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# Dukura

Agroforestry / Energy Centre  
Information bulletin No. 1

Kenya Renewable Energy Development Project

**Kenya  
Renewable  
Energy  
Development  
Project  
(KREDP)  
September  
1985**

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The Bukura Agroforestry/Energy Centre is part of the Kenya Renewable Energy Development Project (KREDP). KREDP was initiated in October 1981 as a bilateral project between the Governments of Kenya and the United States of America to address several critical national energy problems as well as to assist the Government's institutional capacity to solve these energy problems.

To achieve its objectives, the project operates several major components including:

- Agroforestry/Afforestation,
- Cookstoves and charcoal kilns,
- Energy conservation and fuel substitution, and
- Funding of small innovative projects (Energy Development Fund).

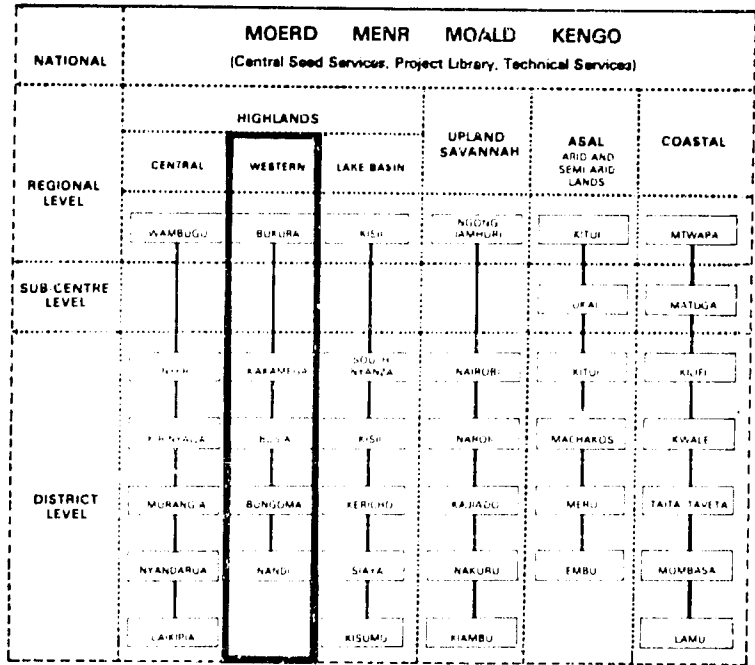
The implementation of KREDP is being administered by the Ministry of Energy and Regional Development (MOERD) in close collaboration with the following agencies:

- Ministry of Agriculture and Livestock Development (MOALD),
- Ministry of Environment and Natural Resources (MENR), and
- Kenya Energy Non-Governmental Organizations Association (KENGO).

The physical, institutional and operational bases of KREDP are the six regional Agroforestry/Energy Centres of which the Bukura Agroforestry/Energy Centre, the subject of this bulletin, is one.

KREDP is partially funded by the United States Agency for International Development (USAID). The implementation of the Project is being assisted by Energy/Development International (E/DI), a private consulting firm.

# KREDP Regional and District Programmes



*Programmes covered in this bulletin.*

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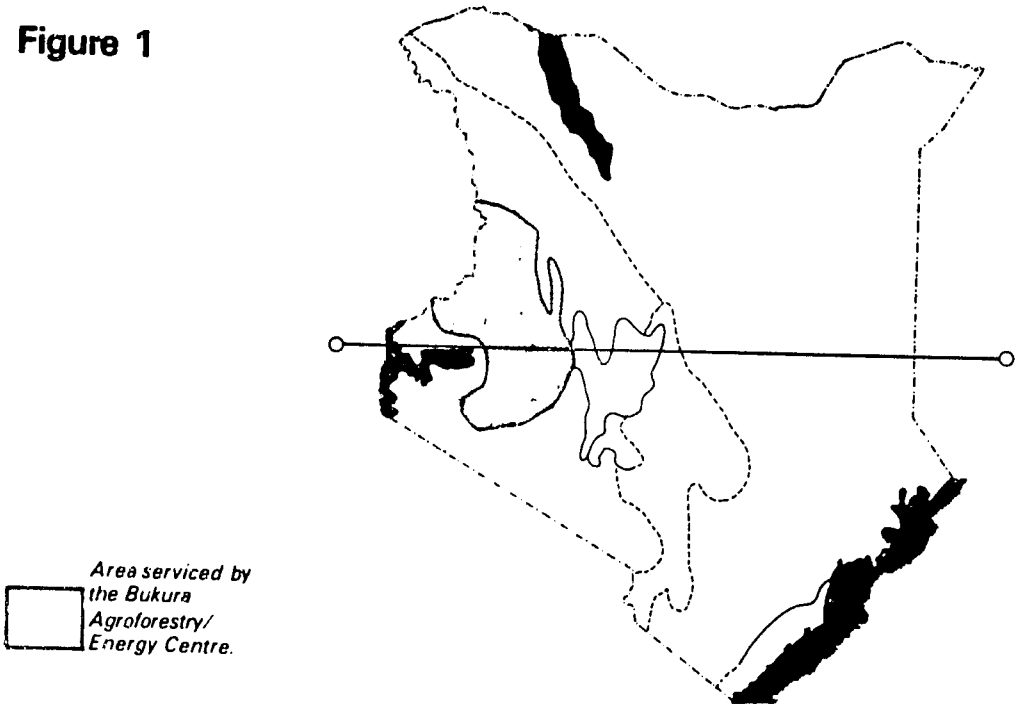
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## Location

The establishment of the Bukura Centre as one of the six regional Agroforestry/Energy Centres was initiated in October 1982. The Centre is physically housed within the Bukura Institute of Agriculture which has about 100 hectares of land. The Bukura Agroforestry/Energy Centre services the whole of Western Province which includes the Kakamega, Bungoma, Busia and Nandi Districts. In future, the Centre hopes to expand activities into Trans Nzoia and Uasin Gishu Districts.

Figure 1



## **Goals and Objectives**

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As part of the national efforts to develop renewable energy resources, the Bukura Centre serves to:

- Reduce deforestation and environmental degradation through increased tree planting efforts, particularly through the promotion of agroforestry techniques,
- Reduce demand on present national woodfuel resources through the introduction and mass dissemination of more fuel-efficient cookstoves, charcoal production techniques (kilns), biogas, and other renewable energy technologies, and
- Develop institutional infrastructures for implementing renewable energy development programmes on a long-term basis.

## **Present Programme Components**

To achieve the above stated objectives, the Centre operates the following major programmes and activities:

### **Agroforestry**

- Tree species evaluation trials,
- Tree seed collection, processing and distribution,
- Tree seedling production (Nurseries),
- Agroforestry research and demonstration, and
- Training, extension, and technical services in agroforestry and afforestation.

### **Improved Cookstoves/Kilns**

- Artisan training/stoves production and demonstration, and
- Technical assistance and extension services.

### **Biogas Technology**

- Artisan training, and
- Technical assistance and extension services.

## Cooperation and Administration

The Bukura Centre has enjoyed, and continues to enjoy, close cooperation from several GOK agencies and NGO's including:

- Forest Department (MENR),
- Bukura Institute of Agriculture (MOALD),
- District Soil Conservation Programmes (MOALD),
- Office of the President (OP),
- Kenya Energy Non-Governmental Organizations Association (KENGO),
- Kenya Woodfuel Development Project (Beijer Institute),
- Partnership for Productivity (PfP), and
- Care-Kenya.

The rapid development of the Bukura Centre has been greatly facilitated by these organizations.



*ADMINISTRATION. The Bukura Centre owes much of its success to the support given by the project administration. In this picture, Under Secretary W. Welime conducts a meeting of MOERD and MOALD field officers for Western and Nyanza Provinces. The purpose of the meeting was to plan and co-ordinate extension activities in these Provinces so that the field officers could be more effective in their duties.*

## Physical Developments Completed

The Bukura Centre has been given full access to existing training and other services of the Bukura Institute of Agriculture. This includes classes, dormitories, catering facilities, offices, stores and farm machinery. The Kenya Renewable Energy Development Project has, however, developed the following:

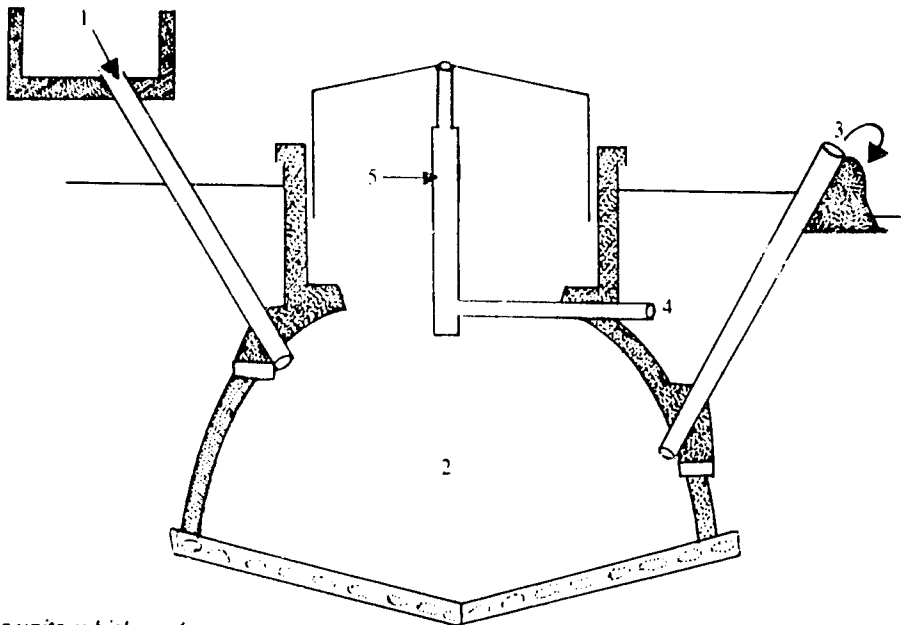
### Structures

- 1 Office/store,
- 1 Pricking-out shed,
- 1 Vehicle/implement shed,
- 1 Biogas digester demonstration room, and
- 1 Jiko production/training workshop.

### Field Programmes

- 2.6 hectare seed orchard and tree species screening trials,
- 1.0 hectare seedling production nursery, and
- 5.8 hectare agroforestry research/demonstration plots

### Schematic Drawing of the Biogas Unit Constructed at the Bukura Centre



*Biogas units, which can be built locally, provide a free fuel which can substitute for charcoal, wood or petroleum based fuels.*

1. Mixing chamber and inlet pipe.
2. Digester
3. Slurry outlet
4. Gas outlet
5. Floating drum gas-holder



## Agroforestry Programme

The agroforestry programme is comprised of the activity areas described below:

### (a) Nursery

The Centre has established and operates a 1.0 hectare nursery with a total production capacity of 1.5 million seedlings per year. The nursery is used for both production of seedlings and for teaching purposes. The current demand for seedlings, particularly *Eucalyptus* spp., *Cupressus* spp., *Pinus patula*, *Grevillea robusta* and *Markhamiapatycalex*, is very high.

Appendix 1 gives the species which are normally produced at the Centre. The Centre produces a wide range of seedlings, including species for fuelwood, timber, browse, fodder, soil conservation, soil improvement, hedges, fencing, ornamental, shade, fruits, and cash crops.

Organised groups, such as women groups and schools can obtain free seedlings. Individual farmers and the public can buy seedlings at a low cost.



**THE BUKURA AGROFORESTRY CENTRE.** The Bukura Agroforestry Centre is sited at the Bukura Institute of Agriculture and conducts programmes in seedling production, tree and seed collection, agroforestry research, improved cookstoves training, biogas training, and extension and training in agroforestry. Pictured is the centre nursery which has a capacity of 1,500,000 seedlings per year.

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## (b) Seed Orchards and Seed Services

### Seed Orchards

The seed orchard is comprised of 43 different tree species, each with 35 trees. These species are being screened based on their growth rates and performance (Appendix 2) and they will eventually serve as sources of seed. Seed is already being harvested from some of the species (Appendix 3). The planting arrangement of the seed orchards is given in Figure 2.

### Seed Services

The Centre collects seed from both indigenous and exotic species within its area of operation and forwards excess material to the Central Seed Services Unit in Nairobi. The seed is then cleaned, fumigated and bagged for distribution. The Centre also processes seed for local use. Appendix 3 lists the species for which seeds are presently (1985) available at the Bukura Centre.

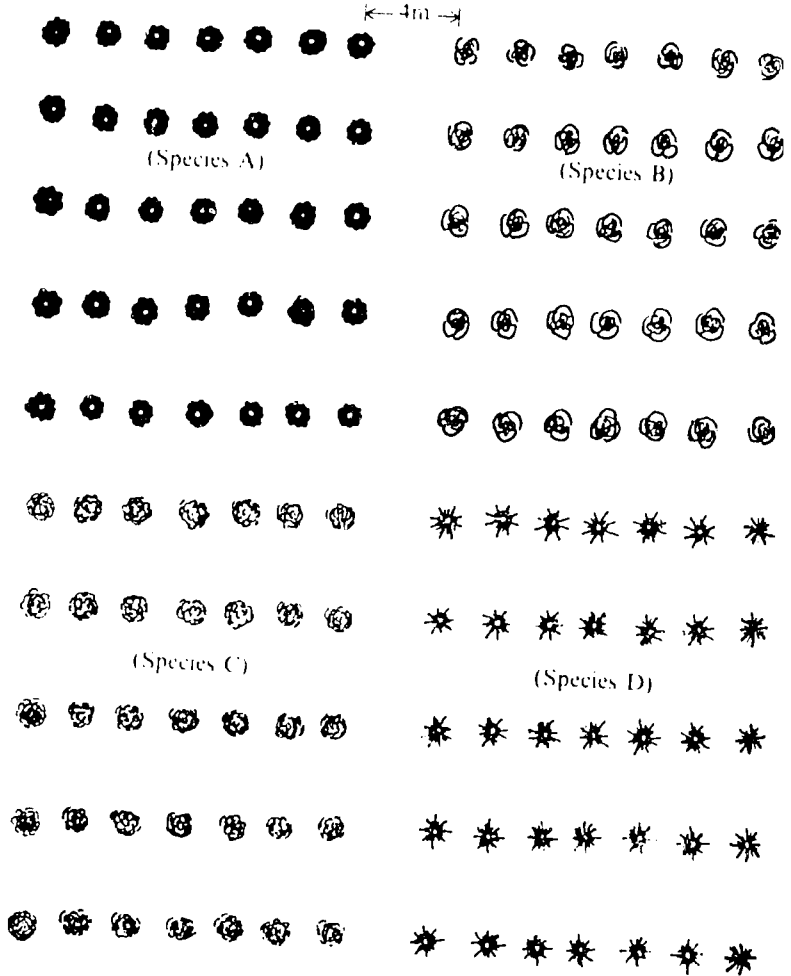


**SEED PROGRAMME.**  
*The seed programme of the Bukura Centre is critical to the success of the other activities at the Centre. Seeds of trees which are good for planting with crops (agroforestry) are collected, processed, packaged and distributed to local organisations involved with tree planting. This ensures the availability of appropriate species to members of the public who are interested in practising agroforestry.*

**Figure 2.**

### Planting Plan of the Seed Orchards (Screening Trials)

*The general ground-plan is shown below. This figure represents only 4 blocks - therefore 4 species. Within each block, the trees are spaced 2 metres apart within rows, and rows are 4 metres apart. Each block contains 35 trees of one species.*



### **(c) Agroforestry Research**

#### **Background: Potential and Constraints of the Region**

The Western highlands are a distinct zone ecologically and, to some extent, agriculturally, thus necessitating a separate regional centre to be established.

There are no distinct rainfall seasons in the area, though rainfall tends to peak in April and May. Most of the Western highlands receive over 1500mm of rainfall per year (Appendix 4). The mean annual temperature of the region is 24°C.

The soils are of volcanic origin, the colour being reddish-brown with clay to clay loam texture. The original vegetation cover was tropical forests, however, the land is now extensively cultivated except for some forest reserves such as the Kakamega (tropical rainforest) Reserve.



*RESEARCH. Research in agroforestry is conducted at the Bukura Centre. The trials that are being tested are helping to identify the best species and the best planting arrangements for agroforestry in the Western Highlands. Pictured are Bukura Centre staff collecting research data on tree growth rates of Grevillea robusta.*

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Current and projected population densities are very high in the region, thus, agricultural production as well as forest products (ex., woodfuel) production needs to increase. Pressure on the land will continue to increase. Economic returns from land and labour appear to be higher from perennial cash crops (tea, coffee, sugar cane, etc.) and dairy farming than from traditional food crops. Food crop production could be made more profitable through agroforestry systems of land use, where food crops such as maize, bananas, and cowpeas are intercropped with multi-purpose trees. Under such systems, the high biological potentials of the land can be fully exploited under sustainable conditions.

### **Description of the Agroforestry Research Programme**

The research and demonstration plots serve as teaching/demonstration tools as well as to generate the biotechnical data which forms the basis for recommendations and technical packages. There are a total of ten tree species in the agroforestry research/demonstration plots, namely:

1. *Calliandra calothyrsus*,
2. *Cassia siamea*,
3. *Citrus limon*,
4. *Cordia abyssinica*,
5. *Eucalyptus maculata*,
6. *Gmelina arborea*,
7. *Grevillea robusta*,
8. *Leucaena leucocephala*,
9. *Markhamia platycalyx*, and
10. *Sesbania sesban*.

Figures 3 & 4 show the basic research plot design.

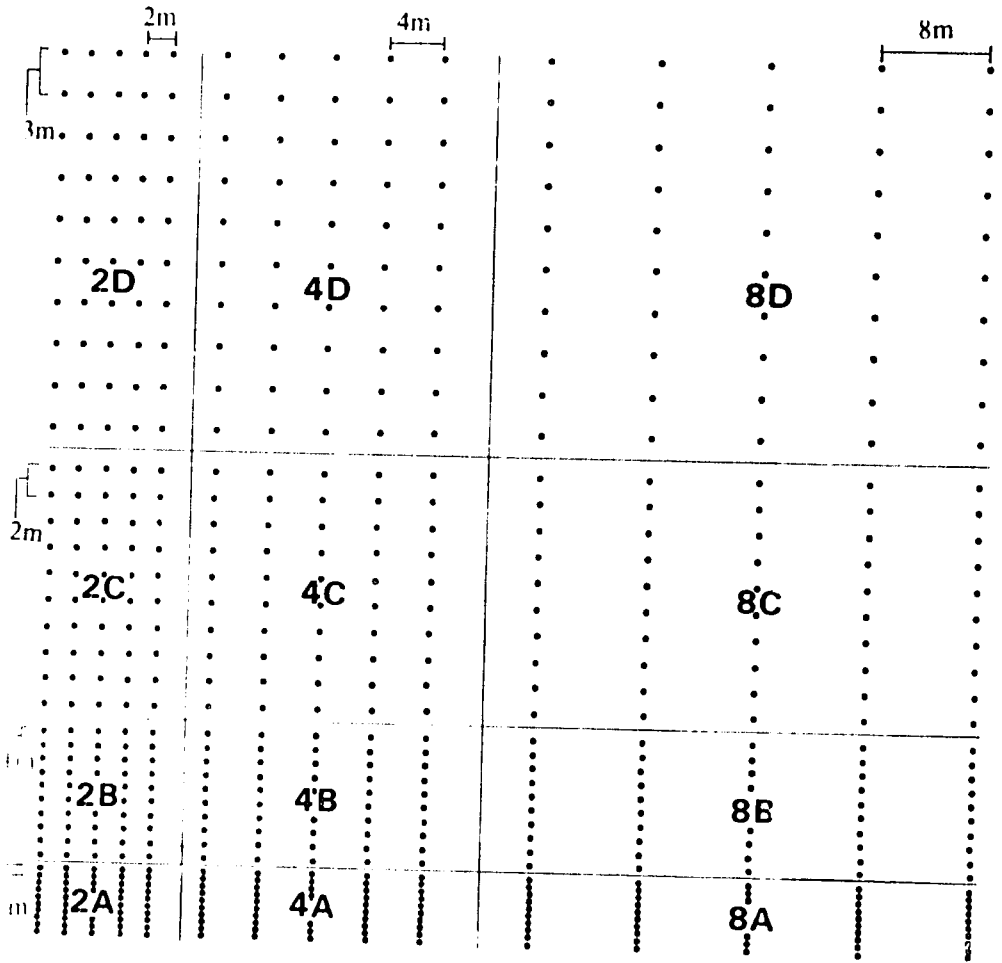
The data being collected in the research/demonstration plots include:

1. Soil fertility (both chemical and mechanical analysis),
2. Light measurements (radiation available to crops),
3. Weed/pest monitoring,
4. Tree/crop interaction over time, viz a viz:
  - (a) Crop yield, and
  - (b) Tree biomass yield, and
5. Agroforestry Management Studies, including:
  - (a) Tree cutting heights and frequencies, and
  - (b) Tree canopy management and husbandry practices.

Production costs such as labour and purchased inputs (seeds, fertilizers, insecticides, labour, etc.) are also kept for both the research and control plots so as to assess each module's efficiency with respect to land, labour and capital used.

**Figure 3**

**Planting Plan of the Trees in the Parallel Systematic Design.**



*Each • represents a tree. In each row there are 10 trees spaced  $\frac{1}{2}$  meter apart, 10 spaced 1 meter, 10 spaced 2 meters, and 20 spaced 3 metres apart. After the first row there are 5 rows that are 2 meters apart, 5 that are 4 meters apart and 5 that are 8 meters apart. This gives the 12 different planting arrangements, from very dense to very dispersed. The crops are planted based on the recommendation of the Ministry of Agriculture and Livestock Development, regardless of the tree.*

**Figure 4A**

**Agroforestry experimental trials planting arrangements**

		Line Density				
		0.5m	1m	2m	3m	
Row Width	2m	Module	2A	2B	2C	2D
	Area per Tree	1m <sup>2</sup>	2m <sup>2</sup>	4m <sup>2</sup>	6m <sup>2</sup>	
4m	Module	4A	4B	4C	4D	
	Area per Tree	2m <sup>2</sup>	4m <sup>2</sup>	8m <sup>2</sup>	12m <sup>2</sup>	
8m	Module	8A	8B	8C	8D	
	Area per Tree	4m <sup>2</sup>	8m <sup>2</sup>	16m <sup>2</sup>	24m <sup>2</sup>	

**Figure 4B**

**Agroforestry experimental trials planting densities**

Area per Tree	1m <sup>2</sup>	2m <sup>2</sup>	4m <sup>2</sup>	6m <sup>2</sup>	8m <sup>2</sup>	12m <sup>2</sup>	16m <sup>2</sup>	24m <sup>2</sup>
Trees per Hectare	10,000	5,000	2,500	1,666	1,250	833	625	416
Modules	2A	2B 4A	2C 4B 8A	2D	4C 8B	4D	8C	8D

## **(d) Preliminary Results/ Recommendations**

The agroforestry experiments and the species screening trials described above are expected to provide information on the optimum arrangements for agroforestry systems for the Western Highlands. The following are some of the outstanding observations made to date:

- 1) Tree seedling survival rates are much higher and growth form better for seedlings grown with crops. This is apparent from the figures in Appendices 2 and 5. The average survival rate for seedlings in Kenya is estimated to be below 40%.
- 2) The tree species which show the best promise for agroforestry in the Western highlands are:  
*Acacia abyssinica*,  
*Acacia lahai*,  
*Calliandra calothyrsus*,  
*Cordia abyssinica*,  
*Grevillea robusta*,  
*Leucaena leucocephala*,  
*Markhamia platycalyx*,  
*Mimosa scabrella*, and  
*Sesbania sesban*

Except for *Calliandra* and *Mimosa*, the other species are already being used and can be seen intercropped with crops or in pasture areas in various parts of these highlands. Other species that have done well in the highlands are given in Appendix 6.

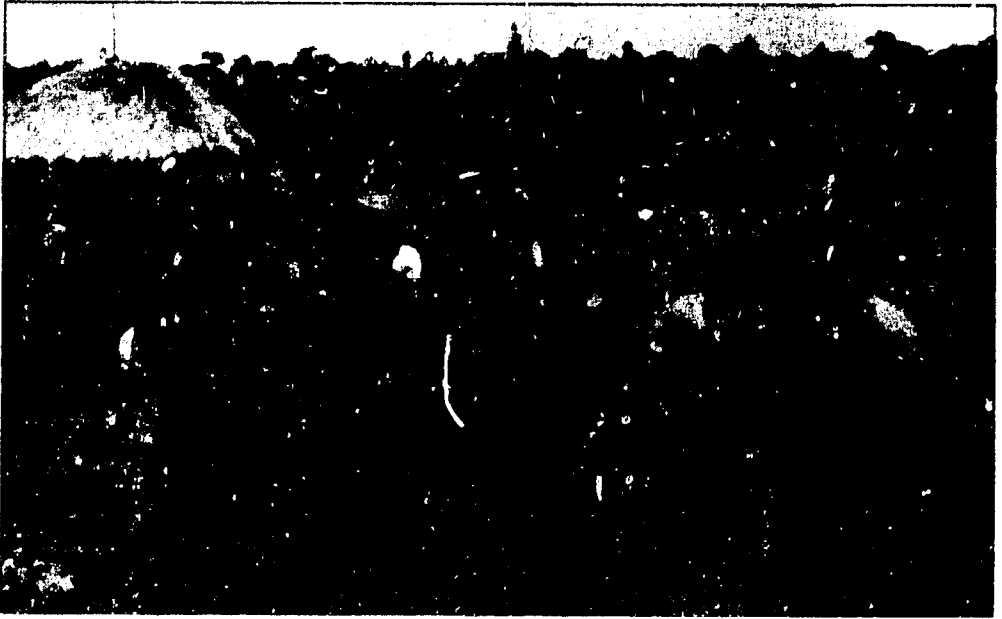
- 3) The preferred spacing of the trees depends on the purpose of the trees. For the shrub/small tree species listed above (*Calliandra*, *Leucaena*, *Mimosa* and *Sesbania*) which can be cut back during the growing season, the closer spacings show the most promise. These would include modules 2A and 2B, 4A and 4B, and even 8A and 8B (see Figures 3 and 4 for explanation). For those species which would be allowed to grow bigger (fruit trees or species for poles or timber), where shade would become an important factor, the wider spacings appear to be better. This includes modules 4C and 4D, and 8C and 8D, or even wider spacings.

## **(e) Extension, Training and Technical Services**

### **Training**

Training activities take place at the Bukura Institute of Agriculture. Groups of farmers, students, NGOs and GOK personnel are regularly given on-site training by the Centre





#### **TECHNICAL SERVICES.**

*The Bukura Centre extension personnel provide technical assistance in tree nursery management and in agroforestry. Pictured is a successful self-help nursery which was assisted by Bukura staff. This nursery has produced thousands of seedlings many of which were planted on the members shambas. Excess seedlings were sold so that members also made money on the project.*

staff. Every course at the Institute of Agriculture is given a short presentation and a tour of the Centre programmes. Special one week courses covering agroforestry are given frequently. Such courses can be arranged with the Centre Manager for students or self-help groups upon request.

#### **Extension and Technical Services**

These activities include technical assistance in nursery start-up and management, and in agroforestry. As well, material assistance for groups in the form of seeds, seedlings, polythene bags and other nursery equipment can be provided. The extension activities are headed by the MOALD District Soil Conservation Programmes. This effort is strengthened by U.S. Peace Corps Volunteers who work as extension officers for MOERD. Extension services have been greatly enhanced by the provision of five motorbikes and six bicycles by MOERD for use by the field officers. The excellent working relationships between MOERD, MOALD, and MENR field staff has played a major role in the success of the extension efforts to date.

The Centre also participates in the District ASK shows where agroforestry and other renewable energies are displayed and promoted. Information is disseminated through technical bulletins both at the ASK shows and in the field.

**THE KENYA CERAMIC JIKO.** *The Kenya Ceramic Jiko has been one of the most successful developments of the Kenya Renewable Energy Development Project, with thousands of units sold throughout Kenya every month. The Bukura Centre conducts training in the production of these new jikos for local artisans. Demand for the jikos is high, so new artisans have ready markets for their products. Pictured are trainees learning to make the clay liner for this new stove.*



## **Cookstoves/ Kilns Programme:**

The implementation of the cookstoves, kilns programme as an energy conservation measure was designed to decrease overall demands for woodfuel and thus slow down the destruction of indigenous forests.

The improved cookstoves programme was initially started at the Bukura Centre and at Hesi, Chavakali and Moi's Bridge. Later, in collaboration with KENGO and CARE-Kenya, projects were initiated in Kisumu and Siaya Districts. Western Kenya has a strong tradition of clayworks and thus it has been relatively easy to introduce the Kenya Ceramic Jiko to the area.

The demand for the improved cookstoves has been increasing and thus there is a need for additional artisan training. Consequently, the Centre has been putting emphasis on training and technical assistance. Training courses are free of charge and normally last 5-10 weekdays. Participants are drawn from the traditional jiko makers, from polytechnic graduates and instructors, and any others who have aptitude with sheet metal or pottery skills.

## Biogas Programme:

**BIOGAS** *The Bukura Centre also conducts training in the construction of biogas units. Biogas can be used in cooking, heating, water heating and even to generate electricity. Pictured is a biogas unit showing the inlet (in front), the biogas digester (middle) and the outlet (background). This unit is on display at the Bukura Centre for interested visitors.*



The Centre has recently initiated biogas training and demonstration and has been using the Kakamega ASK shows as a venue to demonstrate the technology to the general public. Biogas technology, coupled with zero-grazing, is an appropriate technology for the region. Biogas units are based on the decomposition of animal wastes which results in the production of methane, a combustible gas. This fuel source can substitute for wood, charcoal, imported fuels and even electricity. The GTZ Special Programme has been instrumental in the dissemination of this technology, as well as the Ministry of Agriculture and Livestock Development (MOALD), both in cooperation with KREDIP.

The specific type of biogas digester being advanced is the one depicted above, which is largely modified from the Chinese and Indian types.

The training of biogas artisans is an on-going programme at Bukura for people interested in learning how to build biogas digesters. Each biogas course lasts about 10 days. A knowledge of masonry is advantageous for course participants.

**Staff:  
Bukura  
Agroforestry/  
Energy Centre**

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Centre Manager	Alex Ojwang'
Extension Officer, Busia	Arleta Agun
Extension Officer, Bungoma	Tom Sullivan
Extension Officer, Nandi	Alice Elrod
Clerical Officer	Phones Ozimbo
Storeman	Jackson Y. Yamane
Driver	Hussein Ibrahim
Copy Typist	Gladys E. Ashiuma
Artisan (Jiko Trainer)	Peter N. Kimani
Headman	Dickson Ngwete.

The above staff are assisted by 3 watchmen, 10 subordinate staff and 23 casuals.

**Associated Staff:**

Mr. G. Ogolla	— Principal Bukura Institute of Agriculture
Mr. G.J. Manywe	— Principal, Busia F.T.C.
Mr. Kandie	— Principal, Kaimosi F.T.C.
Mrs. I.A. Sagala	— Principal, Bungoma F.T.C.
Mr. J.E. Chew	— D.S.C.O. Kakamega
Mr. Nyongesa	— D.S.C.O. Busia
Mr. Mwangolo	— D.S.C.O. Bungoma
Mr. Maiko	— D.S.C.O. Nandi
Mr. Musa Enyola	— Field Programmes Manager, Bejjer Institute

## Appendix 1

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### Tree Species in the Seedling Production Programme

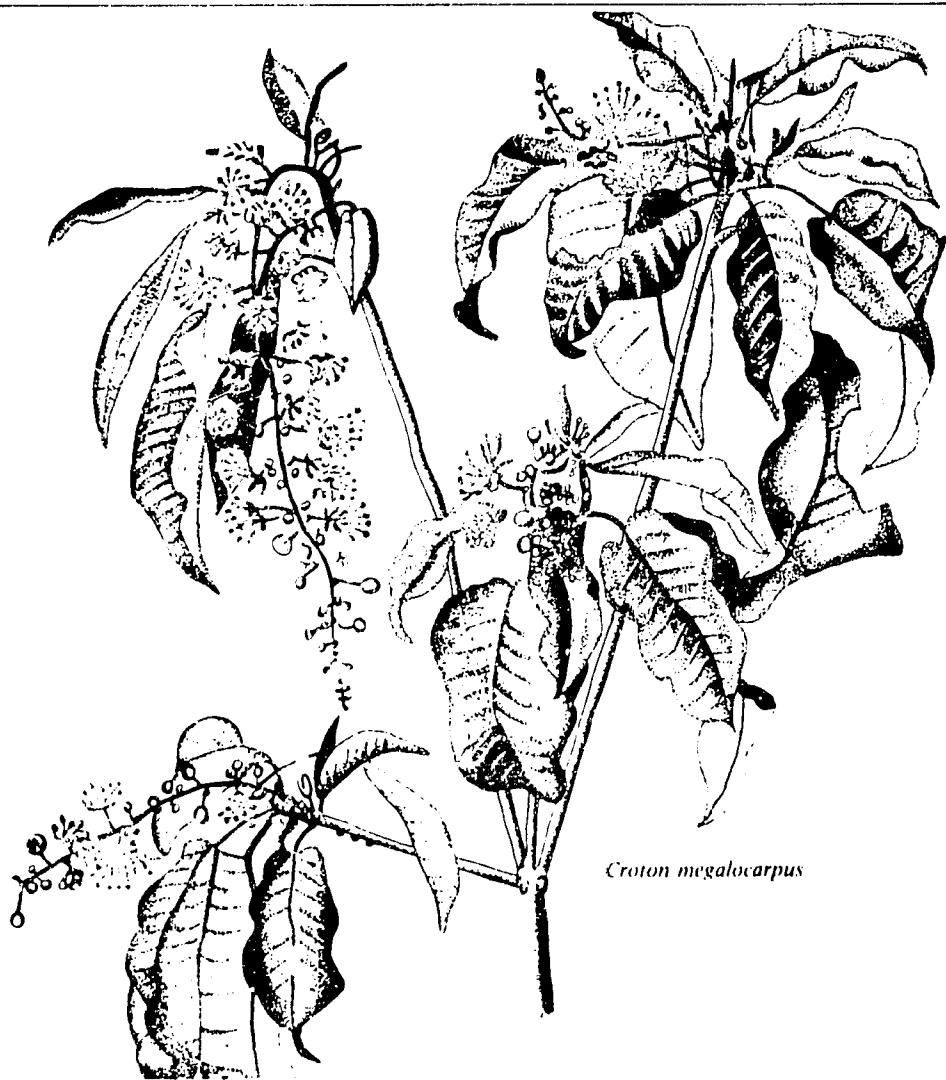
1. *Aberia caffra*
2. *Acacia albida*
3. *Acacia lahai*
4. *Acacia mearnsii*
5. *Acacia saligna*
6. *Acrocarpus fraxinifolius*
7. *Ailanthus altissima*
8. *Albizia gummifera*
9. *Balanites aegyptiaca*
10. *Bischofia javonica*
11. *Calliandra calothyrsus*
12. *Callistemon spp.*
13. *Calodendrum capense*
14. *Carica papaya*
15. *Cassia grandis*
16. *Cassia siamea*
17. *Cassia spectabilis*
18. *Casuarina equisetifolia*
19. *Citrus limon*
20. *Cordia abyssinica*
21. *Croton macrostachyus*
22. *Croton megalocarpus*
23. *Cupressus lusitanica*
24. *Delonix regia*
25. *Entada abyssinica*
26. *Eriobotrya japonica*
27. *Erythrina abyssinica*
28. *Eucalyptus maculata*
29. *Eucalyptus paniculata*
30. *Eucalyptus saligna*
31. *Flamingia congesta*
32. *Gliricidia sepium*
33. *Gmelina arborea*
34. *Grevillea robusta*
35. *Hakea saligna*
36. *Jacaranda mimosifolia*
37. *Leucaena leucocephala*
38. *Maesopsis eminii*
39. *Mangifera indica*
40. *Markhamia platycalyx*
41. *Melia azedarach*
42. *Passiflora edulis*
43. *Persea americana*
44. *Pinus patula*
45. *Podocarpus gracilior*
46. *Prosopis juliflora*
47. *Psidium guajava*
48. *Schinus molle*
49. *Sesbania grandiflora*
50. *Sesbania sesban*
51. *Spathodea nilotica*
52. *Sterculia acerfolia*
53. *Syzygium cumini*
54. *Syzygium guineense*
55. *Tecoma stans*
56. *Tectona grandis*
57. *Terminalia brownii*

## Appendix 2

### Tree Species Performance in the Bukura Screening Trials

Species	Date Planted	Survival Rate	Average Height (cm)
1. <i>Acacia lahai</i>	May '84	70%	50
2. <i>Acacia mearnsii</i>	May '84	80%	400
3. <i>Acrocarpus fraxinifolius</i>	June '84	100%	800
4. <i>Albizia coriaria</i>	Feb. '85	80%	25
5. <i>Bischofia javonica</i>	— '83	100%	400
6. <i>Calliandra calothyrsus</i>	— '83	85%	405
7. <i>Cassia grandis</i>	June '83	25%	150
8. <i>Cassia siamea</i>	June '83	100%	349
9. <i>Cassia spectabilis</i>	May '84	100%	498
10. <i>Casuarina equisetifolia</i>	Aug. '83	97%	299
11. <i>Cordia abyssinica</i>	— '83	100%	301
12. <i>Croton macrostachyus</i>	Aug. '83	88%	275
13. <i>Croton megalocarpus</i>	May '83	100%	299
14. <i>Cupressus lusitanica</i>	Aug. '83	100%	305
15. Unknown A	Feb. '85	70%	24
16. Unknown B	— '85	75%	52
17. Unknown C	— '83	72%	302
18. Unknown D	Feb. '85	65%	25
19. <i>Delonix regia</i>	— —	87%	300
20. <i>Eriobotrya japonica</i>	June '83	100%	200
21. <i>Entada abyssinica</i>	— —	58%	75
22. <i>Eucalyptus paniculata</i>	May '83	100%	699
23. <i>Eucalyptus saligna</i>	May '83	100%	850
24. <i>Flamingia congesta</i>	— '83	85%	203
25. <i>Gliricidia sepium</i>	— '83	75%	200
26. <i>Grevillea robusta</i>	June '83	95%	500
27. <i>Hakea saligna</i>	Feb. '83	75%	298
28. <i>Jacaranda mimosifolia</i>	July '83	100%	425
29. <i>Maesopsis eminii</i>	June '83	100%	204
30. <i>Mangifera indica</i>	— '85	100%	25
31. <i>Markhamia platycalyx</i>	— '83	100%	202
32. <i>Melia azedarach</i>	May '84	65%	405
33. <i>Passiflora edulis</i>	Aug. '83	100%	105
34. <i>Persea americana</i>	May '84	100%	105
35. <i>Pinus patula</i>	May '83	80%	305

36. <i>Psidium guajava</i>	May '83	100%	306
37. <i>Olea welwitschii</i>	'83	88%	105
38. <i>Spathodea nilotica</i>	July '84	100%	308
39. <i>Syzygium cumini</i>	—	94%	54
40. <i>Syzygium guineense</i>	—	100%	25
41. <i>Tecoma stans</i>		100%	200
42. <i>Tipuana tipu</i>	May '83	96%	625
43. <i>Vitex keniensis</i>	May '83	80%	196



## Appendix 3

### Seed Available at the Centre

Species	Sources	
	Seed Orchard	Local Collection
1. <i>Acacia saligna</i>		X
2. <i>Ailanthus altissima</i>	X	
3. <i>Albizia gummifera</i>		X
4. <i>Bischofia javonica</i>	X	X
5. <i>Calliandra calothyrsus</i>	X	
6. <i>Cassia siamea</i>	X	X
7. <i>Cassia spectabilis</i>		X
8. <i>Croton macrostachyus</i>		X
9. <i>Croton megalocarpus</i>		X
10. <i>Cupressus lusitanica</i>		X
11. <i>Flamingia congesta</i>	X	
12. <i>Leucaena leucocephala</i>	X	
13. <i>Maesopsis eminii</i>		X
14. <i>Sesbania sesban</i>	X	X
15. <i>Thevetia peruviana</i>		X



*Cordia abyssinica*



## Appendix 4

### Rainfall Data for Bukura Agroforestry/Energy Centre (in mm)

Month	Year			
	1982	1983	1984	1985
January	80.7	17.0	50.3	57.3
February	59.6	68.5	16.9	69.3
March	85.2	114.5	22.5	156.5
April	344.8	450.8	409.5	180.8
May	358.5	280.1	318.0	339.1
June	161.9	152.7	87.5	133.0
July	181.0	59.8	179.4	
August	451.6	215.8	201.4	
September	91.6	374.4	80.0	
October	231.5	222.8	109.0	
November	347.0	115.5	134.5	
December	207.7	71.9	105.0	
Total	2601.2	2143.8	1714.0	

## Appendix 5

### Tree Species Performance in the Bukura Agroforestry Research/Demonstration Plots

Species	Date Planted	Survival Rate	Average Height (cm)
1. <i>Cassia siamea</i>	July 83	95%	520
2. <i>Calliandra calothyrsus</i>	July 83	94%	290
3. <i>Citrus limon</i>	April 83	80%	185
4. <i>Cordia abyssinica</i>	Nov. 84	97%	40
5. <i>Eucalyptus maculata</i>	April 83	95%	1220
6. <i>Gmelina arborea</i>	June 83	96%	380
7. <i>Grevillea robusta</i>	June 83	98%	610
8. <i>Leucaena leucocephala</i>	April 84	80%	710
9. <i>Markhamia platycalyx</i>	April 83	97%	520
10. <i>Sesbania sesban</i>	Nov. 84	98%	370

## Appendix 6

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### Tree Species Suitable for the Western Highlands

#### 1. Fuelwood

All trees and shrubs

#### 2. Timber

*Bischofia javonica*  
*Catodendrum capense*  
*Casuarina equisetifolia*  
*Chlorophora excelsa*  
*Cordia abyssinica*  
*Croton macrostachyus*  
*Cupressus lusitanica*  
*Eucalyptus maculata*  
*Eucalyptus paniculata*  
*Eucalyptus saligna*  
*Maesopsis eminii*  
*Markhamia platycalyx*  
*Olea welwitschii*  
*Pinus patula*

#### 3. Fruit Trees

*Citrus spp.*  
*Eriobotrya japonica*

*Mangifera indica*  
*Persea americana*  
*Psidium guajava*  
*Syzygium cumini*

#### 4. Fencing

*Aberia caffra*  
*Caesalpinia spinosa*  
*Callistemon spp.*  
*Cupressus lusitanica*  
*Euphorbia tirucalli*

#### 5. Agroforestry

*Acacia abyssinica*  
*Acacia lahai*  
*Calliandra calothyrsus*  
*Cordia abyssinica*  
*Grevillea robusta*  
*Leucaena leucocephala*  
*Markhamia platycalyx*  
*Mimosa scabrella*  
*Sesbania sesban*

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For more information or assistance, please contact the  
Centre Manager of Bukura Agroforestry/Energy Centre

P.O. Box 23,  
BUKURA  
Telephone: Butere 23

**Application form for classes**

Name: \_\_\_\_\_

Address \_\_\_\_\_

Telephone number where you can be contacted \_\_\_\_\_

**Check which class you are interested in attending**

**Agroforestry**

**Biogas**

**Improved cookstoves/kiln**

**State reason you would like to take the class.**

**Please send this form to  
Bukura Agroforestry/Energy Centre**

# Directions to the Bukura Agroforestry / Energy Centre

