows well.
(7) Shade tolerance :
(8) Mature tree's height : 10 m.
(9) Mature tree's diameter :
(10) Utilization : Fuelwood, windbreaks, ornament(D).
(11) Others :

2 Seed

(1) Month of flowering : April in Kitui region.
(2) Month of collection : October in Tiva, Kitui District.
(3) Method of collection : To go up to a tree and take pods.
(4) Method of preparation : After drying pods for 3 or 4 days then take out seeds using a knife from pod and dry for 2 or 3 days.
(5) Method of storage : Keep in tin with charcoal, cotton sack (dardk room or) a well heated place.
(6) Number of seeds per pod :
(7) Number of seeds per Kg. or 1. : 31,000 - 35,000 seeds/kg.
(8) Usual germination rate : 15 - 50%
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment: None, soak in hot water for 12 hours.(D)
(2) Types of seedling
  a. Seedling : Pot seedling
  b. Stump : Stump is available
  c. Bare root : Not examined

(3) Sowing month at Tiva Nursery : February to March.

(4) Growing speed in the nursery : Fast
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : (i) In 1986, total clearing, but not cut down useful trees more than 5cm in D.B.H.
(ii) In 1987, total clearing, the same as in (i) for useful trees.
(iii) In 1988, strip clearing, 1m width slashing and 2m remaining, the same as in (i) for useful trees.
(iv) In 1989, strip clearing, 2m width slashing and 1m remaining, the same as in (i) for useful trees.
(3) Number of seedlings per ha : (i) In 1986, 1,000 seedlings/ha planted.
: (ii) In 1987, 1,000 seedlings/ha planted.
(iii) In 1988, 1,000 seedlings/ha planted.
(iv) In 1989, 830 seedlings/ha planted.
(4) Size of planting hole : (i) In 1986, 45cm x 45cm.
(ii) In 1987, 45cm x 45cm.
(iii) In 1988, 45cm x 45cm.
(iv) In 1989, partly 65cm x 65cm.
(5) Weeding : Weeding is important, 2 times per year.
(6) Damage : The trees are easily damaged by die-buck.
(7) Growing speed : Very fast.
(8) Management :
(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate Jul. 89	Nov. 90	Oct. 90	Oct. 91	Height Oct. 90	Oct. 91
		ha	%	%	%	%	cm	cm
1986		1.68						
1987		0.90						
		1.28						
Sub-total		2.18						
1988	I-N	3.21	86.0	68.0	69.5	65.0	78	120
	II-E-1	1.75	40.4	41.5	48.0	55.0	66	75
	II-G-1	4.93	93.5	71.0	59.5	88.0	68	93
Sub-total		9.89	(73.3)	(60.2)				
1989	A-1-2(L)	0.74			93.5	91.0	55	78
	B-3-2(SW)	0.20			97.2	93.4	34	51
	D-4-3(SW)	0.18			92.1	59.5	52	66
	E-2-4(L)	0.27			99.4	96.4	85	97
	F-4-2(S)	0.09			95.2	73.8	29	32
Sub-total		1.48						

Note (L): Hole size is 65cm x 65cm, (SW): Spotweeding,
(S): Hole size is 25cm x 25cm.

(10) Some data from extension

(11) Others

Card No.20

Species: Casuarina equisetifolia

Cf. A:69, B:79, C:18, D:36, 137, 179, E:-, F:-, G:38, H:9, I:227

1 Basic data

(1) Family name : Casuarinaceae
(2) Vernacular name : Mvinje(swahili), Whistling pine(English)
(3) Origin : Indigenous (There is some debate about its indigenous status as it could very well have been brought from India centuries ago(B.)

(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
II, 1	Ramisi	1000-1600	1300-2100	24-30	0- 900
II, 2-3	Migori	1000-1600	1300-2100	18-20	1500-1850
II, 4	Limuru(part)	1000-1600	1300-2100	18-20	1500-1850
III, 1	Kwale	800-1400	1450-2200	24-30	0- 900
III, 2-3	Kisumu/Murang'a	800-1400	1450-2200	20-24	900-1800
III, 4	Nairobi(part)	800-1400	1450-2200	18-20	1500-1850
IV, 1	Lamu	600-1100	1550-2200	24-30	0- 900
IV, 2-3	Lake Victoria/Thika	600-1100	1550-2200	20-24	900-1800
IV, 4	Rumuruti/Narok(part)	600-1100	1550-2200	18-20	1550-1800
V, 1-2	Taveta/Isiolo	450- 900	1650-2300	22-30	0-1200
V, 3-4	Kajiado	450- 900	1650-2300	18-22	1200-1850

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature	
		Dry months	No. of DP	Mean	Lowest / Hightst
Subhumid	600-1500	4-8	1		>18
Semi-arid,hot	250- 600	11-12	1 or 2	>18	
Semi-arid warm to cold	250- 600	11-12	1 or 2	<18	
Humid sub-tropics	>1200	-	None		-3<t<18 / >22
Temperate maritime	>1200	-	None		-3<t<18 / 10-22
Highland subhumid	500-1200	2-6	1		-3<t<18 / >10

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry period per year

c. Preferable ecological zone (H) :

Eco-Zone	Rainfall(mm)	Altitude(m)	Soil type	Rotation
III-Low-land	800-1,400	0-1,400	Sandy soils	Short(4 6 years)

d. Environmental requirements(G):

Temperature: The monthly mean maximum temperature in its native area is 10 - 33 deg. C, but it is adapted to a wide range of temperature.

Altitude : This is a lowland tree that can be planted from sea level up to 1,500 m.

Rainfall : In its natural habitat, annual rainfall is from 700 - 2,000 mm, often with a dry season of 6 - 8 months. However, it has been planted successfully in area with annual rainfall as little as 200 - 300 mm or as much as 5,000 mm.

Soil : The species tolerates calcareous and slightly saline soil, but it grows poorly on heavy soil such as clays.

e. Site requirement(I): The species grows well on deep sandy soil, tolerates, calcareous and slightly saline site. In its natural habitat annual rainfallvaries between 700 and 2,000 mm. Plantations in other parts of the world have been successfully established with as little as 200-300mm if ground water is available (not deeper than 3 - 4m).

(5) Distribution in Kenya : Coastal area, but this species has done surprisingly well at higher elevations including Nairobi(B).

(6) Soil characteristics : Sand or loam in soil texture, alkaline (pH > 7.5), seasonal water logging or well drained in drainage, Salinity(D).

(7) Shade tolerance : Shade intolerant
Young trees are especially resistant to competition from grass or plants for light(I).

(8) Mature tree's height : 20 M

(9) Mature tree's diameter :

(10) Utilization : Fuelwood, charcoal, industrial timber, small timber/poles, fodder, shade/ ornamental, posts(G).

(11) Others : Nitrogen-fixation.
This species has root nodules containing nitrogen-fixing actinomycete microorganisms(G).
Seedlings raised in nurseries may be planted bare-rooted, but ectomycorrhizae significantly enhance the adaptability of the trees and their ability to grow in newly established plantation and on marginal sites. Thus, transplanging in polythene bags with inoculated soil with Frankia actinomycete is recommended for afforestation(I).

2 Seed

(1)	Month of flowering	:
(2)	Month of collection	:
(3)	Method of collection	:
(4)	Method of preparation	:
(5)	Method of storage	: Seeds may be stored over two years at low temperatures (-7 to 3 deg.C and low humidity, less than 15%)(I).
(6)	Number of seeds per fruit:	
(7)	Number of seeds per Kg. or	1. : 200,000 - 1,000,000 seeds/kg.(D)
(8)	Usual germination rate	: 30 - 70%(D)
(9)	Provenance	:
(10)	Others	:

3 Seedling

(1)	Applied seed pretreatment:	None pretreatment
(2)	Types of seedling	
	a. Pot seedling	: Operational
	b. Stump	: Not examined
	c. Bare root	: Not examined
(3)	Sowing month at Tiva Nursery	: December to June
(4)	Growing speed in the nursery	: Slow
(5)	Note for watering	: Be careful to much watering.
(6)	Note for other things	: When seeds are planted outside their natural range, the soil may need inoculating with clashed nodules from natural stand(G).

4 Plantation

(1)	Site condition	:
(2)	Land Preparation	: (i) In 1986, total clearing, but not cut down useful trees more than 5cm in D.B.H. (ii) In 1988, strip clearing, 1m width slashing and 2m remaining, the same as in (i) for useful trees. (iii) In 1989, strip clearing, 2m width slashing and 1m remaining, the same as in (i) for useful trees.
(3)	Number of seedlings per ha	: (i) In 1986, 1,000 seedlings/ha planted. (ii) In 1988, 1,000 seedlings/ha planted. (iii) In 1989, 830 seedlings/ha planted.
(4)	Size of planting hole	: (i) In 1986, 45cm x 45cm. (ii) In 1988, 45cm x 45cm. (iii) In 1989, 65cm x 65cm.
(5)	Weeding	: Initially very important especially in dense grass cover(G).
(6)	Damage	: The species is susceptible to root rot(G).
(7)	Growing speed	: Fast.

(8) Management :

(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate				Height	
			Jul.89	Nov.89	Oct.90	Oct.91	Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1986		1.28						
1988	I-G	0.25	40.0	10.0	-	-	-	-
1989	C-1-3(L)	0.31			35.5	-	66	-

Note (L): Hole size is 65cm x 65cm

(10) Some data from extension

(11) Others

In dry site, irrigation may be needed immediately after transplanting and as long as the first 3 years(G).

Card No.21

Species: Croton megalocarpus

Cf. A:101, B:83, C:-, D:41, E:89, F:126, G:-, H:5, 7, 11, I:-

1 Basic data

(1) Family name : Euphorbiaceae
(2) Vernacular name : Mukinduri(KIkuyu), Lameanguet(Swambur), Muthulu(Kamba)
(3) Origin : Indigenous
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
I, 3-4	Kakamega	1100-1700	1200-2000	18-22	1200-1850
I, 5-6	Kericho	1100-1700	1200-2000	14-18	1850-2450
II, 3	Migori(part)	1000-1600	1300-2100	20-22	1200-1800
II, 4-6	Limuru	1000-1600	1300-2100	14-20	1500-2450
III, 3	Kisumu/Murang'a(part)	800-1400	1450-2200	20-22	1200-1800
III, 4-5	Nairobi	800-1400	1450-2200	16-20	1150-2150
III, 6	Eldoret	800-1400	1450-2200	14-16	2150-2450
IV, 3	Lake Victoria/ Thika(part)	600-1100	1150-2200	20-22	1200-1800
IV, 4	Rumuruti/Isiolo(part)	600-1100	1150-2200	18-20	1500-1850

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) : No data
c. Preferable ecological zone (H) :

Eco-Zone	Rainfall(mm)	Altitude(m)	Soil type	Rotation
II	Over 11,400	1,000 - 2,000	Variable deep red to loamy sandy soils	Short to Medium
III-Highland	800 - 1,400	1,000 - 2,000	Sandy to sandy-clay soils to riverine sandy/clay soils.	Short to Medium (15-25 yrs)
IV	400 - 800	1,000 - 2,000	Sandy to sandy clay soils to riverine sandy/clay soils	Short to medium

d. Environmental requirements(G) : No data
e. Site requirements(I) : No data

(5) Distribution in Kenya : Dry upper land forest, often plants in country areas as boundery marks(A).
(6) Soil characteristics :
(7) Shade tolerance : Tolerant in young stage.
(8) Mature tree's height : More than 35 m(A)
(9) Mature tree's diameter :
(10) Utilization : Fuelwood, but the charcoal smoke can hurt the eyes.(B)
(11) Others : The oil expected from seeds has been reported on very favourably for

medicinal purposes. The pounded bark is soaked in water overnight, the

extract is drunk as a remedy for intestinal worms, and for the treatment of whooping cough(E)

2 Seed

(1) Month of flowering : January in Kaveta
(2) Month of collection : July - November in Kitui district.
(3) Method of collection : To collect fruits, or fall them on the ground by rocking or hitting by pole then collect, or go up to a tree and take fruits. Collect from the ground after falling.(B)
(4) Method of preparation : To crack nuts and take out seeds then dry for 3 - 4 days.
(5) Method of storage : Keep in tin with charcoal, cotton sack in dark room (or a well heated place).
(6) Number of seeds per nut :
(7) Number of seeds per Kg. or 1. : 1,000 seeds/kg.
(8) Usual germination rate : 70 - 100%(D)
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment: No pretreatment, (Germination is usually quick with no pretreatment required.(B)
(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Stumps are available
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : February to March.
(4) Growing speed in the nursery : Fast.
(5) Note for watering : Avoid too much watering.
(6) Note for other things : If seedlings grow too high, treaming is available.

4 Plantation

(1) Site condition :
(2) Land Preparation : (i) In 1987, total clearing, but not cut down useful trees more than 5cm in D.B.H
(ii) In 1988, 1m width slashing and 2m remaining, the same as in (i) for useful trees.
(iii) In 1989, 2m width slashing and 1m remaining, the same as in (i) for useful trees.
(3) Number of seedlings per ha : (i) In 1987, 1,000 seedlings/ha planted.
(ii) In 1988, 1,000 seedlings/ha planted.
(iii) In 1989, 830 seedlings/ha planted.

(4) Size of planting hole : (i) In 1987, 45cm x 45cm
(ii) In 1988, 45cm x 45cm
(iii) In 1989, mostly 65cm x 65cm

(5) Weeding : Weeding is desirable 2 times per year.
(6) Damage :
(7) Growing speed : Slightly fast growing
(8) Management :
(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate Jul. 89	Nov. 89	Oct. 90	Oct. 91	Height Oct. 90	Oct. 91
		ha	%	%	%	%	cm	cm
1987		1.57	44.5	-	27.5	25.0	134	170
		1.73	0.0	-	-	-	-	-
		1.33	0.0	-	-	-	-	-
Sub-total		4.69						
1988	I-E-1	3.38	89.0	89.5	85.5	88.0	62	93
	I-J-2	2.81	90.5	93.0	91.5	91.5	90	129
	II-B	3.79	92.0	87.5	91.0	91.5	95	156
	II-G-2	4.03	90.0	71.0	71.5	68.5	75	102
Sub-total		14.01	(09.4)	(85.0)				
1989	A-1-1(L)	0.88			94.5	84.0	37	58
	B-2-3	0.55			98.0	86.5	42	62
	B-3-3(SW)	0.14			97.1	92.3	36	56
	D-4-4(SW)	0.28			92.3	66.0	27	39
	E-2-3(L)	0.38			98.0	92.5	50	79
	F-4-3	0.08			78.0	65.5	31	48
Sub-total		2.31						

Note (L): Hole size is 65cm x 65cm. (SW): Spotweeding.

(10) Some data from extension

(11) Others
According to the experiment, the average height of 65cm x 65cm hole size was 1.4 times and 1.2 times as tall as that of 25cm x 25cm, and 45cm x 45cm hole size, after 2 years later experiment area being just set up, an increase was 469% for 25cm hole size, 579% for 45cm hole size, 700% for 65cm hole size.

Card No.22

Species: Dalbergia melanoxylon

Cf. A:(97), B:84, C:169, D:42, 186, E:-, F:-, G:-, H:9, 11, I:249

1 Basic data

(1) Family name : Papilionaceaee
(2) Vernacular name : Muvingo(Kamba), Mpingo(Swahili), African black-wood(English)(B).
(3) Origin : Indigenous
(4) Climatic condition
a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
III, 1	Kwale	800-1400	1450-2200	24-30	0- 900
III, 2-3	Kisumu/Murang'a	800-1400	1450-2200	20-24	900-1800
IV, 1	Lamu	600-1100	1550-2200	25-30	0- 900
IV, 2-3	Lake Victoria/Thika	600-1100	1550-2200	20-24	900-1800
V, 1-2	Taveta/Isiolo	450- 900	1650-2300	22-30	0-1200
V, 3	Kajiado(part)	450- 900	1650-2300	20-22	1200-1800
VI, 1-2	Magadi/Garba Tula	300- 550	1900-2400	22-30	0-1200

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) : No data
c. Preferable ecological zone (H) :

Eco-Zone	Rainfall(mm)	Altitude(m)	Soil type	Rotation
III-Lowland	800-1,400	0-1,400	Variable, sandy to sandy-clay	Long
IV	400-800	0-1,400	Sandy to sandy-clay soils to riverine clay/sandy soils	Medium to long

d. Environmental requirements(G): No data
e. Site requirement(I):Needs sufficient moist soil, preferably near waterholes or watercourses, also on skeleton soils(I).

(5) Distribution in Kenya : This species grows best in sub-humid and semiarid areas. Many trees can be found in the valleys east of Kitui Town(B)
(6) Soil characteristics :
(7) Shade tolerance :
(8) Mature tree's height : 4 - 7m high, occasionally over 12m high(I).
(9) Mature tree's diameter : 60 cm(C).
(10) Utilization : Fodder, wood for conversion into various products, medicine(D). Used for cleaning wounds, to alleviate abdominal pains, to relieve pain in joints(E). Like ebony, it is primarily used for

special applications such as musical instruments, inlays and arts (carving)(I).

(9) Mature tree's height : 4 - 7m high, occasionally over 12m high (I).
(10) Mature tree's diameter : 60 cm(C)
(11) Others : Nitrogen-fixation. The tree can be regarded as ant and beetle proof, and is a prized wood among Kamba carvers and European instrument makers(B). This wood is very heavy, dencity 1.2(C)

2 Seed

(1) Month of flowering :
(2) Month of collection : March in Tiva.
(3) Method of collection :
(4) Method of preparation :
(5) Method of storage :
(6) Number of seeds per pod :
(7) Number of seeds per Kg. or 1. : 6,000 - 16,000 seeds/kg.(D)
(8) Usual germination rate : 15 - 50%(D)
(9) Provenance :
(10) Others : %

3 Seedling
(1) Applied seed pretreatment:
(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Possible
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : February
(4) Growing speed in the nursery : Slow
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation
(1) Site condition :
(2) Land Preparation : (i) In 1988, strip clearing, 1m width slashing and 2m remaining, but not cut down useful trees more than 5cm in D.B.H.
(ii) In 1989, strip clearing, 2m width slashing and 1m remaining, the same as in (i) for useful trees.
(3) Number of seedlings per ha : (i) In 1988, 1,000 seedlings/ha planted.
(ii) In 1989, 830 seedlings/ha planted.
(4) Size of planting hole : (i) In 1988, 45cm x 45cm
(ii) In 1989, 65cm x 65cm
(5) Weeding : Weeding is very important, at least 2 times per year.
(6) Damage :

(7) Growing speed : Very slow.
(8) Management :

(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate				Height	
			Jul.89	Nov.89	Oct.90	Oct.91	Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1988	I-F	1.49	96.5	95.5	97.5	98.0	57	33
1989	C-1-2(L)	0.24			90.3	92.4	18	18

Note (L): Hole size is 65cm x 65cm.

(10) Some data from extension

(11) Others
To be planted at the age of 5 months. After seven years upto 4m high (I).
The trees planted in compartment I-F were eaten by dik-diks.

Card No.23

Species: Delonix regia

Cf. A:59, B:-, C:171, D:43, 187, E:-, F:-, G:-, H:-, I:-

1 Basic data

(1) Family name : Caesalpinaceae
(2) Vernacular name : Mjohoro(Swahili), Flamboyant(English)
(3) Origin : Madagascar
(4) Climatic condition
a. Preferred climatic type(B) : No data
b. Climate adaptability(D) : No data
c. Preferable ecological zone (H) :
No data
d. Environmental requirements(G) : No data
e. Site requirements(I) : No data

(5) Distribution in Kenya : Common at the coast, but at Nairobi's altitude flowering only erratically(A).
(6) Soil characteristics :
(7) Shade tolerance :
(8) Mature tree's height : 10 m, but under ideal conditions to 15 m(A).
(9) Mature tree's diameter :
(10) Utilization : Shade/shelter, ornamental, fuelwood, edible seed pod, bee-forage(D).
(11) Others : Nitrogen-fixation.

2 Seed

(1) Month of flowering : January in Kaveta
(2) Month of collection : July in Kaveta
(3) Method of collection : To collect pods, or fall them on the ground by rocking or hitting by pole then collect, or go up to a tree and take pods.
(4) Method of preparation : After drying pods for 3 - 7 days then take seeds from pod using a knife and dry for 2 - 3 days.
(5) Method of storage :
(6) Number of seeds per pod :
(7) Number of seeds per Kg. or 1. : 1,600 - 9,300 seeds/kg.(D)
(8) Usual germination rate : 35 - 75%(D)
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment: Stratify, soak in cold/tepid water for 24 hours, soak in concentrated H2So4 for 45 - 60 minutes, none pretreatment(D).
(2) Types of seedling
a. Pot seedling : Operational

b. Stump : Not examined
c. Bare root : Not examined

(3) Sowing month at Tiva Nursery : March
(4) Growing speed in the nursery : Fast
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : In 1988, strip clearing 1 m width slashing and 1m remaining, but not cut down useful trees more than 5cm in D.B.H.
(3) Number of seedlings per ha :In 1988,1,000 seedlings/ha planted
(4) Size of planting hole : In 1988, 45cm x 45cm
(5) Weeding : Weeding is very important, at least 2 times per year.
(6) Damage :
(7) Growing speed :
(8) Management :
(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate			Height	
			Jul.89	Nov.89	Oct.90	Oct.91	Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1988	I-G	1.49	13.0	3.5	-	-	-	-

(10) Some data from extension

(11) Others
This species prefers high humid lower altitude area.

Card No.24

Species: Eucalyptus camaldulensis

Cf. A:193, B:86, C:336, D:47, 149, 193, E:-, F:-, G:126, H:9, 11, I:263

1 Basic data

(1) Family name : Myrtaceae
(2) Vernacular name : Red river gum(English)
(3) Origin : Eastern Australia
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
III, 1	Kwale	800-1400	1450-2200	24-30	0- 900
III, 2-3	Kisumu/Murang'a	800-1400	1450-2200	20-24	900-1800
IV, 1	Lamu	600-1100	1550-2200	24-30	0- 900
IV, 2-3	Lake Victoria/Thika	600-1100	1550-2200	20-24	900-1800
V, 1-2	Taveta/Isiolo	450- 900	1650-2300	22-30	0-1200
V, 3	Kajiado(part)	450- 900	1650-2300	20-22	1200-1800

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature	
		Dry months	No. of DP	Mean	Lowest	Highest
Subhumid	600-1500	4-8	1		>18	
Semi-arid, hot	250- 600	8-10	1 or 2	>18		
Semi-arid, warm to cold	250- 600	8-10	1 or 2	<18		
Arid, hot desert	<250	11-12	1	>18		
Arid, warm to cold	<250	11-12	1	<18		
Humid sub-tropics	>1200	-	None		-3<t<18	>22
Temperate maritime	>1200	-	None		-3<t<18	10-22
Highland sub-humid	500-1200	2-6	1		-3<t<18	>10

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No. of DP : Number of dry period per year.

c. Preferable ecological zone (H) :

Eco-Zone	Rainfall(mm)	Altitude(m)	Soil type	Rotation
III-Lowland	800-1,400	0-1,400	Red clay-loamy to sandy-loamy soils	Short (6-8yrs)
IV	400-800	0-1,400	Sandy to sandy-clay soils to riverine clay/sandy soils.	Short (6 yrs)

d. Environmental requirements(G):
Because of the species occurs over such an extensive natural range, seeds collected from different localities may produce trees with very different appearance, growth rate, health, environmental tolerance and wood quality. It is criticaly important to get seeds from a climatic zone similar to that of the planting zone.

Temperature: The trees withstand high summer temperatures and are hardy down to 3 deg. C.
Altitude : Although mainly a tree of river plane, some provenances can be grown in highland area.
Rainfall : In its native habitat the species is found both in area of low and high rainfall (200 - 1,250 mm). A lower limit for commercial plantation is 400 mm annual rainfall.
Soil : The tree adopts well to a wide variety of soils, although, the provenance choice is very important.

e. Site requirement(I):Grows from sea level to approximately 600m altitude with precipitations over 250mm. Best growth in Africa with precipitation between 700 and 1,200 mm. Tolerates a dry season of over 8 months, also grows on poor degraded soils and tolerates short term flooding. Prefers deep silt with clay subsoil. Salt tolerance varies with provenance.

(5) Distribution in Kenya : This species is one of the world's most widely planted trees, primarily in semi-arid and Mediterranean climates.(B)
(6) Soil characteristics : Sand or loam in soil texture, acid (pH < 6.5) or neutral(pH 6.5 - 7.5) in reaction, seasonal water logging, well water drainage. This species is best suited to areas having over 500mm of rain and dry seasons for not more than eight months' duration(B).
(7) Shade tolerance : Shade intolerant.
(8) Mature tree's height : 20 to 50 m
(9) Mature tree's diameter : 90 to 210 cm D.B.H.
(10) Utilization : Industrial purposes, fuelwood/charcoal, tanning/dyes, poles, ornamental essential oils, bee-forage, heavy construction, building poles, short fibre pulp(D).
(11) Others : The dense red wood is resistant to termites(A).

2 Seed

(1) Month of flowering :
(2) Month of collection :
(3) Method of collection :
(4) Method of preparation :
(5) Method of storage :

(6) Number of seeds per Kg. or 1. : 90,000 - 400,000 seeds/kg.(D)
200,000 to 1,000,000 seeds/kg(I).
(7) Usual germination rate :
(8) Provenance :
(9) Others :

3 Seedling

(1) Applied seed pretreatment: None pretreatment
(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : May to August
(4) Growing speed in the nursery : Fast
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation :(i) In 1988, strip clearing, 1m width slashing and 2m remaining, but not cut down useful trees more than 5cm in D.B.H.
(ii) In 1989, strip clearing, 2m width slashing and 1m remaining, the same as in (i) for useful trees.
(3) Number of seedlings per ha :(i) In 1988, 1,000 seedlings/ha planted.
(ii) In 1989, 830 seedlings/ha planted
(4) Size of planting hole : (i) In 1988, 45cm x 45cm
(ii) In 1989, 65cm x 65cm
(5) Weeding : Weeding is very important. Extensive weeding is mandatory(G).
(6) Damage : Young trees and weakened by drought can be infected by moth lavae, eucalyptus snout beetle, termite, and eucalyptus borer(G).
(7) Growing speed : Very fast
(8) Management : Coppicing and pollarding are available(D).
(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate Jul.89	Nov.89	Oct.90	Oct.91	Height Sep.90	Oct.91
		ha	%	%	%	%	cm	cm
1988	I-K	0.79	26.5	-	0.5	-	350*	-
1989	C-1-1(L)	0.50			82.0	76.0	174	227

Note * Only one tree' datum, (L): Hole size is 65cm x 65cm.

(10) Some data from extension

(11) Others
Transplanted to field, spacing as close as 2m x 2m are used for fuelwood(G).

Card No.25

Species: Eucalyptus citriodora

Cf. A:, B:87, C:337, D:48, 193, E:-, F:-,G:128, H:-, I:-

1 Basic data

(1) Family name : Myrtaceae
(2) Vernacular name : Lemon gum(English)
(3) Origin : Queensland, Eastern Australia(B,C)
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
II, 1	Ramisi	1000-1600	1300-2100	24-30	0- 900
II, 2-3	Migori	1000-1600	1300-2100	20-24	900-1800
II, 4	Limuru(part)	1000-1600	1300-2100	18-20	1500-1850
III, 1	Kwale	800-1400	1450-2200	24-30	0-900
III, 2-3	Kisumu/Murang'a	800-1400	1450-2200	20-24	900-1800
III, 4	Nairobi(part)	800-1400	1450-2200	18-20	1500-1850
IV, 1	Lamu	600-1100	1550-2200	24-30	0- 900
IV, 2-3	Lake Victoria/Thika	600-1100	1550-2200	20-24	900-1800
IV, 4	Rumuruti/Narok(part)	600-1100	1550-2200	18-20	1500-1850

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) : No data
c. Preferable ecological zone (H) : No data
d. Environmental requirements(G) : No data

Temperature : The trees withstand both high temperature(29 - 35 deg. C mean monthly maximum) and light frosts.

Altitude : It occurs at altitude from sea level up to 900 m in Queensland, but in Sri-Lanka it has been grown at elevations as high as 2,000 m.

Rainfall : In its native habitat, it tolerates dry season of 5 - 7 months. The minimum required annual rainfall is 600 mm, but for best growth, over 900 mm is desirable.

Soil : In its native habitat, this tree occurs on rolling country side where the soils are generally poor and gravlly including podzols, residual podzols of lateric origin, and infertile clay. It seems to prefer well-drained soil.

e. Site requirements(I): No data

(5) Distribution in Kenya : This species needs about 900 mm rain annually and tolerates up to 7 months drought(B).
(6) Soil characteristics :
(7) Shade tolerance :
(8) Mature tree's height : 30 - 40 m(C)
(9) Mature tree's diameter : 1.3 m(G).
(10) Utilization : Industrial purposes, fuelwood, charcoal, essential oil, timber, posts,

(11) Others : bee-forage, ornamental(D). Saw-timber, perfume(G).

2 Seed

(1) Month of flowering :
(2) Month of collection :
(3) Method of collection :
(4) Method of preparation :
(5) Method of storage :
(6) Number of seeds per kg. or 1. : 108,000 - 124,000 seeds/kg.(D)
(7) Usual germination rate : 60 - 90%(D)
(8) Provenance :
(9) Others :

3 Seedling

(1) Applied seed pretreatment: None pretreatment
(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : May to August
(4) Growing speed in the nursery : Fast
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : In 1987, total clearing but not cut down useful trees more than 5 cm in D.B.H.
(3) Number of seedlings per ha : In 1987 1,000 seedlings/ha planted
(4) Size of planting hole : 45cm x 45cm
(5) Weeding : Weeding is very important, at least 2 times per year.
(6) Damage : Young trees are susceptible to termite damage(B).
(7) Growing speed : Fast growing
(8) Management : Coppicing is available(B).
(9) Some data from forestation site

Planted year	Compart. Areas	Survival rate				Height	
		Jul.89	Nov.89	Oct.90	Oct.91	Oct.90	Oct.91
	ha	%	%	%	%	cm	cm
1987	1.23	-	-	-	-	-	-

(10) Some data from extension
(11) Others
This is better suited to moist climates, though in its natural habitat it extends into area with only 600 mm of rainfall(?).

Card No.26

Species: Eucalyptus paniculata

Cf. A:193, B:, C:, D:52, 195, E:-, F:-, G:-, H:-, I:-

1 Basic data

(1) Family name : Myrtaceae
(2) Vernacular name :
(3) Origin : Coastal Queensland and New South Wales, Australia

(4) Climatic condition
a. Preferred climatic type(B) : No data
b. Climate adaptability(D) : No data
c. Preferable ecological zone (H) : No data
d. Environmental requirements(G) : No data
e. Site requirements(I) : No data

(5) Distribution in Kenya : Common in Ngong area(A).
(6) Soil characteristics : Often on black-cotton soil(A).
(7) Shade tolerance :
(8) Mature tree's height : High (25 - 40m) (C)
(9) Mature tree's diameter :
(10) Utilization : Converted timber, posts, fuelwood, bee-forage, ornamental(D).
(11) Others :

2 Seed

(1) Month of flowering :
(2) Month of collection :
(3) Method of collection :
(4) Method of preparation :
(5) Method of storage :
(6) Number of seeds per kg. or 1. : 112,000 - 2,021,400 seeds/kg.(D)
(7) Usual germination rate : 30 - 70%(D)
(8) Provenance :
(9) Others :

3 Seedling

(1) Applied seed pretreatment: None pretreatment
(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery :
(4) Growing speed in the nursery : Fast
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :

(2) Land Preparation : (i) In 1987, total clearing, but not cut down useful trees more than 5cm in D.B.H.
(ii) In 1988, strip clearing, 1m width slashing and 2m remaining, the same as in (i) for useful trees.
(iii) In 1989, strip clearing, 2m width slashing and 1m remaining, the same as in (i) for useful trees.

(3) Number of seedlings per ha : (i) In 1987, 1,000 seedlings/ha planted.
(ii) In 1988, 1,000 seedlings/ha planted.
(iii) In 1989, 830 seedlings/ha planted.

(4) Size of planting hole : (i) In 1987, 45cm x 45cm
(ii) In 1988, 45cm x 45cm
(iii) In 1989, 65cm x 65cm

(5) Weeding : Weeding is very important, at least 2 times per year.

(6) Damage :

(7) Growing speed : This species is hardy but fairly slow growing(A).

(8) Management :

(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate				Height	
			Jul.89	Nov.89	Oct.90	Oct.91	Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1987		0.64						
		1.99						
Sub-total		2.63						
1988	I-L-3	0.49	25.0	12.5	-	-	-	-
1989	D-2-3(L)	0.67			42.8	15.9	51	82

Note (L): Hole size is 65cm x 65cm.

(10) Some data from extension

(11) Others

Card No.27

Species: Eucalyptus tereticornis

Cf. A:, B:, C:342, D:54, 196, E:-, F:-, G:-, H:-, I:-

1 Basic data

(1) Family name : Myrtaceae
(2) Vernacular name : Forest red gum, Blue gum(English)
(3) Origin : Australia
(4) Climatic condition
a. Preferred climatic type(B): No data
b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature	
		Dry months	No. of DP	Mean	Lowest	Highest
Monsoonal, short dry season	>1500	<4	1		>18	
Subhumid	600-1500	4-8	1		>18	
Semi-arid, hot	250- 600	8-10	1 or 2	>18		
Highland sub-humid	500-1500	2-6	1		-3<t<18	>10

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry period per year

c. Preferable ecological zone (H) :No data
d. Environmental requirements(G) : No data
e. Site requirements(I) : No data

(5) Distribution in Kenya :
(6) Soil characteristics :
(7) Shade tolerance :
(8) Mature tree's height : 30 - 45 m(C)
(9) Mature tree's diameter : 90 - 150 cm D.B.H.(C)
(10) Utilization : Industrial purposes, fuelwood/charcoal, construction, boxes, building poles, short fibre pulp, oils, bee-forage, ornamental(D).
(11) Others :

2 Seed

(1) Month of flowering :
(2) Month of collection :
(3) Method of collection :
(4) Method of preparation :
(5) Method of storage :
(6) Number of seeds per kg. or 1. : 90,000 - 400,000 seeds/kg.(D)
(7) Usual germination rate : 55 - 80%(D)
(8) Others :

3 Seedling

(1) Applied seed pretreatment: None pretreatment

(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : May to August
(4) Growing speed in the nursery : Fast
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : (i) In 1987, total clearing, but not cut down useful trees more than 5cm in D.B.H.
(ii) In 1989, 2m width slashing and 1m remaining, the same as in (i) for useful trees.
(3) Number of seedlings per ha : (i) In 1987, 1,000 seedlings/ha planted.
(ii) In 1989, 830 seedlings/ha planted.
(4) Size of planting hole : (i) In 1987, 45cm x 45cm
(ii) In 1989, 65cm x 65cm
(5) Weeding : Weeding is very important, at least 2 times per year.
(6) Damage : Young trees are susceptible to termite damage.
(7) Growing speed : Fast
(8) Management :
(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate				Height	
			Jul.89	Nov.89	Oct.90	Oct.91	Sep.90	Oct.91
		ha	%	%	%	%	cm	cm
1987		2.57						
1989	D-2-1(L)	0.55			67.5	46.5	117	116

Note(L) :Hole size is 65cm x 65cm

(10) Some data from extension

(11) Others

Card No.28

Species: Gmelina arborea

Cf. A:, B:92, C:435, D:58, 141, 202, E:-, F:-, G:46, H:10, I:-

1 Basic data

(1) Family name : Verbenaceae
(2) Vernacular name : -
(3) Origin : The moistre forest of South Asia, from India through Southern China(B).

(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
I, 3-4	Kakamega	1100-1700	1200-2000	18-22	1200-1850
II, 1	Ramisi	1000-1600	1300-2100	24-30	0- 900
II, 2-3	Migori	1000-1600	1300-2100	20-24	900-1800
III, 1	Kwale	800-1400	1450-2200	24-30	0- 900
III, 2-3	Kisumu/Murang'a	800-1400	1450-2200	20-24	900-1800
IV, 1	Lamu	600-1100	1550-2200	24-30	0- 900
IV, 2-3	Lake Victoria/Thika	600-1100	1550-2200	20-24	900-1800

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature	
		Dry months	No. of DP	Mean Lowest	Highest
Monsoonal	>1500	<4	1	>8	
Subhumid	600-1500	4-8	1	>18	
Humid sub-tropics	>1200	-	None	-3<t<18	>22
Temperate maritime	>1200	-	None	-3<t<18	10-22

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry period per year

c. Preferable ecological zone (H) :

Eco-Zone	Rainfall(mm)	Altitude(m)	Soil type	Rotation
III Low-land	800-1,400	0-1,400	Sandy to sandy loam soils	Short (15-25 yrs)

d. Environmental requirements(G):

Temperature : This tree withstands up to 52 deg. C, but can be severely injured by frost.
Altitude : Up to 1,000 m.
Rainfall : It grows satisfactorily on sites that receive from 750 mm to 5,500 mm annually. At best some provenance have drought tolerance: in West Africa, this species is grown where the dry season is 7 months long.

Soil : It is fairly adaptable and survives well on wide range of soil types: acid soil, calcareous loams, and lateritic soil. It produces best in moist, base-rich, well-drained alluvium.

e. Site requirements(I): No data

(5) Distribution in Kenya :

(6) Soil characteristics : Sundy soil, neutral(pH 6.5 - 7.5) in reaction, well drained in drainage(D).

(7) Shade tolerance :

(8) Mature tree's height : Under optimum condition it may reach heights of about 30 m, but it is usually about 20 m(G).

(9) Mature tree's diameter :

(10) Utilization : Timber, fuelwood, furniture, plywood, matches(B), pulp, honey(G).

(11) Others :

2 Seed

(1) Month of flowering :

(2) Month of collection :

(3) Method of collection :

(4) Method of preparation :

(5) Method of storage :

(6) Number of seeds per fruit:

(7) Number of seeds per kg. or 1. : 400 - 3,000 seeds/kg.(D), 2,000 - 3,000 seeds/kg(B).

(8) Usual germination rate : 90 - 100%(D)

(9) Provenance :

(10) Others :

3 Seedling

(1) Applied seed pretreatment: None pretreatment, soak in concentrated H2So4 for 45 - 60 minutes, soak in cold/ tepid water for 48 hours(D).

(2) Types of seedling

a. Pot seedling : Operational

b. Stump : Stump is available

c. Bare root : Not examined

(3) Sowing month at Tiva Nursery : January to February

(4) Growing speed in the nursery :

(5) Note for watering : Avoid too much watering.

(6) Note for other things : Although this species is mainly native to moist forests, it occurs in some comparatively dry area in central India (G).

4 Plantation

(1) Site condition :

(2) Land Preparation : In 1988, strip clearing with 1m width slashing and 2m remaining, but not cut down useful trees more than 5cm in D.B.H.

(3) Number of seedlings per ha : In 1988, 1,000 seedlings/ha planted.

(4) Size of planting hole : In 1988, 45cm x 45cm

(5) Weeding : Weeding is essential during the first year: this species cannot compete with aggressive grasses or vines(G).

(6) Damage : Seeds and foliages are eaten widly by deer and rabbits, cattle eat foliage and barks of young trees(G).

(7) Growing speed : Very fast

(8) Management : Coppicing is available(D). Coppice rotations are usually at 5 years intervals for fuel(but in some the moist area)(G).

(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate				Height	
			Jul.89	Nov.89	Oct.90	Oct.91	Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1988	I-G	0.12	89.7	62.0	84.9	87.7	114	161

(10) Some data from extension

(11) Others

A spacing 2 m x 2 m has been recommended for fuelwood plantation in Malaysia(G). The trees are seldom killed by fire, but fire damage can facilitate insect and fungal attack(G).

This species is planted in coast area.

Card No.29

Species: Grevillea robusta

Cf. A:233, B:93, C:-, D:58, 142, 202, E:-, F:-, G:-, H:6, 7, I:-

1 Basic data

(1) Family name : Proteaceae
(2) Vernacular name : Mkima(Kikuyu), Silki oak, grevillea(English)(A).
(3) Origin : Sub-tropical region of Queensland and New South Wales, Australia(B).
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
I, 3-4	Kakamega	1100-1700	1200-2000	18-22	1200-1850
I, 5-6	Kericho	1100-1700	1200-2000	14-18	1850-2450
II, 3	Migori(part)	1000-1600	1300-2100	20-22	1200-1800
II, 4-6	Limuru	1000-1600	1300-2100	14-20	1500-2450
III, 3	Kisumu/Murang'a(part)	800-1400	1450-2200	20-22	1200-1800
III, 4-5	Nairobi	800-1400	1450-2200	16-20	1500-2150
IV, 3	Lake Victoria/ Thika(part)	600-1100	1550-2200	20-22	1200-1800
IV, 4-5	Rumuruti/Narok(part)	600-1100	2550-3300	16-20	1500-2150

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature		
		Dry months	No. of DP	Mean	Lowest	Highest
Humid sub-tropics	>1200	-	None		-3<t<18	>22
Temperate maritime	>1200	-	None		-3<t<18	10-22
Highland sub-humid	500-1200	2-6	1		-3<t<18	>10
(Semi-arid, hot)	250-600	11-12	1	>18		
(Semi-arid, warm to cold)	250-600	11-12	1	<18		

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry period per year

c. Preferable ecological zone (H) :

Eco-Zone	Rainfall(mm)	Altitude(m)	Soil type	Rotation
II	Over 1,400	0-2,500	Most variable but loves deep red soils	Short(6yrs for pole) (30yrs for timber)

III Highland	800-1,400	0-2,500	Variable spectrum of soil adaptation	Short(6yrs for pole) (30yrs for timber)

d. Environmental requirements(G) : No data
e. Site requirements(I) : No data

(5) Distribution in Kenya : This species was brought to Kenya for use as a coffee and tea shade. It can be grown in shambas without any crop with any negative effect(B).
The tree is very widely planted from 1,200 m(A).

(6) Soil Characteristics : Loamy soil, neutral(pH 6.5 - 7.5) in reaction, well drained soil(D).

(7) Shade tolerance :
(8) Mature tree's height : 20 m or more(A)
(9) Mature tree's diameter :
(10) Utilization : Fuelwood/charcoal, timber, furniture, boxes, bee-forage, veneer/plywood, ornamental, windbreak(D).

(11) Others :

2 Seed

(1) Month of flowering : January in Kaveta or Matinyani.
(2) Month of collection : March in Kaveta or Matinyani.
(3) Method of collection : To collect fruits, or fall them on the ground by rocking or hitting by pole then collect, or go up to a tree and take fruits.
(4) Method of preparation :
(5) Method of storage : Viability is short, about 3 months(B).
(6) Number of seeds per fruit:
(7) Number of seeds per Kg. or 1. : 51,000 - 150,000 seeds/kg.(D)
(8) Usual germination rate : 30 - 90%(D)
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment: None pretreatment(D).
(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : March to May
(4) Growing speed in the nursery :
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :

(2) Land Preparation : (i) In 1988, strip clearing, 1m width slashing and 2m remaining but not cut down useful trees more than 5cm in D.B.H.
(ii) In 1989, strip clearing, 2m width slashing and 1m remaining, same as in (i) for useful trees.

(3) Number of seedlings per ha : (i) In 1988, 1,000 seedlings/ha planted.
(ii) In 1989, 830 seedlings/ha planted.

(4) Size of planting hole : (i) In 1988, 45cm x 45cm
(ii) In 1989, 65cm x 65cm

(5) Weeding : Weeding is very important, at least 2 times per year.

(6) Damage : Young trees are very sucseptible to termite damage in the Pilot Forest.

(7) Growing speed : Very fast

(8) Management : Coppicing, pollading and pruning are available(D).

(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate				Height	
			Jul.89	Nov.89	Oct.90	Oct.91	Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1988	II-F-2	2.26	83.0	90.0	72.0	59.5	64	95
1989	D-2-2(L)	0.31			83.0	52.5	89	107

Note(L) : Hole size is 65cm x 65cm

(10) Some data from extension

(11) Others

Card No.30

Species: Leucaena leucocephala

Cf. A:217, B:97, C:183, D:64, 143, 208, E:-, F:-, G:50, H:10, 12, I:317

1 Basic data

(1) Family name : Mimosaceae
(2) Vernacular name : -
(3) Origin : The drier western side of Central America.
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
I, 3	Kakamega(part)	1100-1700	1200-2000	20-22	1200-1800
II,1	Ramisi	1000-1600	1300-2100	24-30	0- 900
II, 2-3	Migori	1000-1600	1300-2100	20-24	900-1800
III, 1	Kwale	800-1400	1450-2200	24-30	0- 900
III, 2-3	Kisumu/Murang'a	800-1400	1450-2200	20-24	900-1800
IV, 1	Lamu	600-1100	1550-2200	24-30	0- 900
IV, 2-3	Lake Victoria/Thika	600-1100	1550-2200	20-24	900-1800

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature	
		Dry months	No. of DP Mean	Lowest	Highest
Permanently humid	>1500	-	None	>18	
Monsoonal	>1500	<4	1	>18	
Sub-humid	600-1500	4-6	1	>18	
Humid sub-tropics	>1200	-	None	-3<t<18	>22
Temperate maritime	>1200	-	None	-3<t<18	10-22
(Semi-arid)	250-600	8-10	1 or 2		

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry period per year.

c. Preferable ecological zone (H) :

Eco-Zone	Rainfall(mm)	Altitude(m)	Soil type	Rotation
III Low-land	800-1,400	0-1,400	Clay-loamy to sandy soils.	Short
IV	400-800	0-2,000	Variable but prefers slightly alkaline	Short

d. Environmental requirements(G):

Temperature : This species is restricted to the tropics and sub-tropics; frost kills it.
Altitude : This is a species for lowland area mainly below 500 m. The plant continues growing at high elevations, but without its lowland vigor.

Rainfall : The species grows best where annual rainfall is 600 - 1,700 mm.

Soil : Root system of this species allows it to tolerate a wide array of soil conditions. It is found in soil varying from rock to heavy clay to coral. Unaided, this species grows well on in neutral or alkaline (especially lime-stone) soil.

e. Site requirements(I): Average annual rainfall of 400 - 800mm, but tolerates dry seasons of 4 - 5 months. This species is not very sensitive with regard to soils, but high yields can only be expected in areas with reasonably fertile and well-drained site. Near-neutral or alkaline soils with a high moisture content are preferred.

(5) Distribution in Kenya : This species has an undeserved reputation for drought tolerance, and it does best near the coast and in places like Kitui, Kisumu/Murang'a(B).

(6) Soil characteristics : Loam, sand in soil texture, Alkali(pH> 7.5) and neutral(6.5<pH<7.5) in reaction, seasonal water logging or well drained in drainage(D).

(7) Shade tolerance : The site should be carefully weeded before seeding and during the first growing season(D).

(8) Mature tree's height : 5 - 8m, but dependent on variety growing up 20m.

(9) Mature tree's diameter :

(10) Utilization : Industrial purposes, soil improvement, green manure, fence posts, fuelwood/ charcoal, fodder, building posts, short fibre pulp, bee-forage(D).

(11) Others : Nitrogen-fixation
It is very important to know that this species has a great number of varieties e.g. common or "Hawaiian" type upto 5m high, Giant or "Salvador" type, upto 20m high, "Peru" type upto 15m. Even seedlings develop a comparatively big taproot to resist drought(I).

2 Seed

(1) Month of flowering : January in Kaveta and Matinyani.

(2) Month of collection : March in Kaveta and Matinyani.

(3) Method of collection : To go up a tree and take pods.

(4) Method of preparation : After drying the pods, then put into a sack and hit by a pole.

(5) Method of storage :

(6) Number of seeds per pod :

(7) Number of seeds per Kg. or 1. : 13,000 - 34,000 seeds/kg.(D)

(8) Usual germination rate : 50 - 85%(D)

(9) Provenance :

(10) Others :

3 Seedling

(1) Applied seed pretreatment: Soak in hot water for 12 hours (D).
(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : May to June
(4) Growing speed in the nursery : Fast
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : (i) In 1987, total clearing, but not cut down useful trees more than 5cm in D.B.H.
(ii) In 1988, 1m width slashing and 2m remaining, the same as in (i) for useful trees.
(iii) In 1989, 2m width slashing and 1m remaining, the same as in (i) for useful trees.
(3) Number of seedlings per ha : (i) In 1987, 1,000 seedlings/ha planted.
(ii) In 1988, 1,000 seedlings/ha planted.
(iii) In 1989, 830 seedlings/ha planted.
(4) Size of planting hole : (i) In 1987, 45cm x 45cm
(ii) In 1988, 45cm x 45cm
(iii) In 1989, 65cm x 65cm
(5) Weeding : Weeding is very important. Once rapid growth begins the plants form canopy of foliage that shade out weed(G).
(6) Damage : Common pests are seed weevils, twig borers, and termites(G).
(7) Growing speed : Very fast.
(8) Management : Coppicing, pollading and pruning are available(D).
(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate Jul.89	Nov.89	Oct.90	Oct.91	Height Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1987		1.20			20.0	20.5	269	311
1988	II-J-1	0.93	52.7	47.0	26.5	26.0	22	110
1989	E-1-1(L)	0.18			56.0	37.7	23	23

Note (L): Hole size is 65cm x 65cm

(10) Some data from extension

(11) Others
Its foliage contains mimosin, toxi to ruminants if consumed in excessive amounts(G).

Card No.31

Species: Melia azedarach

Cf. A:145, B:, C:257, D:67, 143, 211, E:-, F:-, G:-, H:-, I:-

1 Basic data

(1) Family name : Meliaceae
(2) Vernacular name : Beed tree, Persian lilac, Chinaberry(English)(A).
(3) Origin : Western Asia, Himalayas.
(4) Climatic condition
a. Preferred climatic type(B) : No data
b. Climate adaptability(D) :

Zone	Prec.	Dry period			Temperature	
		Dry months	No. of DP	Mean	Lowest	Highest
Monsoonal	>1500	<4	1		>18	
Sub-humid	600-1500	4-8	1		>18	
Semi-arid, hot	250- 600	8-10	1 or 2	>18		
Semi-arid, warm to cold	250- 600	8-10	1 or 2	<18		
Humid sub-tropics	>1200	-	None		-3<t<18	>22
Temperate maritime	>1200	-	None		-3<t<18	10-22
Highland sub-humid	500-1200	2-6	1		-3<t<18	>10

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry period per year

c. Preferable ecological zone (H) : No data
d. Environmental requirements(G) : No data
e. Site requirements(I) : No data

(5) Distribution in Kenya : Fairly widely planted in Kenya up to 2,000 m(A).
(6) Soil characteristics : Sandy soil, acid(pH < 6.5) or neutral (pH 6.5 - 7.5) in reaction, well drainaged soil, shallowness (less than 50 cm), salinity(D).
(7) Shade tolerance :
(8) Mature tree's height : 10 m(A)
(9) Mature tree's diameter :
(10) Utilization : Timber, fuelwood/charcoal, live fencing bee-forage, pesticide, ornamental essential oil, wood-tool/utensils, posts, medicine(D).
(11) Others :

2 Seed

(1) Month of flowering : January in Kaveta and Matinyani.
(2) Month of collection : April in Kaveta and Matinyani.

(3) Method of collection : To collect fruits, or fall them on the ground by rocking or hitting by a pole then collect, or go up to a tree and take fruits.

(4) Method of preparation : Dry seeds.
(5) Method of storage :
(6) Number of seeds per fruit:
(7) Number of seeds per Kg. or 1. : 475 - 2,800 seeds/kg.(D)
(8) Usual germination rate : 55 - 85%(D)
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment: Soak in cold/tapid water for 48 hours, scarify mechanically or none pretreatment(D).

(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : March to May
(4) Growing speed in the nursery : Fast
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : (i) In 1987, total clearing, but not cut down useful trees more than 5cm in D.B.H.
(ii) In 1988, 1m width slashing and 2m remaining, the same as in (i) for useful trees.
(iii) In 1989, 2m width slashing and 1m remaining, the same as in (i) for useful trees.
(3) Number of seedlings per ha : (i) In 1987, 1,000 seedlings/ha planted.
(ii) In 1988, 1,000 seedlings/ha planted.
(iii) In 1989, 830 seedlings/ha planted.
(4) Size of planting hole : (i) In 1987, 45cm x 45cm.
(ii) In 1988, 45cm x 45cm.
(iii) In 1989, 65cm x 65cm.
(5) Weeding : Weeding is very important, at least 2 times per year.
(6) Damage : Budding, coppicing and lopping are available(D).
(7) Growing speed : Fast
(8) Management :

(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate				Height	
			Jul.89	Nov.89	Oct.90	Oct.91	Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1987		0.48						
		0.92						
Sub-total		1.40						
1988	II-G-3	2.44	80.5	11.0	32.0	1.0	39	-
1989	E-1-2(L)	0.55			31.5	2.0	24	24

Note (L): Hole size is 65cm x 65cm.

(10) Some data from extension

(11) Others

This species is short-lived(A).

Card No.32

Species: Melia volkensii

Cf. A:145, B:100, C:, D:, E:157, F:-, G:-, H:12, I:-

1 Basic data

(1) Family name : Meliaceae
(2) Vernacular name : Mukau(Kikuyu), Kirumbotu(Taita), Melia(English)
(3) Origin : Indigenous
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
IV, 1	Lamu	600-1100	1550-2200	24-30	0- 900
IV, 2-3	Lake Victoria/Thika	600-1100	1550-2200	20-24	900-1800
V, 1-2	Taveta/Isiolo	450- 900	1650-2300	22-30	0-1200
V, 3	Kajiado(part)	450- 900	1650-2300	20-22	1200-1800
VI, 1-2	Magadi/Garba Tula	300- 550	1900-2400	22-30	0-1200
VI, 3	Kirimun(part)	300- 550	1990-2400	20-22	1200-1800

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) : No data
c. Preferable ecological zone (H) :

Eco-Zone	Rainfall(mm)	Altitude(m)	Soil type	Rotation
IV	400-800	1,000-1,400	Sandy to sandy-clay soils riverine clay/ sandy soils.	Short

d. Environmental requirements(G) : No data
e. Site requirements(I) : No data

(5) Distribution in Kenya : Widely distributed from sea-level to 1,200 m in lower semi-arid savannah districts such as Kitui, Machakos, Samburu, Taita and Voi(A).
(6) Soil characteristics :
(7) Shade tolerance :
(8) Mature tree's height : 15 m(A)
(9) Mature tree's diameter :
(10) Utilization : Timber (very good quality)(A). Used as a cure for pain and aches in the body. The bark is boiled and a very small amount is taken. It can be poisonous in an overdoes (E)
(11) Others :

2 Seed

(1) Month offlowering : October in Kwa-vonza Location.

(2) Month of collection : February in Kwa-vonxa Location.
(3) Method of collection : To collect fruits, or fall them on the ground by rocking or hitting by a pole, or go up to a tree and take fruits.
(4) Method of preparation :
(5) Method of storage :
(6) Number of seeds per fruit:
(7) Number of seeds per Kg. or 1. :
(8) Usual germination rate :
(9) Provenance
(10) Others :

3 Seedling

(1) Applied seed pretreatment:
(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : January
(4) Growing speed in the nursery :
(5) Note for watering : Avoiod too much watering.
(6) Note for other things : Propagation from root suckers has proved more successful than germination from seed(A).

4 Plantation

(1) Site condition :
(2) Land Preparation : (i) In 1987, total clearing, but not cut down useful trees more than 5cm in D.B.H.
(ii) In 1989, 2m width slashing and 1m remaining, the same as in (i) for useful trees.
(3) Number of seedlings per ha : (i) In 1987, 1,000 seedlings/ha planted.
(ii) In 1989, 830 seedlings/ha planted.
(4) Size of planting hole : (i) In 1988, 45cm x 45cm.
(ii) In 1989, 65cm x 65cm.
(5) Weeding : Weeding is very important, at least 2 times per year.
(6) Damage :
(7) Growing speed : Fast.
(8) Management :
(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate				Height	
			Jul.89	Nov.89	Nov.90	Oct.91	Nov.90	Oct.91
		ha	%	%	%	%	cm	cm
1987		0.68						
1989	D-1-3	0.48			29.9	30.0	30	56

(10) Some data from extension : The farmers in the Kwa-vonza Location like this tree for timber and fuelwood.

(11) Others

Card No.33

Species: Moringa stenopetala

Cf. A:187, B:100, C:-, D:68, E:-, F:-, G:-, H:-, I:-

1 Basic data

(1) Family name : Moringaceae
(2) Vernacular name : Mzunze, Mrongo(Swahili), Murunda(Kamba), Horse-radish tree, Drumstock tree(English).
(3) Origin : Indigenous
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
V, 1-2	Taveta/Isiolo	450- 900	1650-2300	22-30	0-1200
VI, 1-2	Magadi/Garba Tula	300- 550	1900-2400	22-30	0-1200
VII, 1-2	Wajir	150- 350	2100-2500	22-30	0-1200

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) : No data
c. Preferable ecological zone (H) : No data
d. Environmental requirements(G) : No data
e. Site requirements(I) : No data

(5) Distribution in Kenya : Common near Isiolo and on the island at Lake Baringo(A).
(6) Soil Characteristics :
(7) Shade tolerance :
(8) Mature tree's height : 10 m(A)
(9) Mature tree's diameter :
(10) Utilization : The species is able to use as live fence, food (leaves and pods) and spice(B). Modern research suggests that this species may be an even more efficient water purifier(A).
(11) Others :

2 Seed

(1) Month of flowering :
(2) Month of collection :
(3) Method of collection :
(4) Method of preparation :
(5) Method of storage :
(6) Number of seeds per fruit:
(7) Number of seeds per Kg. or 1. :
(8) Usual germination rate : Germination is high(B).
(9) Provenance :
(10) Others : Seeds are large, 5 cm long and 2 cm wide, also triangular with wings(B).

3 Seedling

(1) Applied seed pretreatment: Direct sowing in pots is appropriate(B).
(2) Types of seedling
    a. Pot seedling : Operational
    b. Stump : Not examined
    c. Bare root : Not examined
(3) Sowing month at Tiva Nursery :
(4) Growing speed in the nursery :
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : In 1988, strip clearing, 1m width slashing and 2m remaining but not cut down useful trees more than 5cm in D.B.H.
(3) Number of seedlings per ha : In 1988, 1,000 seedlings/ha planted.
(4) Size of planting hole : In 1988, 45cm x 45cm
(5) Weeding : Weeding is very important, at least 2 times per year.
(6) Damage :
(7) Growing speed :
(8) Management :
(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate				Height	
			Jul.89	Nov.89	Oct.90	Oct.91	Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1988	I-K	0.51	74.5		14.2	-	25	-

(10) Some data from extension

(11) Others

Card No.34

Species: Parkinsonia aculeata

Cf. A:61, B:104, C:-, D:71, 144, 218, E:-, F:-, G:140, H:-, I:343

1 Basic data

(1) Family name : Caesalpinaceae
(2) Vernacular name : Jerusalem thorn(English)
(3) Origin : Tropical and sub-tropical America
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
V, 1-2	Taveta/Isiolo	450- 900	1650-2300	22-30	0-1200
V, 3	Kajiado(part)	450- 900	1650-2300	20-22	1200-1800
VI, 1-2	Magadi/Garba Tula	300- 550	1900-2400	22-30	0-1200
VI, 3	Kirimun(pan	300- 550	1900-2400	20-22	1200-1800
VII, 1-2	Wajir	150- 350	2100-2500	22-30	0-1200

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) :

Zone	Prec.	Dry period			Temperature	
		Dry months	No. of DP	Mean	Lowest	Highest
Semi-arid, hot	250-600	8-10	1 or 2	>18		
Semi-arid, warm to cold	250-600	8-10	1 or 2	<18		
Arid, hot desert	<250	11-12	1	>18		
Highland sub-humid	500-1200	2-6	1		-3<t<18	>10

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry period per year

c. Preferable ecological zone (H) : No data
d. Environmental requirements(G):

Temperature : It grows in tropical and sub-tropical climate. It withstands high temperature (for example, up to 36 deg. C) and light frosts. For best growth it requires full sun.
Altitude : It is generally found at altitude below 1,300 m.
Rainfall : The tree grows well where annual rainfall is as high as 1,000 mm, but its greatest potential is in dry area receiving as little as 200 mm annually and having dry seasons as long as 9 months.
Soil : This species occurs naturally in poor, gravelly, or sandy alluveal soil in desert grassland and canyon. It tolerates saline site, but grows poorly in soils subject to water-logging.

e. Site requirements(I): Poor gravelly or sandy-soils. Moderately sald-tolerant. Is not water-log. Grows under 200-1,000 mm of precipitation. Survives light frost.

(5) Distribution in Kenya : Widely planted in poor or sandy soil at lower altitudes(A). Well established in drier places in Kenya already(B).
(6) Soil characteristics : Sand and loam in soil texture, alkaline (pH > 7.5) in reaction, well drained in drainage, salinity(D).
(7) Shade tolerance : Shade intolerant, in shaded sites, its growth is retarded(G).
(8) Mature tree's height : 6 m. Growing to 10 m(G).
(9) Mature tree's diameter : Up to 40 cm (G).
(10) Utilization : Fuelwood/charcoal, ornamental, local medicine, bee-forage, live-fencing, mulching, hedgerow, fodder(D).
(11) Others : Nitrogen-fixation, drought resistant.

2 Seed

(1) Month of flowering :
(2) Month of collection : March to October in Kibwezi, Tiva.
(3) Method of collection : To collect pods under a tree, or fall tham on the ground by rocking or hitting by pole then collect.
(4) Method of preparation : After dry pods, then put them into a sack and hit by a pole.
(5) Method of storage : Seeds remain viable in storage for long periods(B).
(6) Number of seeds per pod :
(7) Number of seeds per Kg. or 1. : 7,500 - 13,000 seeds/kg.(D)
(8) Usual germination rate : 30 - 70%(D).
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment: Immerse in boiling for 3 minutes, allow to cool, soak in cool/tepid water for 36 hours(D)(I).

(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : April to June
(4) Growing speed in the nursery : Fast
(5) Note for watering : Care should be taken not to over-water as damping off is problem(B).
(6) Note for other things : Roots must be cut back(I).
Root and shoot cuttings and air-layers have been successfully tried(I).

Plantation

(1) Site condition :

(2) Land Preparation : (i) In 1987, total clearing, but not cut down useful trees more than 5cm in D.B.H
(ii) In 1988, 1m width slashing and 2m remaining, the same as in (i) for useful trees.
(iii) In 1989, 2m width slashing and 1m remaining, the same as in (i) for useful trees.

(3) Number of seedlings per ha : (i) In 1987, 1,000 seedlings/ha planted.
(ii) In 1988, 1,000 seedlings/ha planted.
(iii) In 1989, 830 seedlings/ha planted.

(4) Size of planting hole : (i) In 1987, 45cm x 45cm
(ii) In 1988, 45cm x 45cm
(iii) In 1989, 65cm x 65cm.

(5) Weeding : Weeding is very important, at least 2 times per year, if possible 3 times.

(6) Damage : Young plants are damaged by termites(G).

(7) Growing speed : Fast.

(8) Management : Pollading is available(D).

(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate				Height	
			Jul.89	Nov.89	Oct.90	Oct.91	Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1987		1.98						
1988	II-F-1	3.00	70.5	27.0	-	-	-	-
1989	E-1-3(L)	0.54			20.0	5.0	24	68

Note (L): Hole size is 65cm x 65cm

(10) Some data from extension

(11) Others

Card No.35

Species: Prosopis juliflora

Cf. A:, B:108, C:197, D:75, 145, 222, E:-, F:-, G:152, H:-, I:357

1 Basic data

(1) Family name : Mimosoaceae
(2) Vernacular name : -
(3) Origin : South-western U.S. and Mexico(B).
(4) Climatic condition
a. Preferred climatic type(B) : No data
b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature	
		Dry months	No. of DP	Mean	Lowest Highest
Sub-humid	600-1500	4-8	1		>18
Semi-arid, hot	250- 600	8-10	1 or 2	>18	
Arid, hot desert	<250	11-12	1	>18	
Arid,warm to cold	<250	11-12	1	18	

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry period per year

c. Preferable ecological zone (H) : No data
d. Environmental requirements(G) :

Temperature : This species grows in very warm, dry climates. Some varieties are not frost hardy.

Altitude : The tree is found growing from sea level to 1,500 m. The plant's roots penetrate to great depths in search of soil moisture.

Soil : The tree grows on variety of soils. It does well on sandy soil and will grown on rocky terrain provided that root growth is not impeded.

e. Site requirements(I): Suitable for dry sites because of deep rooting habit. Tolerates extreme head; 150 - 700mm precipitation, 0 - 1,500m altitude. Sandy and rocky soils as long as root-growth is not impeded by crusts. Not on insufficiently drained sites; very suitable for dunes; tolerates salt and nutrient - poor soils.

(5) Distribution in Kenya : This species is widely planted in Kenya from the coast to Turkana(B).
(6) Soil characteristics : Sandy soil, neutral(pH 6.5 - 7.5) or alkaline (pH > 7.5) in reaction, seasonal or permanent water logging in drainage(D).
(7) Shade tolerance : Very weak for shade
(8) Mature tree's height : This tree may grow to 10 m more, depending on the variety and site(G).
(9) Mature tree's diameter :

(10) Utilization : Fodder, bee-forage, carvings/turnery, fuelwood/charcoal, poles/posts and timber(D).

(11) Others : Nitrogen-fixation(D).
Special care is required concerning the provenance of seed(I). There is a risk of uncontrolled spread(I).
Direct seeding is recommended, but requires weeding.

2 Seed

(1) Month of flowering : August in Kyuso.
(2) Month of collection : February in Kyuso.
(3) Method of collection : To collect pods under a tree, or fall them on the ground by rocking or hitting by a pole then collect them.
(4) Method of preparation :
(5) Method of storage :
(6) Number of seeds per pod :
(7) Number of seeds per Kg. or 1. : 8,000 - 30,000 seeds/kg.(D)
(8) Usual germination rate : 40 - 80%(D).
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment: Soak in cold/tepid water for 48 hours, or immerse in boiling water, allow to cool.(D) The seeds must be mechanically scarified and either treated with 20% sulfuric acid for 1 hour, or soaked in concentrated sulfiric acid for about 20 minutes, or covered with boiling water and allowed to cool and soak for 24 hours(G).

(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : March to May
(4) Growing speed in the nursery : Fast
(5) Note for watering : Avoid too much watering.
(6) Note for other things : Cutting (2 years old plant) available(I).

4 Plantation

(1) Site condition :
(2) Land Preparation : (i) In 1986, total clearing, but not cut down useful trees more than 5cm in D.B.H
(ii) In 1987, total clearing, the same as in (i) for useful trees.
(iii) In 1988, strip clearing, 1m width slashing and 2m remaining, the same as in (i) for useful trees.

(iv) In 1989, strip clearing, 1m width slashing and 2m remaining, the same as in (i) for useful trees.

(3) Number of seedlings per ha : (i) In 1986, 1,000 seedlings/ha planted.
(ii) In 1987, 1,000 seedlings/ha planted.
(iii) In 1988, 1,000 seedlings/ha planted.
(iv) In 1989, 830 seedlings/ha planted.

(4) Size of planting hole : (i) In 1986, 45cm x 45cm.
(ii) In 1987, 45cm x 54cm.
(iii) In 1988, 45cm x 45cm.
(iv) In 1989, partly 65cm x 65cm.

(5) Weeding : Weeding is very important, at least 2 times per year, if possible 3 times.

(6) Damage :

(7) Growing speed : Fast

(8) Management : Possible of coppicing, lopping, pollarding and pruning(D).

(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate Jul.89	Nov.89	Oct.90	Oct.91	Height Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1986		0.83*						
1987		0.42						
		2.51	68.0	-	39.0	33.5	167	233
Sub-total		2.93						
1988	I-J-3	1.42	74.0	31.0	16.5	-	22	-
	I-M	3.27	86.0	63.0	50.0	29.5	46	60
	II-E-2	3.76	89.5	71.0	67.5	56.5	92	114
	II-H-1	3.85	82.5	65.5	44.5	35.0	39	41
Sub-total		12.30						
1989	A-1-4(L)	0.80			18.0	10.0	28	41
	B-2-4	0.47			39.0	8.0	8	26
	B-3-4(SW)	0.14			53.3	4.7	11	7
	D-4-5(SW)	0.45			36.1	2.6	9	16
	F-2-2(Tr)	0.39			61.0	45.0	46	86
	F-4-4(S)	0.05			38.1	13.0	7	40
Sub-total		2.30						

* Note: According to survey on March 1990, 273 trees in 0.54Ha are surviving, average height is 173 cm, average base diameter is 3 cm.
:(L): hole size is 65cm x 65cm; (S): hole size is 25 x 25cm;
(SW): Spotweeding; (Tr): Turkana method.

(10) Some data from extension

(11) Others
Taxonomy of the genus Prosopis is confused. The name juliflora has been used in the past to describe species native to Texas and nearby states. These are now known as P. glandulase and

P. velutina. Plants that were distributed around the world under the name P. juliflora are probably mislabeled in many cases(G). There are many closely related prosopis species, such as P. chilensis, P. glandulosa and P. velutina, which have also been introduced into the semi-arid area of Africa and are now occasionally taken as P. juliflora. They have, however, slightly differing sight requirements and their use potential may be different. The species P. juliflora in itself has a great number of forms and varieties(I).

Card No.36

Species: Schinus molle

Cf. A:7, B:-, C:-, D:82, 229, E:-, F:-, G:-, H:8, I:-

1 Basic data

(1) Family name : Anacardiaceae
(2) Vernacular name : Pepper tree(English)
(3) Origin : Peru, Andes
(4) Climatic condition
a. Preferred climatic type(B) : No data.
b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature	
		Dry months	No. of DP	Mean	Lowest	Highest
Semi-arid, hot	250-600	8-10	1 or 2	>18		
Semi-arid, warm to cold	250-600	8-10	1 or 2	<18		
Arid, warm to cold	<250	11-12	1	<18		
Highland sub-humid	500-1200	2-6	1		-3<t<18	>10

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry period per year

c. Preferable ecological zone (H) :

Eco-Zone	Rainfall(mm)	Altitude(m)	Soil type	Rotation
III Highland	800-1,400	1,500-3,000	Variable red to cotton loamy soils	Short (10-20 yrs)

d. Environmental requirements(G) : No data
e. Site requirements(I) : No data

(5) Distribution in Kenya : Commonly planted in dry, warm climates in many parts of the world as well as most districts of Kenya(A).
(6) Soil characteristics : Very tolerant of most soils, including both black cotton and dry sandy soil(A).
(7) Shade tolerance :
(8) Mature tree's height : 10 - 15 m(A)
(9) Mature tree's diameter :
(10) Utilization : Cosmetic/hyginic, ornamental, gum, fuelwood/charcoal, bee-forage, food-spice, live fencing, shade and shelter, fence posts(D).
(11) Others : Extremely drough-resistant once established and reaching maturity in less than 20 years(A).

2 Seed

(1) Month of flowering :
(2) Month of collection :

(3) Method of collection :
(4) Method of preparation :
(5) Method of storage :
(6) Number of seeds per fruit:
(7) Number of seeds per Kg. or 1. : 14,000 - 44,000 seeds/kg.(D)
(8) Usual germination rate :
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment:
(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : June to July
(4) Growing speed in the nursery : Fast growing(A)
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : In 1988, strip clearing, 1m width slashing and 2m remaining, but not cut down useful trees more than 5cm in D.B.H.
(3) Number of seedlings per ha : In 1988, 1,000 seedlings/ha planted.
(4) Size of planting hole : In 1988, 45cm x 45cm
(5) Weeding : Weeding is very important, at least 2 times per year.
(6) Damage :
(7) Growing speed : Fast(A).
(8) Management :
(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate Jul.89	Nov.89	Oct.90	Oct.91	Height Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1988	I-G	0.98	61.0	8.5				

(10) Some data from extension

(11) Others

Card No.37

Species: Sesbania grandiflora

Cf. A:-, B:-, C:201, D:83, 147, 231, E:-, F:-, G:62, H:-, I:-

1 Basic data

(1) Family name : Papilionaceae
(2) Vernacular name : -
(3) Origin : Tropical Asia
(4) Climatic condition
a. Preferred climatic type(B) : No data
b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature	
		Dry months	No. of DP	Mean	Lowest	Highest
Permanently humid	>1500	-	None		>18	
Monsoonal	>1500	<4	1		>18	
Sub-humid	600-1500	4-8	1		>18	
Semi-arid	250- 600	8-10	1 or 2			

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry period per year

c. Preferable ecological zone (H) : No data
d. Environmental requirements(G) :
Temperature : The tree is frost sensitive and is adapted only to tropical conditions.
Altitude : Grows up to 800 m above sea level.
Rainfall : This species grows best where annual rainfall exceeds 1,000 mm and there are only a few months of dry season. It is widely grown in areas where there is extensive irrigation or flooding, such as in Asian rice paddies. On the other hand, the species grows abundantly on semi-arid Tomor Island of Indonesia.
Soil : The species is able to grow in wide range of soils, even poor ones, including black, poorly structured clay. Its extraordinary nodulation undoubtedly helps restore fertility to those soils. This, coupled with its rapid growth suggests that its soil improvement qualities - though unmeasured - may be exceptional.
e. Site requirements(I): No data

(5) Distribution in Kenya :
(6) Soil Characteristics : Sand, loam in soil texture, acid(pH < 6.5), neutral(pH: 6.5 - 7.5), in reaction, seasonal logging in drainage(D).
(7) Shade tolerance :
(8) Mature tree's height : 10 m(C)
(9) Mature tree's diameter :
(10) Utilization : Pulpwood, fodder, food (flower, leaves, young pods), ornamental, fuelwood/ charcoal, short fibre pulp, green manure, gum, tannins(D).

(11) Others : Nitrogen-fixation.

2 Seed

(1) Month of flowering : April in Matinyani.
(2) Month of collection : August in Matinyani.
(3) Method of collection : To collect pods, or fall them on the ground by rocking or hitting by pole then collect, or go up a tree and take pods.
(4) Method of preparation : After drying the pods, then put them into a sack and hit by a pole.
(5) Method of storage :
(6) Number of seeds per pod :
(7) Number of seeds per kg. or 1. : 17,000 - 20,000 seeds/kg.(D)
(8) Usual germination rate : 85 - 90%(D)
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment:
(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : May to August
(4) Growing speed in the nursery : Fast.
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation :
(3) Number of seedlings per ha :
(4) Size of planting hole :
(5) Weeding :
(6) Damage :
(7) Growing speed : Fast(C).
(8) Management : Coppicing and lopping are available(D).
(9) Some data from forestation site: Not planted in the Pilot Forest.

(10) Some data from extension

(11) Others

Card No.38

Species: Sesbania sesban

Cf. A:225, B:111, C:-, D:83, 147, 231, E:142, F:130, G:-. H:6, 8, I:-

1 Basic data

(1) Family name : Paiplionaceae
(2) Vernacular name : Mwethia(Kikuyu), Munyongo(Kamba) Sesbania, River beans(English)(A, B).
(3) Origin : Indigenous
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
I, 3-4	Kakamega	1100-1700	1200-2000	18-22	1200-1850
II, 1	Ramisi	1000-1600	1300-2100	24-30	0- 900
II, 2-3	Migori	1000-1600	1300-2100	20-24	900-1800
II, 4	Limuru(part)	1000-1600	1300-2100	18-20	1500-1850
III, 1	Kwale	800-1400	1450-2200	24-30	0- 900
III, 2-3	Kisumu/Murang'a	800-1400	1450-2200	20-24	900-1800
III, 4-5	Nairobi	800-1400	1450-2200	16-20	1500-2150
IV, 1	Lamu	600-1100	1550-2200	24-30	0- 900
IV, 2-3	Lake Victoria/Thika	600-1100	1550-2200	20-24	900-1800
IV, 4	Rumuruti/Narok(part)	600-1100	1550-2200	18-20	1500-1850

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg,C)
Alt. Altitude, m

b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature	
		Dry months	No. of DP	Mean Lowest	Highest
Permanently humid	>1500	-	None	>18	
Highland subhumid	500-1200	2-6	1	-3<t<18	>10

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry period per year

c. Preferable ecological zone (H) :

Eco-Zone	Rainfall(mm)	Altitude(m)	Soil type	Rotation
II	Over 1,400	1,400-2,500	Variable soils	Short (2-3yrs)
III Highland	800-1,400	1,400-2,500	Variable soils	Short (2-3yrs)

d. Environmental requirements(G) : No data
e. Site requirements(I) : No data

(5) Distribution in Kenya : Widely distributed from 1,300 to 2,000 m, often along rivers or in swampy ground(A).

(6) Soil characteristics : Loam, clay in soil texture, acid(pH<6.5) neutral(pH: 6.5 - 7.5) in reaction,

seasonal logging, well drained in drainage, salinity(D).

(7) Shade tolerance :
(8) Mature tree's height : 8 m near water(A)
(9) Mature tree's diameter :
(10) Utilization : Fodder, fuelwood/charcoal, fibres, medicinal, support(D).
Used as a medicine for increasing milk in cows. The leaves are made into paste, and diluted with water, and the cow is forced to take this mixture a few days after delivery. For treatment of swollen parts of the body, grind up the leaves, and apply. Ground leaves are used for stomach trouble(E).
(11) Others : Nitrogen-fixation.
This species is one of a few Kenyan trees already being used as an agro-forestry tree(B).

2 Seed

(1) Month of flowering : May in Tiva
(2) Month of collection : October in Tiva
(3) Method of collection : To stand on the ladder or something like that, then drow the branch carefully by stock with hook and take pods.
(4) Method of preparation : Damaged seed is often found in the pod, necessitating sorting and cleaning(B).
(5) Method of storage : When kept dry and cool, the seed has long viability(B).
(6) Number of seeds per pod :
(7) Number of seeds per Kg. or 1. :
(8) Usual germination rate :
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment:
(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : July to August
(4) Growing speed in the nursery : Fast.
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : In 1987, total clearing, but not cut down useful trees more than 5cm in D.B.H.

(3) Number of seedlings per ha : In 1987, 1,000 seedlings/ha planted.

(4) Size of planting hole : In 1987, 45cm x 45cm

(5) Weeding : Weeding is very important, at least 2 times per year.

(6) Damage :

(7) Growing speed : Very fast growing(A,B)

(8) Management : Coppicing, lopping and pollading are available(D).
Because of its quick germination and fast growth it is best to plant this species directly in the field rather than in a nursery(B).

(9) Some data from forestation site

Planted year	Compart. Areas	Survival rate				Height	
		Jul.89	Nov.89	Oct.90	Oct.91	Oct.90	Oct.91
	ha	%	%	%	%	cm	cm
1987	1.55			-	-	-	-

(10) Some data from extension

(11) Others

Card No.39

Species: Tamarindus indica

Cf. A:63, B:112, C:203, D:85, 148, 234, E:123, F:-, G:-, H:12, I:383

1 Basic data

(1) Family name : Caesalpinaceae
(2) Vernacular name : Muthithi(Meru), Kithamula(Kamba), Mkwaju(Swahili), Tamarind(English).
(3) Origin : Indigenous, Madagascar, East Africa(I).
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
III, 1	Kwale	800-1400	1450-2200	24-30	0- 900
III, 2-3	Kisumu/Murang'a	800-1400	1450-2200	20-24	900-1800
IV, 1	Lamu	600-1100	1550-2200	24-30	0- 900
IV, 2-3	Lake Victoria/Thika	600-1100	1550-2200	20-24	900-1800
V, 1-2	Taveta/Isiolo	450- 900	1650-2300	22-30	0-1200
V, 3	Kajiado(part)	450- 900	1650-2300	20-22	1200-1800
VI, 1-2	Magadi/Garba Tula	300- 550	1900-2400	22-30	0-1200
VI, 3	Kirimun(part)	300- 550	1900-2400	20-22	1200-1800
VII, 1-2	Wajir	150- 350	2100-2500	22-30	0-1200

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) :

Zone	Prec.	Dry period		Temperature	
		Dry months	No. of DP	Mean	Lowest	Highest
Mosoonal	>1500	<4	1		>18	
Sub-humid	600-1500	4-8	1		>18	
Semi-arid, hot	250- 600	8-10	1 or 2	>18		
Semi-arid, warm to cold	250- 600	8-10	1 or 2	18		
Humid sub-tropics	>1200	-	None		-3<t<18	>22
Temperate maritime	>1200	-	None		-3<t<18	10-22

Note; Prec. Average annual rainfall, mm
Dry months: Total number of dry months (<50 mm) per year
No of DP : Number of dry period per year

c. Preferable ecological zone (H) :

Eco-Zone	Rainfall(mm)	Altitude(m)	Soil type	Rotation
IV	400-800	1,000-1,400	Sandy to sandy-clay soils to riverine clay/sandy soils.	Short

d. Environmental requirements(G): No data

e. Site requirements(I): The wide distribution of Tamarindus shows that it is a very adaptable species. Grows preferably in semi-arid regions (with approximately 400 mm annual precipitation), but also in the monsoon region with more than 1,500 mm. No particular soil requirements, but has preference for deep alluvial soils. A slight salinity is tolerated. pH should be about 5.5 (I).

(5) Distribution in Kenya : Widely distributed in drier grassland from coast to 1,500 m(A).

(6) Soil Characteristics : Loam to sand in soil texture, acid(pH < 6.5) in reaction, well drained in drainage(D).

(7) Shade tolerance : Tolerance.

(8) Mature tree's height : 25m.

(9) Mature tree's diameter :

(10) Utilization : Very valuable tree of the drier regions(B), used for fuelwood/charcoal, industrial timber, poles, shade/ ornamental, food fruits.

(11) Others : Develops long and deep roots(A).

2 Seed

(1) Month of flowering : January in Kitui East and Zombe.

(2) Month of collection : August in Kitui East and Zombe.

(3) Method of collection : To collect, fruits, or fall them on the ground by rocking or hitting a pole then collect, or go up to a tree and take fruits.

(4) Method of preparation : Put fruits into a vessel with water and sand, wash with hand, then wash seeds with water and dry in shadow for one week.

(5) Method of storage : They store well, remaining viable for more than two years if protected from insect attack(B).
Keep in (a tin with charcoal) a cotton sack in dark room or well heated place.

(6) Number of seeds per pod :

(7) Number of seeds per Kg. or 1. : 700 - 2600 seeds/kg.(D), 3,000 seeds/kg.(D).

(8) Usual germination rate : 30 - 70%(D), 90%(B)

(9) Provenance :

(10) Others :

3 Seedling

(1) Applied seed pretreatment: Soak in cold/tepid water for 24 hours or 48 hours, soak in hot water for 24 hours.(D)

(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : February to March
(4) Growing speed in the nursery : Slow
(5) Note for watering : Avoid too much watering.
(6) Note for other things : As soon as the cotyledons break through, planst must be shaded until they reach a hight of 35cm. Seedlings should attain at least 80cm before being transplanted to their final location at the beginning of the rainy season(I).

4 Plantation

(1) Site condition :
(2) Land Preparation : (i) In 1986, total clearing, but not cut down useful trees more than 5cm in D.B.H
(ii) In 1987, total clearing, the same as in (i) for useful trees.
(iii) In 1988, strip clearing, 1m width slashing and 2m remaining, the same as in (i) for useful trees.
(iv) In 1989, strip clearing, 2m width slashing and 1m remaining, the same as in (i) for useful trees.
(3) Number of seedlings per ha : (i) In 1986, 1,000 seedlings/ha planted.
(ii) In 1987, 1,000 seedlings/ha planted.
(iii) In 1988, 1,000 seedlings/ha planted.
(iv) In 1989, 830 seedlings/ha planted.
(4) Size of planting hole : (i) In 1986, 45cm x 45cm.
(ii) In 1987, 45cm x 45cm.
(iii) In 1988, 45cm x 45cm.
(iv) In 1989, partly 65cm x 65cm.
(5) Weeding : Weeding is required.
2 times per year.
(6) Damage :
(7) Growing speed : Very slow.
(8) Management : Possible of coppicing(D).

(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate Jul. 89	Nov. 89	Oct. 90	Oct. 91	Height Oct. 90	Oct. 91
		ha	%	%	%	%	cm	cm
1986		0.91*						
1987		0.88	-					
		5.12	40.5	-	18.0	-	20	-
Sub-total		6.00						
1988	I-E-2	3.92	84.5	65.0	48.5	46.5	15	27
	I-H	2.05	80.0	52.0	36.5	16.0	13	18
	I-K	0.92	89.0	73.0	50.5	52.0	12	18
	II-A	4.99	82.5	55.5	61.5	57.5	13	14
	II-H-3	1.02	88.5	64.5	69.5	73.0	21	21
	II-H-4	2.75	94.5	79.5	83.5	80.0	23	24
Sub-total		15.66	(86.0)	(65.4)				
1989	A-1-5(L)	0.30			79.0	61.0	251	14
	B-2-5	0.69			69.0	27.0	12	13
	B-3-5(SW)	0.09			95.4	91.7	17	19
	D-4-1(SW)	0.27			85.9	48.9	15	17
	E-2-1(L)	0.71			93.5	79.0	20	25
	F-4-5(S)	0.05			71.0	40.0	17	22
Sub-total		2.11						

* Note: According to the survey on March 1990, 330 trees in 0.63 ha are surviving, average height is 102cm and average base diameter is 2.4cm.
(L): Hole size is 65cm x 65cm.
(S): Hole size is 25cm x 25cm. (SW): Spotweeding.

(10) Some data from extension

(11) Others : When establishing pure plantation, spacing should be at least 13m x 13m(I).

Card No.40

Species: Terminalia brownii

Cf. A:79, B:114, C:-, D:87, 235, E:57, F:-, G:-, H:10, I:-

1 Basic data

(1) Family name : Combretaceae
(2) Vernacular name : Muhutu, Muuku(Kamba), Manera, Onera(Luo), Mbarao(Swahili).
(3) Origin : Indigenous
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
III, 1	Kwale	800-1400	1450-2200	24-30	0- 900
III, 2-3	Kisumu/Murang'a	800-1400	1450-2200	20-24	900-1800
IV, 1	Lamu	600-1100	1550-2200	24-30	0- 900
IV, 2-3	Lake Victoria/Thika	600-1100	1550-2200	20-24	900-1800
V, 1-2	Taveta/Isiolo	450- 900	1650-2300	22-30	0-1200
V, 3	Kajiado(part)	450- 900	1650-2300	20-22	1200-1800
VI, 1-2	Magadi/Garba Tula	300- 550	1900-2400	22-30	0-1200
VI, 3	Kirimun(part)	300- 550	1900-2400	20-22	1200-1800

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) : No data

c. Preferable ecological zone (H) :

Eco-Zone	Rainfall(mm)	Altitude(m)	Soil type	Rotation
III Lowland	800-1,400	0-1,400	Sandy to sandy/clay soils.	Short

d. Environmental requirements(G) : No data
e. Site requirements(I) : No data

(5) Distribution in Kenya : Widely distributed in drier wooded savannah from 700 to 2,000 m, often near rivers in very dry areas, also planted in Nairobi city as a shade tree(A).
(6) Soil Characteristics :
(7) Shade tolerance :
(8) Mature tree's height : Usually 4 to 5 m in height but occasionally reach 25 m(A).
(9) Mature tree's diameter :
(10) Utilization : Fuelwood/charcoal, fodder, wood for conversion into various products(D). The phloem are chewed and solution swallowed in the treatment of yellow fever particularly in children.
(11) Others : This species is both drought and termite-resistant(A).

2 Seed

(1) Month of flowering : January in Kitui
(2) Month of collection : April in Kitui
(3) Method of collection : To collect, fruits are fallen on the ground by rocking or hitting by a pole then collected, or go up to a tree and take fruits.
(4) Method of preparation : Dry seeds.
(5) Method of storage : Keep seeds into plastic bags then keep in a dark place.
The seeds stay indefinitely, and care should be taken to inspect all seeds for insect damage(B).
(6) Number of seeds per fruit:
(7) Number of seeds per kg. or 1. : 6,340 seeds/kg.(D)
(8) Usual germination rate : 30%(D), but at Tiva Nursery, germination rate is very low.
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment: None pretreatment.
(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : December to February
(4) Growing speed in the nursery : Slow
(5) Note for watering : Avoid too much watering.
(6) Note for other things : Germination is difficult(B).

4 Plantation

(1) Site condition :
(2) Land Preparation : In 1989, strip clearing 2 m width slashing and 1m remaining but not cut down useful trees more than 5 cm in D.B.H.
(3) Number of seedlings per ha : In 1989, 830 seedlings/ha planted.
(4) Size of planting hole : In 1989, 65cm x 65cm
(5) Weeding : Weeding is very important, at least 2 times per year.
(6) Damage :
(7) Growing speed : Slow growth unless irrigated(B).
(8) Management : Ropping is available.
(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate			Height	
			Jul.89	Nov.89	Nov.90	Oct.91	Nov.90	Oct.91
		ha	%	%	%	%	cm	cm
1989(L)	D-6-1	0.69			95.0	95.0	30	38

Note (L) : Hole size is 65cm x 65cm.

(10) Some data from extension: The farmers in Kwa-vonza Location like this tree for pole, bee-hive, fodder and shades.

(11) Others

Card No.41

Species: Terminalia catappa

Cf. A:79, B:-, C:366, D:87, E:-, F:-, G:66, H:-, I:-

1 Basic data

(1) Family name : Combretaceae
(2) Vernacular name : Mkungu(Swahili), Indian almond, Bastardalmon(English).
(3) Origin : Andaman Island, India, Madagascar.
(4) Climatic condition
a. Preferred climatic type(B) : No data
b. Climate adaptability(D) : No data
c. Preferable ecological zone (H) : No data
d. Environmental requirements(G) :
Temperature : This species is strictly a tropical species, thriving in humid climate.
Altitude : It grows best at low altitudes.
Rainfall : The tree needs at least 1,000 mm of annual rainfall unless the water table is high enough for its roots to penetrate.
Soil : This species is not particular as to soil; for example, though it grows well in sand or shingle, it also thrives in marl and permeable siliceous limestone.
e. Site requirements(I): No data

(5) Distribution in Kenya : Widely planted at the coast, also up-country districts such as Voi, Nairobi and Kisumu(A).
(6) Soil Characteristics : Preferring sandy soil and tolerating salt(A).
(7) Shade tolerance :
(8) Mature tree's height : 15 to 20 m(A, C).
(9) Mature tree's diameter :
(10) Utilization : Timber, furniture, tool, oil, tannin, ornamental, medicinal(C).
(11) Others : The tree develops an extensive root system(A).

2 Seed

(1) Month of flowering :
(2) Month of collection :
(3) Method of collection :
(4) Method of preparation :
(5) Method of storage :
(6) Number of seeds per pod :
(7) Number of seeds per kg. or 1. : 150 - 860 seeds/kg.(D)
(8) Usual germination rate : 30 - 70%(D)
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment: Soak in cold/tepid water for 48 hours(D).

(2) Types of seedling
  a. Pot seedling : Operational
  b. Stump : Not examined
  c. Bare root : Not examined

(3) Sowing month at Tiva Nursery :

(4) Growing speed in the nursery :

(5) Note for watering : Avoid too much watering.

(6) Note for other things :

4 Plantation

(1) Site condition :

(2) Land Preparation : In 1989, strip clearing 2m width slashing and 1m remaining, but not cut down useful trees more than 5cm in D.B.H.

(3) Number of seedlings per ha : In 1989, 830 seedlings/ha planted.

(4) Size of planting hole : In 1989, 65cm x 65cm.

(5) Weeding :

(6) Damage :

(7) Growing speed : Fast growing(A).

(8) Management :

(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate			Height	
			Jul.89	Nov.89	Nov.90	Oct.91	Nov.90	Oct.91
		ha	%	%	%	%	cm	cm
1989(L)	D-1-1	0.33			28.5	-	22	-

Note (L): Hote size is 65cm x 65cm.

(10) Some data from extension

(11) Others

Card No.42

Species: Terminalia mentalis

Cf. A:81, B:-, C:-, D:-, E:-, F:-, G:-, H:-, I:-

1 Basic data

(1) Family name : Combretaceae
(2) Vernacular name :
(3) Origin : Madagascar
(4) Climatic condition
a. Preferred climatic type(B) : No data
b. Climate adaptability(D) : No data
c. Preferable ecological zone (H) : No data
d. Environmental requirements(G) : No data
e. Site requirements(I) : No data

(5) Distribution in Kenya : This species is widely planted as a street and shade tree around and in Nairobi and down as far as the coast(A).
(6) Soil Characteristics :
(7) Shade tolerance :
(8) Mature tree's height : 10 m(A).
(9) Mature tree's diameter :
(10) Utilization : Ornamental
(11) Others : Drought-resistant once established(A).

2 Seed

(1) Month of flowering : January in Kitui East and Zombe.
(2) Month of collection : May in Kitui and Zombe.
(3) Method of collection :
(4) Method of preparation :
(5) Method of storage :
(6) Number of seeds per fruit:
(7) Number of seeds per Kg. or 1. :
(8) Usual germination rate :
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment:
(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : February to March
(4) Growing speed in the nursery :
(5) Note for watering : Avoid too to much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : In 1988, strip clearing 1m width slashing and 2m remaining, but not cut down useful trees more than 5cm in D.B.H
(3) Number of seedlings per ha : In 1988, 1,000 seedlings/ha planted.
(4) Size of planting hole : In 1988, 45cm x 45cm.
(5) Weeding :
(6) Damage :
(7) Growing speed : Very slow but it is said to be very fast in good soil condition(A).
(8) Management :
(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate				Height	
			Jul.89	Nov.89	Oct.90	Oct.91	Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1988	I-F	1.05	87.5	82.5	74.5	70.5	19	22

(10) Some data from extension
This species is preferred by farmers as ornamental tree.

(11) Others

Card No.43

Species: Terminalia prunioides

Cf. A:81, B:115, C:-, D:236, E:-, F:-, G:, H:-, I:-

1 Basic data

(1) Family name : Combretaceae
(2) Vernacular name : Mwagati(Swahili), Mutau(Kamba), Purple-pod terminalia(English)(B).
(3) Origin : Indigenous
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
IV, 1	Lamu	600-1100	1550-2200	24-30	0- 900
IV, 2	Lake Victoria/Thika(part)	600-1100	1550-2200	22-24	900-1200
V, 1-2	Taveta/Isiolo	450- 900	1650-2300	22-30	0-1200
VI, 1-2	Magadi/Garba Tula	330- 550	1900-2400	22-30	0-1200

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) : No data
c. Preferable ecological zone (H) : No data
d. Environmental requirements(G) : No data
e. Site requirements(I) : No data

(5) Distribution in Kenya : Occurring in coastal forest and dry acacia bushland in the Taita, Tana and Lamu districts from 30 m to 1,400 m(A).
(6) Plantable soil :
(7) Shade tolerance :
(8) Mature tree's height : Usually 3 m, occasionally to 10 m.
(9) Mature tree's diameter :
(10) Utilization : Timber, posts, fuelwood, ornamental(D).
(11) Others :

2 Seed

(1) Month of flowering : January in Kitui East and Zombe.
(2) Month of collection : May in Kitui East and Zombe.
(3) Method of collection :
(4) Method of preparation :
(5) Method of storage :
(6) Number of seeds per fruit:
(7) Number of seeds per Kg. or 1. :
(8) Usual germination rate :
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment:

(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : December.
(4) Growing speed in the nursery : Slow.
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : In 1988, strip clearing 1m width slashing and 2m remaining, but not cut down useful trees more than 5cm in D.B.H.
(3) Number of seedlings per ha : In 1988, 1,000 seedlings/ha planted.
(4) Size of planting hole : In 1988, 45cm x 45cm.
(5) Weeding : Weeding is very important, at least 2 times per year.
(6) Damage :
(7) Growing speed :
(8) Management :
(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate				Height	
			Jul.89	Nov.89	Oct.90	Oct.91	Sep.90	Oct.91
		ha	%	%	%	%	cm	cm
1988	I-G	0.60	77.0	79.0	78.5	76.0	31	38

(10) Some data from extension

(11) Others

Card No.44

Species: Terminalia spinosa

Cf. A:81, B:115, C:-, D:-, E:57, F:-, G:-, H:-, I:-

1 Basic data

(1) Family name : Combretaceae
(2) Vernacular name : Mwangati(Swahili), Mutula(Kamba)
(3) Origin : Indigenous
(4) Climatic condition

a. Preferred climatic type(B) :

Zone	Climatic type	Prec.	Evap.	Temp.	Alt.
IV, 1	Lamu	600-1100	1550-2200	24-30	0- 900
IV, 2	Lake Victoria/Thika(part)	600-1100	1550-2200	22-24	900-1200
V, 1-2	Taveta/Isiolo	450- 900	1650-2300	22-30	0-1200
VI, 1-2	Magadi/Garba Tula	300- 550	1900-2400	22-30	0-1200
VII, 1-2	Wajir	150- 350	2100-2500	22-30	0-1200

Note; Prec. Average annual rain fall, mm
Evap. Average annual potential evaporation, mm
Temp. Mean annual temperature, (deg.C)
Alt. Altitude, m

b. Climate adaptability(D) : No data
c. Preferable ecological zone (H) : No data
d. Environmental requirements(G) : No data
e. Site requirements(I) : No data

(5) Distribution in Kenya : This species is found in coastal forest and in very dry parts of Kenya(A). It grows in desert area and dry coastal forests. It can be found in lower Meru District(B).
(6) Soil Characteristics :
(7) Shade tolerance :
(8) Mature tree's height : Occasionally 15 m(A).
(9) Mature tree's diameter :
(10) Utilization : Timber for house building, live fence, fuelwood.
(11) Others : It's hard, heavy, dark-brown wood is almost termite-proof and very durable(B).

2 Seed

(1) Month of flowering :
(2) Month of collection :
(3) Method of collection :
(4) Method of preparation :
(5) Method of storage :
(6) Number of seeds per fruit:
(7) Number of seeds per Kg. or 1. :
(8) Usual germination rate :
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment:
(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : September to December
(4) Growing speed in the nursery : Slow
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation : In 1988, strip clearing 1m width slashing and 2m remaining, but not cut down useful trees more than 5cm in D.B.H.
(3) Number of seedlings per ha : In 1988, 1,000 seedlings/ha planted.
(4) Size of planting hole : In 1988, 45cm x 45cm.
(5) Weeding : Weeding is very important, at least 2 times per year.
(6) Damage :
(7) Growing speed :
(8) Management :
(9) Some data from forestation site

Planted year	Compart.	Areas	Survival rate			Height	
			Jul.89	Nov.89	Oct.90	Oct.91	Oct.90	Oct.91
		ha	%	%	%	%	cm	cm
1988	I-G	0.07	42.9	6.0	-	-	-	-

(10) Some data from extension

(11) Others

Card No.45

Species: Trichilia roka (T. emetica)

Cf. A:149, B:-, C:-, D:88, 237, E:-, F:-, G:-, H:-, I:-

1 Basic data

(1) Family name : Meliaceae
(2) Vernacular name : Mururi(Kikuyu)
(3) Origin : Indigenous
(4) Climatic condition
a. Preferred climatic type(B) : No data
b. Climate adaptability(D) : No data
c. Preferable ecological zone (H) : No data
d. Environmental requirements(G) : No data
e. Site requirements(I) : No data

(5) Distribution in Kenya : Widely distributed from coast to 1,850 m(A).
(6) Soil Characteristics : Preferring good soil(A).
(7) Shade tolerance :
(8) Mature tree's height : 15 m, occasionally 30 m(A).
(9) Mature tree's diameter :
(10) Utilization : Converted timber, posts, fuelwood, bee-forage, ornamental, fodder, food, medicine, wood for convertion into various products(D).
(11) Others :

2 Seed

(1) Month of flowering :
(2) Month of collection :
(3) Method of collection :
(4) Method of preparation :
(5) Method of storage :
(6) Number of seeds per fruit:
(7) Number of seeds per Kg. or 1. : 1,950 seeds/kg.(D)
(8) Usual germination rate :
(9) Provenance :
(10) Others :

3 Seedling

(1) Applied seed pretreatment: None pretreatment.
(2) Types of seedling
a. Pot seedling : Operational
b. Stump : Not examined
c. Bare root : Not examined
(3) Sowing month at Tiva Nursery : January
(4) Growing speed in the nursery :
(5) Note for watering : Avoid too much watering.
(6) Note for other things :

4 Plantation

(1) Site condition :
(2) Land Preparation :
(3) Number of seedlings per ha :
(4) Size of planting hole :
(5) Weeding :
(6) Damage :
(7) Growing speed : Fairly fast-growing in well watered sites(A).
(8) Management :
(9) Some data from forestation site : Not planted in the Pilot Forest.
(10) Some data from extension
(11) Others