CALLIANDRA CALOTHYRSUS: SUSTAINABLE PLANTING MATERIAL DISTRIBUTION AND MARKETING SYSTEMS

Study by TechnoServe Inc. and International Centre for Research in Agroforestry

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January 2003
(edited by J.L. Stewart, September 2003)

ABBREVIATIONS AND ACRONYMS

ACK	Anglican Church of Kenya
ADRA	Adventist Development Relief Agency
ARU	Applied Research Unit
CBO's	Community Based Organizations
DAEO	Divisional Agricultural Extension Officer
DEC	Divisional Extension Coordinator
DGAK	Dairy Goat Association of Kenya
ELCK	Evangelical Lutheran Church of Kenya
FTC	Farmers Training Centre
GTZ	German Technical Co-operation
HPI	Heifer Project International
ICRAF	World Agroforestry Centre/International Centre for Research in Agroforestry
IUCN	International Union for Conservation of Nature and Natural Resources
KARI	Kenya Agricultural Research Institute
KCC	Kenya Cooperative Creameries
KEFRI	Kenya Forestry Research Institute
KEPHIS	Kenya Plant Health Inspectorate Services
Kg	Kilogram
KWAP	Kenya Wood Fuel and Agroforestry Programme
LEVMP	Lake Victoria Environmental Management Programme
MoARD	Ministry of Agriculture & Rural Development
MoE	Ministry of Energy
NALEP	National Agricultural and Livestock Extension Programme
NARP	National Agroforestry Research Project
NGO	Non-Governmental Organization
NTSP	National Tree Seed Programme
RRC	Regional Research Centre
SCODP	Sustainable Community Oriented Development Programme
VI	VI Agroforestry Project

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EXECUTIVE SUMMARY

Calliandra calothyrsus is a fast-growing, nitrogen-fixing leguminous shrub principally used for animal fodder, soil stabilization and amelioration, stakes for agricultural crops such as climbing beans, and fuel-wood. Adequate and sustained supply of planting materials is a problem wherever calliandra planting is expanding. There seems to be little spontaneous development of market-driven seed or seedling production. This study explored the current distribution and marketing systems for *Calliandra calothyrsus* planting material, identifying constraints and suggesting options for the development of more sustainable systems. Forty-four interviews were conducted with dairy farmers, institutional key informants, commercial seed farmers, seed vendors, seedling sellers and farmer groups in central and western Kenya.

Seed production and sources of planting material

The private sector in western Kenya is effective in providing seed for sale to institutional buyers, but not to farmers. In central Kenya farmer groups received free seed from supporting institutions and there was heavy reliance on group nurseries to supply seedlings. Farmers were, however, leaving some trees uncut for seed production in their farms; this practice may ensure that once calliandra is adopted in an area, within three years, the area could be self-sustaining in terms of seeds. This may work well, if there is a collection and distribution mechanism on the ground that ensures maintenance of genetic diversity through inter-farm seed exchange systems.

Seed distribution and marketing

Seed vendors in western Kenya were unable to sell all their seed, despite a shortage of seed in central Kenya. There is currently little private sector involvement in the tree seed market: there does not appear to be sufficient incentive for the private sector to undertake calliandra seed distribution. Demand for seed needs to be developed by raising awareness and training farmers in calliandra management and use. However, efficient milk markets are likely to be the key motivation for farmers to grow calliandra so as to increase their milk production. In view of the current erratic milk markets in Kenya, a system for marketing calliandra seed, based on free market rules in areas where calliandra is newly introduced, may not be feasible. Instead, a subsidised seed distribution and marketing system may still be necessary and the following marketing options need to be explored:

- Link seed marketing to other economically attractive activities such as milk collection, bulking and processing and marketing of other forage.
- Develop and/or strengthen partnership with organizations and institutions in dairy development and seed distribution.
- Explore and initiate pilot private sector seed distribution systems in areas where calliandra planting is expanding.
- Support existing seed vendors and private nurseries.

Development of an effective calliandra distribution and marketing system will also require coordination of such activities as:

- Promotion of value/price based distribution of calliandra among partners
- Collection and dissemination of market information
- Development of linkages among partners in seed production, distribution and marketing
- Preparation of appropriate and effective training programmes
- Improvement on feedback to research and dissemination of new information.

INTRODUCTION

Calliandra calothyrsus Meissn. ('calliandra') is a fast-growing, nitrogen-fixing leguminous shrub used principally for animal fodder, soil stabilization and amelioration, stakes for agricultural crops such as climbing beans, and fuelwood. Within a year after planting, the leaves are ready to be pruned for feeding. As a fodder shrub, calliandra holds great potential for increasing the income of smallholder dairy farmers. Fodder from this shrub is rich in protein and, unlike grasses, it remains green and retains its nutritive value during the dry season.

Establishment and expansion of calliandra plantings

Since the early 1990s, 5,000 to 10,000 farmers have planted fodder trees in central Kenya. Some farmer-to-farmer seed transfer is occurring, but planting material is not available in most areas where calliandra is grown. ICRAF has been buying most of its seed from several large private seed producers in western Kenya for distribution to projects and farmers. There are also a few farmers and groups in central Kenya who sell potted seedlings, but these cannot be easily transported over long distances.

In a study to assess the early stages of adoption of calliandra in central Kenya in 1995, calliandra was found to have a high survival rate (93%; sd=13%). In a random sample of 45 farmers, 82% expanded once during the three years following their first planting and 36% expanded twice or more. Whereas the principal method in farmers' first and second plantings was to use potted seedlings obtained from projects, the most important method in the third and subsequent plantings was to establish a nursery. Similarly, farmers' own trees and other sources replaced projects as the principal source of planting material from the third planting. The most common planting niches were in homestead boundaries and in lines on contours (Franzel et al. 1999)

Calliandra utilization and milk production

The low quality and quantity of feed resources is the greatest constraint to improving the productivity of livestock in sub-Saharan Africa (Winrock International 1992). Feeding livestock with forages rich in nitrogen helps them to realise their genetic potential for milk production and to utilise low protein basal feeds more efficiently. Dairy animals should be fed with fodder legumes at the rate of 25-30% in combination with basal forage, mainly grasses and Napier. Calliandra contains 20-25% crude protein, whereas on average grasses contain about 7-10% protein. If calliandra is the only supplement, a cow should get 6-10 kg fresh leaves daily, while a dairy goat needs about 0.5-1 kg of fresh leaves. To be able to feed these amounts throughout the year, a farmer needs to plant about 500 trees per cow and 150 trees per dairy goat (Wambugu 2002).

On-farm feeding trials have confirmed the effectiveness of *Calliandra* both as a supplement to the cow's diet and as a substitute for dairy meal. The trials found that 1 kg of dry *Calliandra* had about the same amount of digestible protein as 1 kg of dairy meal; both increased milk production by roughly 0.75 kg under farm conditions,

but the response varied depending on such factors as the cow's health and the quality of its basal diet (O'Neill et al. 1995; Paterson et al. 1996).

The dairy sector in Kenya

According to a study by Tegemeo (Karin 2001), the current milk demand in Kenya is about 2.4 billion litres whereas supply is 2.5 billion litres, giving the impression of a surplus. This surplus is actually not available due to marketing inefficiencies whereby excess milk in some regions goes to waste. Nyanza, Nairobi and Western provinces were found to have large milk deficits.

Liberalization of milk marketing in 1992 affected the monopoly of KCC with private processors and informal milk traders entering the market. The collapse of KCC, which used to process powdered milk, has negatively affected the capacity of the existing milk processors to buy all the milk produced by farmers. Currently the milk market in Kenya is erratic, with milk going to waste and low farmer prices during the glut season.

Processors unable to buy all the milk produced impose quotas under which farmers sell only a part of their total milk. In other cases, the farmers sell their milk only on certain days of the week. Consumption of processed milk has also been declining, mainly owing to high prices. Consumer prices tend not to respond to the forces of supply and demand, thus remaining high even when farm gate prices are low (TechnoServe 2001).

The volumes of processed milk have been decreasing; in the early 1990s, processed milk production had risen to about 340 million litres per year, but by 1999 only 150 million litres was processed. The installed processing capacity in the country is 2.2 million litres per day, but only a quarter (26%) of that is being utilized. Low capacity utilization is partly attributable to the dominance of raw milk in the market and problems of delayed or non-payment by new processors. Hawkers usually offer better prices than co-operative societies that deliver milk to processors.

OBJECTIVES OF THE STUDY

Adequate and sustained supply of planting materials (seeds and seedlings) is a problem wherever farmers want to expand the planting of calliandra. There seems to be little spontaneous development of market-driven seed or seedling production. This study explores the institutional, economic and cultural forces shaping the distribution and marketing of calliandra planting material and defines the factors that need to be in place to ensure sustainable production and distribution. The key objectives of the study were:

I. To analyze the status of the existing calliandra planting material (seed & seedling) production, distribution and marketing scenarios in Kenya.

II. To define key factors for sustainable calliandra seed/seedling production, distribution and marketing in Kenya. The following issues were explored:

a. Farmer's motivation to produce planting materials for calliandra.
b. Why a sustainable private sector seed-marketing system has not developed.
c. The circumstances where, and extent to which, calliandra seeds/seedlings can be promoted through the private sector; and when other subsidized channels need to be used.
d. Steps that ICRAF and TechnoServe can take to facilitate a sustainable seed/seedling supply system.

STUDY METHODOLOGY

This was a collaborative study undertaken by TechnoServe and ICRAF.

Sampling procedure

The study was conducted in central and western Kenya in areas where ICRAF and partners have facilitated calliandra seed production and tree planting.

A stratified purposive sample was taken, to cover the range of existing scenarios for calliandra production, distribution and marketing along the whole market chain. Owing to resource constraints, a very limited sample was taken from each of the following categories:

1. Individual farmers who grow and use calliandra in the central highlands of Kenya
2. Institutions involved in agroforestry development such as MoARD, KARI, churches, development departments, NGOs and CBOs
3. Commercial seed farmers/vendors in Western Kenya
4. Farmer group nurseries and private nurseries (seed/seedling sellers)
5. Farmer groups involved in agroforestry activities
    a. Successful groups
    b. Unsuccessful groups

A total of 44 interviews were conducted (Table 1).

Table 1: Sample distribution

Category	**Central**	**Western**	**Total**
Individual calliandra farmers	10	-	**10**
Institutional key informants	10	3	**13**
Commercial seed farmers/Vendors	-	7	**7**
Seed / Seedling sellers	6	2	**8**
Farmer groups	4	2	**6**
Total	**30**	**14**	**44**

Data and Information Gathering

Existing information and secondary data were reviewed before proceeding to primary data collection in the field. There was however almost no secondary information available on the distribution and marketing of calliandra.

Primary data was collected through a collaborative effort by TechnoServe and ICRAF staff in July 2002. Individuals and groups were interviewed using five semi-structured questionnaires tailored for each group. In two cases in Western Kenya, informal discussions were held with a group of seed vendors and a group of small-scale seed farmers.

A dissemination workshop was also held in central Kenya to discuss the study findings. The issues raised during the workshop have been incorporated in the study. Annex IV details the workshop proceedings.

STUDY FINDINGS

Characteristics of each respondent category

Individual calliandra farmers

Individual farmers were interviewed in central Kenya. Of the ten farmers interviewed, seven were male and three were female (Annex III, list 1). The mean age was 53 (sd=12). All the farmers interviewed were growing calliandra; seven also had *Leucaena trichandra* and two had *Sesbania sesban* (Table 2). The number of calliandra trees per farmer ranged from 5 to 8000 trees (mean=1083; sd=2460). Eight of the farmers had grown calliandra for three years and two for four years (i.e. since 1999 and 1998 respectively).

Table 2: The number of farmers growing fodder trees

Fodder trees	**No. of farmers (N=10)**
Calliandra	10
Leucaena	7
Sesbania	2
Mutundu (Local name)	1

Farmers in central Kenya had an average of two dairy cows (sd = 1.45) with one lactating cow, and five dairy goats (sd = 5.44), with one lactating goat.
The average milk produced per cow was 10 litres (sd = 10.2) and per goat 0.6 litres (sd = 0.88) per day. On average a farmer sold 9 litres of cow's milk per day at an average price of Kshs 13 (sd= 3). Goat milk was all being consumed domestically. Challenges farmers faced in milk production and marketing included low prices (four farmers), lack of market (two farmers), delayed payments, poor infrastructure (bad roads), lack of transport and drought. Other on-farm sources of income are shown in Table 3.

Seven farmers did not have off-farm sources of income; for the three who did, these sources were running public transport vehicles, artisan, and group leadership respectively. The group leadership income indicated by one farmer could be allowances given to leaders when they are sent to meetings to represent the group (since group leadership is usually a voluntary role).

Table 3: On-farm sources of income

On-farm source of income	No. of farmers (N=10)
Coffee	5
Selling seedlings	3
Selling goats	2
Bananas	2
Maize	2
Beans	2
Selling pigs	1
Mangoes	1
Potatoes	1
Cut flowers	1
Fruits	1
Selling trees	1
Buying and selling bananas	1
Selling cows	1

Institutional characteristics and activities

Thirteen key informants were interviewed (ten in central and three in western Kenya) as shown in Annex III, List 2. These respondents were individual(s) from organizations supporting agroforestry in some way. The institutions were working with a number of partners in agroforestry as shown in Annex III, List 6. Institutions mainly worked with the groups shown in Table 4.

Table 4: Farmer groups with whom institutions worked

Groups involved	No of Respondents (N=13)
Non-specific farmer groups	7
MoARD Common Interest Groups	4
Goats groups	2
Dairy groups	1
Women groups	1
VIAgroforestry groups (10-15 members)	1
Youth groups	1

Commercial seed farmers/ seed vendors

Seven farmers who were primarily producing calliandra seed for sale were interviewed in three districts in western Kenya: Vihiga (1), Busia (5) and Siaya (1). Five of those interviewed were male, and two female (Annex III, List 3). Two of the farmers were also seed vendors. Apart for one farmer who started in 1978, they began producing seed between 1991 and 1997. The number of trees grown by an individual farmer ranged from 35 to 3000.

Seedling sellers (nursery) business characteristics

Eight seedling sellers (tree nursery operators) - two from Western Region and six from Central Region - were interviewed (Annex III, List 4). Nurseries belonged to either groups or individuals. Among the respondents three were selling calliandra seedlings while two groups, one farmer group and ICRAF program II in Maseno, were selling calliandra seed (Table 5). Nurseries were found to be selling fodder trees, timber trees, fruit trees, fence trees, ornamentals and in one case coffee trees. The fodder trees being sold were calliandra, leucaena, sesbania, and *Croton macrostachys*.

Table 5: Fodder tree planting materials sold

Product sold	**Number of dealers (N=8)**
Calliandra seed	2
Calliandra seedlings	3
Sesbania seedlings	1
Leucaena seedlings	1
Croton macrostachys seedlings	2

Timber trees were the most common, with *Grevillea robusta* the most prominent, being sold in five nurseries. The oldest business started in 1988 while none of the businesses had started after 1999 (Table 6); this could indicate lack of growth in demand for seedlings in recent years.

Table 6: Year of nursery business start-up

Business start year	**Number of businesses**
1988	1
1991	1
1992	1
1995	1
1996	1
1997	1
1999	2
Total	8

Farmer groups

Four farmer groups were interviewed in central Kenya (Annex III, List 5). The groups had been in existence for only 3-4 years. Three of them had agroforestry as their main activity and one was principally a dairy goat group but involved in agroforestry. Groups were found to have multiple activities as shown in Table 7.
Groups were supported in their activities by various organizations, with KARI, ICRAF, MoARD and Forestry Department supporting agroforestry, Farm Africa and DGAK working with dairy goat groups, and ACK Embu Diocese working on bee keeping.

Three of the groups started growing calliandra in 1999 and one group in 2000. Two of the groups had all their members growing calliandra. While all the farmers in the four groups had planted calliandra, some farmers lost all their trees and did not plant again. The loss was due to drought though failure to plant again may imply that the initial planting was done because the seedlings were free or the farmers got discouraged after their initial failure. The number of trees initially planted by each farmer ranged from 100 to 800 (sd = 334).

Table 7: Farmer group activities

Activity	**No. of groups (N=4)**
Seedlings production & marketing	3
Agroforestry	3
Dairy goats	3
Soil conservation	2
Dairy cows	1
Fish pond	1
Merry-go-round	1
Bee keeping	1

Seed vendors in western Kenya

Informal interviews were held with a group of three seed vendors in Western Kenya. These vendors deal with a variety of tree seeds that they buy from Tranzoia, Busia, Maseno and Kakamega areas. Most of the seed is bought in Busia from farmers with seed stands. Other farmers mainly plant seed trees along contours. The highest volume bought from farmers in one lot is about 10-20 kg per year. Each vendor has ten farmers from whom they collect seed. These farmers usually receive seeds from other farmers in the neighbourhood so that the vendor can collect seed from a few central points. Vendors also buy from middlemen who acquire seed from the farmers.

The vendors run their businesses from their homes because seed is usually bought seasonally. They store seed in airtight containers. Seed viability tests are sometimes done on a randomly selected sample of seeds by visual inspection of seeds cut open

with scissors . Occasionally seed is sent for testing at ICRAF laboratories. However in most cases, seeds are bought from well-trained seed producers and they are assumed to be viable. The maximum volume traded by an individual vendor was 100 kg per year. Most of the calliandra seed was sold to institutional buyers, mainly locally and occasionally outside the country (see Annex I).

Small-scale seed farmers in western Kenya

Five small-scale seed farmers were interviewed as a group in Maseno. These seed farmers faced various challenges including lack of markets (as most farmers expect to be given seedlings free of charge); mortality of some of the trees planted in the early 90s; other farmers not knowing the use of calliandra; lack of polythene tubes to pot the seedlings; theft of seedlings; and prohibitive by-laws restricting farmers from cutting trees. All these problems make the farmers wonder whether to plant more trees.

To create a market for seed/seedlings, the farmers suggested that NGOs should buy seeds/seedlings from suppliers and use them for demonstration in other farms. Seed dealers should visit seed farmers to brief them about their seed requirements and also leave contacts for the farmers to follow up. The seed and seedling farmers also need to promote calliandra among neighbouring farmers to increase demand for calliandra planting materials. (see Annex II for more information).

Adoption of calliandra

An ‘adopter’ was loosely defined as any farmer who had planted calliandra. Representatives of institutions estimated that 41% (sd=27) of farmers had adopted calliandra in the areas where they worked. This estimate was based on the few farmers/groups assisted by the institutions. ADRA in Kericho had the highest adoption rate: 80% of the farmers they worked with. Five of the nursery owners also indicated that farmers in their locality knew about calliandra and generally said it was a good tree, especially as a substitute for commercial dairy feeds.

Six of the ten farmers interviewed in central Kenya said they did not have enough calliandra to feed their cows and goats. Three had enough trees to feed their animals; of these, two had only goats and rabbits and the third person dried and stored excess calliandra fodder. One farmer had no animals and left the trees to grow for firewood. Respondents in this study reported cases of farmers who had calliandra but did not know how to use it, and there were others who had neglected their trees. Some farmers were said to lack both money to buy the seed and tree management knowledge. There were instances of trees being attacked by pests such as yellow beetles and termites and also by wildlife such as dikdik and antelopes.

Benefits of Calliandra

Calliandra for animal feed was the principal benefit perceived by nine of the ten farmers and three of the four groups interviewed in central Kenya. Eight of the farmers indicated that calliandra improved the health of cows and increased milk production. Milk from cows fed with calliandra was also said to be creamier.

Other benefits mentioned were improved soil fertility, firewood, and beauty (Table 8). Farmers in central Kenya considered seed production as a further benefit, and some of them had harvested seed that they hoped to get a market for. Unlike central Kenya, where calliandra was predominantly used as fodder, in western Kenya firewood was the most common use, possibly because few farmers have improved dairy cows or goats.

Table 8: Benefits derived from calliandra growing

Benefits of calliandra	**No. of farmers (N=10)**	**No. of institutions (N=13)**	**No. of groups (N=4)**
Feed for animals	9		3
Improving soil fertility and controlling erosion	5	5	3
Firewood	3		
Seed production/sale	2		
Beauty			1

Sources of planting material (Seed/seedlings)

In central Kenya KARI/ICRAF/KEFRI projects were found to be the major source of seed for both farmers and institutions. There are three different calliandra provenances (types) in KARI Embu, each with a seed stand. The Green Belt Movement was also reported to be providing seeds and seedlings in Meru Central. Farmers were also harvesting their own seed and using it to establish nurseries for expansion of their fodder hedges. Farmer groups were collecting seed from members to establish group nurseries which will later redistribute the seedlings. Other sources of seed are shown in Table 9.

Table 9: Sources of calliandra seed/seedlings for farmers and institutions

Source of planting material	**Product**	**Number of farmers**	**Number of institutions**
KEFRI	Seed		2
Timau farmer	Seed	1	
Meru Dryland farming Isiolo	Seed		2
Individual farmers	Seed		2
Farmer / Catchment Group	Seed/ seedlings	3	2
Own seeds/ own nursery	Seed/ seedlings	2	2
Farm Africa	Seed/ seedlings	2	
Laikipia seed centre	Seed/ seedlings	1	
KARI/ICRAF/ KEFRI Projects	Seed/seedlings	6	5
Wildlings	Seedling		1
VI Agroforestry	Seedling		2
NALEP	Seedling		1

The seven commercial seed farmers in western Kenya had no problems acquiring planting material. Five were using their own seed, one planted wildlings, another obtained seed from ICRAF and two obtained it from KWAP. Seedling sellers (nursery enterprises) in western Kenya got their seeds from Bukura Energy Centre and the ARU project that operated in Laikipia District.

All the farmers interviewed in central Kenya were members of groups. There was still heavy reliance on group nurseries to supply seedlings. Lack of water to establish nurseries, however, was a major problem cited by three groups, three institutions and three farmers. Although group nurseries are an easy way to acquire seedlings, in some cases they were not cared for due to group leadership and management problems. The nursery owners said that other problems were: lack of markets, lack of seed, high cost of seed, low price of seedlings, difficult seed harvesting and destruction of seedlings by wildlife such as antelopes (Table 10).

Table 10: Problems faced by seedling sellers

Problem	**Number of respondents (N=8)**
Lack of market	4
Lack of seed	3
Lack of water for nursery	1
High costs of seed	1
Low price for seedlings	1
Difficult seed harvesting	1
Antelopes destroying nurseries	1

Solutions suggested to solve these problems included: the use of Approtec Moneymaker pumps (foot and hand pumps) for irrigation; initiating or reviving Government water projects; and organizing study tours to expose and train farmers in improved technologies.

Seed production

Central Kenya

Seed harvested by six of the farmers interviewed was minimal, ranging from 250g to 3 kg (Table 11). This figure does not represent the total seed produced since most farmers were not harvesting much of their seed. The number of trees left for seed (instead of being pruned for feed) varied from 2 to 300 (mean = 98) per farmer. While most farmers were growing calliandra for fodder, the practice of leaving a few trees for seed was observed to be very common. However, farmers who could not plant all their seed had no idea where they could sell it. They also seemed to have very little knowledge of seed production and management skills.

Table 11: Total seed production per farmer in central Kenya

Seed weight in Kilograms	Number of farmers
0.00	4
0.25	1
0.30	2
1.00	1
1.50	1
3.00	1

Western Kenya

Both commercial and small-scale farmers produce seed for sale in western Kenya. The commercial farmers were producing an average of 69 kgs (sd = 73) per year. Individual small-scale farmers were said to produce at most 10 to 20 kgs of seed per year that they sold to seed vendors. Farmers reported having seed stands as well as hedges for seed trees. Commercial farmers regarded seed production as an income generating activity and five of them were also buying seed from other farmers.

Speeding up seed production

Institutional respondents were asked how seed production might be increased. Their suggestions are summarised in Table 12.

Table 12: Institutional suggestions on how to speed up seed production

Respondents' suggestions	Number of responses
Promotion to increase no. of farmers growing calliandra	6
Train farmers on seed collection & management	5
Encourage farmers to leave some trees for seed	5
Identify market for seed	5
Demonstrations	4
Give free seedling samples	4
Establish institutional bulking plots	3
Leave seed trees on hedge & boundaries	1
Introduce other benefits that don't require cutting tree	1
Identify areas of higher seed production	1
Establish individual farmer nurseries	1
Encourage group/institution nurseries	1
Reduce cost of seed	1

Calliandra seed/seedling market characteristics

Seed/seedling selling and distribution

Farmers, farmer groups and institutions were all found to be distributing seed and seedlings. Most of the farmers (8 out of 10) had introduced other farmers to calliandra growing through training and providing information on calliandra (7), giving free seedlings (4) or selling them seed (1). Most (9) institutions also distributed calliandra seed to groups (9), other institutions (3) and individuals (3). Nurseries sold their seedlings to the customers shown in Table 13.

Table 13: Buyers of seedlings from nurseries

Buyers of seedlings	**Number of nurseries (N=8)**
Individual farmers	5
Farmer groups	2
Institution (School, Churches)	3
NGO's	2
Chief camp	1

Three of the four groups had distributed calliandra seedlings to non-members as shown in Table 14. The groups mainly sold their calliandra planting material, although schools received free promotional seedlings from one group.

Table 14: Farmer group seedling distribution

Distributed to	**Number of groups (N=4)**	
	Mode of distribution	
	Sold	**Free**
Individuals	2	
Schools		1
Churches	1	
Molo farmer group	1	
Njoro farmer group	1	
Machakos farmer group	1	
ICRAF	1	
DGAK-Embu	1	

Commercial seed farmers mainly sold their seed to institutions and minimal amounts to individual farmers. ICRAF and VI, both involved in agroforestry promotion, were the major buyers of seed.

Table 15: Frequency of seed buying from commercial farmers

Institution	
ICRAF	5
Individuals	4
VI	2
KARI Kisii	2
GTZ	1
NTSP	1

Price of seed

In western Kenya seed farmers sold their seed at Kshs 200-700 per kg to vendors. The usual selling price by the commercial vendors was Kshs 700-1000 per kg, although two seed sellers interviewed sold calliandra seed at Kshs 650 and Kshs 1500 respectively. Among the vendors interviewed there seems to be a trend of prices becoming lower with time (Table 16). Although KWAP used to sell seed in the mid-1990s at Kshs 1 per 5 grams sachet (200 per kg), this was an unusually low price. VI also imported a large quantity of seed from Uganda for only 500 Kshs/kg in 2001. Of the institutions distributing calliandra seed, ten gave it free and three sold it at Kshs1500 per kilogram, which was the price at which they had bought it from KARI/ICRAF (i.e. the institutions sold at cost). Currently, ICRAF is also redistributing the seeds to farmers after it is repackaged to small quantities of 15g and 250g through the extension departments, NGOs, churches and agrochemical companies.

Table 16: Summary of seed purchase prices by institutional buyers.

Year	**Buyer**	**Seed wt (kg)**	**Buying price (Kshs/kg)**
1993	GTZ	60	2000
1998	NTSP	20	2300
	ICRAF	20	500
1999	ICRAF	100	500
2000	ICRAF	n/a	3500
	VI	340	1000
2001	ICRAF	2	600
	VI	400	500
	KARI-Kisii	50	700
	KARI-Kisii	70	500
2002	Individuals	0.5	500

Answers by nine institutions to a general question about their perception of current seed prices gave an range of Kshs 700-4000/kg, with five of them quoting a price of

Kshs 1500. ICRAF Programme II in Maseno sells leucaena seed at Kshs 2000 per kg. Seven of them felt that these prices were not reasonable, and some said that a lower price could increase adoption. Reasonable prices suggested for seed were Kshs 500 (by one institution) and Kshs 750 (by two institutions). Five institutions who felt that the prevailing seed prices were reasonable gave various reasons for their position including high labour costs for seed harvesting; the fact that a kilogram of seed has 15000-20000 seeds; high levels of demand; lack of competition in the market; and the need to make the business sustainable.

Farmer groups in central Kenya thought a reasonable price for calliandra seed was Kshs 1000-1500 per kg . There was a however a group in Mukurweini - Nyeri successfully selling seed in small packs of 65g for Kshs 200 each (approx. Kshs 3000 per Kg).

Prices of seedlings

Prices of tree seedlings varied, with the highest price reported being Kshs 20 for one seedling. The average price for fodder seedlings was Kshs 6, for timber trees Kshs 8, and for fruit trees (non-grafted varieties) Kshs 13. Timber trees and fruit trees tended to be more expensive and in higher demand, perhaps owing to their perceived high economic value.

Table 17: Selling price for seedlings.

Type of seedling	**Average selling price (Kshs).**
Fodder	6
Timber	8
Fruit (non-grafted varieties)	13
Ornamentals (bottle brush)	10
Coffee	25

Farmer groups suggested that a reasonable price for a calliandra seedling would be Kshs 5, although the groups do not usually sell seedlings to their members. Most institutions also reported prices for calliandra seedlings in the range Kshs 3-5, although prices as low as Kshs 0.2 and as high as Kshs 13 were also quoted.

Two of the institutions had fodder tree nurseries; their selling price per seedling ranged from Kshs 1 to 3. In western Kenya, KWAP set a precedent in the mid-1990s of selling seedlings at Kshs 1 and giving them away free to the seed farmers.

Pricing methods for seed

Seed vendors and institutions said they based their price of Kshs 1500/kg on KEFRI price lists. However, KEFRI, which buys seed from western Kenya, was found to be selling seed at the higher price of Kshs 2000 - a price they said was based on international guidelines. It seems the international prices for calliandra seed have

changed upwards but the institutions and vendors dealing with the seed in Kenya are not aware. The price they use may be from an outdated KEFRI price list.

Lack of power to control selling prices as well as uncertainty of markets forced vendors to pay much lower prices to seed farmers. Institutional buyers dictated their buying price for seed. There did not seem to be any guidelines among the institutions on how they did this. For example, VIAgroforestry in Kitale who were the major buyer of seed in Western Kenya had been offering Kshs. 700 per kg in 2001, however, in 2002, they lowered their buying price to Kshs. 500. VI argued that some vendors were willing to sell at this price, and being the major market they did not feel the need to pay a higher price! Vendors however felt this price was low in view of difficult seed collection logistics, delayed payments and uncertainty in markets. Some vendors refused to sell the seed to VI and the NGO imported seed from Uganda where it was cheaper; this resulted in vendors lacking a market for their seed.

Seed/seedling demand and supply in central Kenya

Lack of seed was a challenge in central Kenya mentioned by three (out of eight) seedling sellers, seven institutions and two of the farmers. Six of the eight nurseries also said that demand for seedlings was sometimes higher than they could meet. They attributed this inability to meet demand for calliandra seedlings to lack of seed and unexpected demand for high numbers of seedlings. There were also, however, farmers in central Kenya who had trees for seed that were not being harvested, owing to lack of a seed collection and distribution system.

According to participants at the dissemination workshop held in Nyeri, central Kenya at the end of the study (see Annex IV), farmers' lack of knowledge of the use and management of calliandra was said to be the major hindrance to its adoption. It was felt that if farmers understood the benefits of calliandra, they would look for planting material. Aggressive promotion by the extension services would also increase adoption to a great extent.

Seed demand and supply in western Kenya

In Western Kenya, lack of markets for seed was a major problem for five of the commercial seed farmers and for all the small-scale farmers. Only one farmer said he could not meet the demand for seed at times when unexpected orders came. At times when there was no market for seed, four of the commercial farmers said they stored the seed hoping for a future market, three said they planted some of it on their farm, while two said they gave some away.

Seed vendors knew that calliandra seed could stay viable for three years if stored in airtight containers, but that seed quality is affected by the storage conditions, with factors such as temperature and moisture having a great influence on seed viability.

Seed vendors in Western Kenya also depended heavily on assistance from ICRAF, KEFRI and the Forestry Department to find them markets for seed.
Institutions involved in agroforestry had nurtured the three seed vendors interviewed and they were still depending on institutions to find them markets for their seed.

Transportation of seed/seedlings to the market

Seedlings were transported on foot (using sacks), wheelbarrows, public transport, hired pick-ups, and sometimes vehicles belonging to institutions such as ICRAF, KARI and Farm Africa. Five farmers transported seed to buyers using public transport. The cost of public transport was usually the fare charged for the individual transporting the seed, since only a small amount of seed was transported on each occasion.

Seed marketing problems in western Kenya

Commercial seed farmers identified a number of problems in marketing their seed. These are shown in Table 18, along with the number of farmers articulating each of the problems.

The 'unfair competition from ICRAF and KARI staff' refers to staff who were buying and selling seed in an individual capacity, for personal benefit. This was mentioned by three farmers. Quality control for seed was also said to be difficult because of lack of knowledge about this.

The seed farmers also suggested various solutions to the problems they were facing (Table 19). Most of the suggested solutions focused on solving the marketing problem. Farmer education, mentioned by three respondents, would enhance calliandra use and so increase the market for seed.

Table 18: Challenges facing commercial seed farmers in western Kenya

	Number of farmers
Unfair competition by ICRAF and KARI staff	3
Lack of market	3
Lack of cash to buy seed from farmers	2
Lack of organised seed marketing system	2
Conmen posing as ICRAF staff and taking seed on credit	2
Delayed payments by ICRAF	1
Lack of documentation/system when ICRAF buys seed	1
No transport refund by ICRAF when checking delayed payments	1
Lack of information on buyers other than ICRAF	1
Labour for seed bed establishment	1
Shortage of water	1
Lack of seed packaging material	1
High cost of seedling tubes	1

Table 19: Suggested solutions to problems facing commercial seed farmers

	Number of farmers
Educate farmers on calliandra use	3
Develop seed marketing systems	3
Contractual seed farming	2
Seed vendors should form an association for marketing	2
Buyers to have proper documentation for seed purchasing	2
Training vendors in business	1
Water harvesting	1
Shops to stock packing material	1
Buyers to pay cash	1

Accelerating calliandra seed distribution

Institutional respondents suggested many possible ways in which the rate of dissemination of calliandra could be increased. These are summarized in Table 20.

Groups interviewed said that distribution could be improved by developing enterprises such as group nurseries (4), encouraging individuals to bulk seed (2), raising awareness in public fora (2), and greater involvement of MoARD (2). Commercial nurseries may be another avenue, but the owners must be trained to avoid the situation encountered in Laikipia and Eldoret, where some nursery owners were selling calliandra but did not know about its benefits.

Table 20: Institutional suggestions for improving seed distribution

	Number of Responses
Free samples of seed	6
Increased extension, and establishment of group nurseries	5
Promotion of calliandra as part of the MoARD extension package	4
Appointed seed stockists	3
More players in the market	3
Avoiding distribution of free seedlings	3
Marketing seed in small packs	3
Systems to collect, package and sell seed	3
Development of networks of seed sellers	2
Development of a calliandra ‘selling theme’	2
Improved quality control	2
Formation of a central coordinating body	2
Sensitization of farmers about the market	1
Training for more extension staff	1
Development of a pricing system	1

Promotion of calliandra seed sales

Four of the eight seed/seedling sellers interviewed said that they could increase their sales if farmers were educated about the importance and use of calliandra through barazas, field days and demonstrations. Other suggestions for improving sales included farmer training on seed stand establishment and management; good nursery site selection; seed-bulking stands; complementary activities such as beekeeping and providing bucks (he-goats) to dairy farmers (to improve dairy goats); and advertising via the extension services.

All the farmer groups interviewed were giving away free seedlings, especially to institutions. One group displayed seedlings at the market to raise awareness. One group had also held a field day; another gave informal training to farmers.

Of the seven commercial seed farmers, four promoted calliandra through barazas and field days, three by telephoning and visiting potential buyers, especially institutions, two by holding seminars in schools and churches, and two by collaborating with the Forestry Department. Other methods mentioned included demonstrations with KARI, ICRAF and KEFRI, selling seed at the market, and distribution of free samples. Two said that the most effective promotion method was collaboration with the Forestry Department, and one identified telephoning and visiting potential institutional buyers as the most effective method. However, promotion of calliandra is difficult in a new area because of the long duration (about one year) needed for the farmer to realize the benefits. Moreover, the benefits cannot be easily demonstrated in new areas where there is no one growing and feeding livestock with calliandra.

When asked how calliandra seed sales might be increased, four of the seven commercial seed farmers identified the need for a reliable market. One also expressed the need for information on export markets. Other suggestions included promotion through barazas, schools and churches, agroforestry displays at central locations such as markets, training of farmers, and development of stakeholder networks. Like the institutional respondents, they also suggested marketing seed in small packets.

Extension issues

Calliandra Management and Use

To increase adoption of calliandra, most respondents in this study felt there was great need for farmer education on management and use. The need for training was identified by seven out of eight seed/seedling sellers, three out of four groups, and seven out of thirteen institutions. Of the six farmers interviewed in central Kenya who did not have enough trees to feed their cows, two said they did not know calliandra could be fed to cows; this underlines the need for more widespread farmer training.

Nursery managers were also found to have very little knowledge of fodder trees. For example, we found a nursery in Eldoret shaded by a calliandra tree, which had been planted just over the fence on the property of the Forest Department office. The

nursery manager did not know the use of the tree; he thought it could be sold as an ornamental and had tried to germinate the seed but was unsuccessful. It is telling that he never thought to go to the Forest Department office to ask for information about propagating the tree.

Existing Extension Services

Eight of the thirteen institutions interviewed were providing extension services. However, four said they lacked knowledge about calliandra management, and three lacked funds for extension. Groups and institutions interviewed said that farmer exchange visits had been very useful in enhancing knowledge sharing.

Most farmers (nine of the ten interviewed) said they received some form of advice from extension agents. Advice received was on tree management and use and general agriculture and animal husbandry. Sources of extension information were: MoARD (7 farmers), ICRAF (2 farmers) KARI (2 farmers), Forest Department (2 farmers), Green Belt Movement (1 farmer) and radio programmes (1 farmer). MoARD was thus the main provider of extension services to farmers in central Kenya.

Discussions with MoARD representatives revealed that they were constrained both by lack of knowledge about calliandra management, and by lack of funds to carry out extension. In the course of the study it was noted that there was a clear gap in extension services in central Kenya. Where intensive extension was done, increased adoption was achieved. For instance, in Kagarii village, in Mukwereini Division of Nyeri District, the Divisional Extension Coordinator (DEC) reported 60% adoption. This was achieved by the active involvement of the MoARD staff.

Improving Extension

Institutional respondents suggested various approaches to increase adoption. These included encouraging farmers to join groups; extension approaches targeting whole households; individual nurseries, and promoting multiple benefits of calliandra.

A fodder tree dissemination facilitator has recently been recruited by ICRAF to serve western Kenya. Such a facilitator on the ground was hailed as an important way of increasing calliandra adoption. In central Kenya even the institutions that had been involved in extension seemed to have been more active when there was an ICRAF facilitator assisting them.

ADRA in Kericho also found farmer educators to be very effective, estimating that 80% of the farmers in the areas where they had worked had adopted calliandra. Contact farmers were said not to be effective in western Kenya, as they tended to be viewed as above average and atypical by other farmers, who did not therefore consult or learn from them.

CONCLUSIONS

Seed production and sources of planting material

The private sector in western Kenya is effective in providing seed for sale to institutional buyers. There is however no private sector mechanism supplying seed to farmers.

All the farmers interviewed in central Kenya were members of groups. There was heavy reliance on group nurseries to supply seedlings, because institutions prefer to provide seeds and training to groups rather than to individuals. Group nurseries, whilst an easy way for farmers to acquire seedlings, were in some cases not cared for because of group leadership and management problems. Some farmers learned how to establish nurseries in groups, then subsequently established their own nurseries. Individually owned nurseries are likely to be more efficient, because the owners bear all the risks and profits and are therefore committed to proper management. However, most farms have water problems, so individual entrepreneurial nurseries could be an effective alternative way to increase the amount of planting material available to individual farmers.

The practice of each farmer having his own seed trees makes it possible that once calliandra is adopted in an area, within a period of about three years, the area could be self-sustaining in seed. However, a situation where farmers are using their own seed in their own nurseries could result in poor trees due to low genetic diversity. Seed quality control is also difficult with individual farmers. A seed collection and distribution system that motivates the farmer to pool his seed with that of others is therefore necessary. It should also be noted that such locally self-sufficient systems would only be possible in those areas where there is no biological constraint to seed production.

Seed distribution and marketing

<u>Demand and supply</u>

Lack of seed was a major challenge in central Kenya, despite many instances of farmers who had seed trees which were not being harvested. Undeveloped demand, as a result of many farmers not knowing about the use of calliandra as a feed, has hindered initiatives to harvest seed. In addition, the continued availability and/or expectation of free seed from diverse sources tend to reduce the incentive to harvest the seed.

In western Kenya commercial and small-scale farmers were harvesting seed, but lack of markets was again a major problem. When farmers had access to a market for their seed they were motivated to harvest it. However, the distribution of seed is dominated by supporting institutions and organizations (see Diagram 1). In the absence of these institutions little marketing activity can go on since the seed vendors have no direct contact with the farmers, who reside mostly in central Kenya and Rift Valley Province and are the ultimate users of the seeds. The existing pricing structures for calliandra seed were also highly influenced by institutions promoting

fodder trees. It is therefore difficult for a ‘real’ price driven by market forces of supply and demand to emerge.

Developing an infrastructure to market seed for fodder trees is likely to be a challenge for several reasons. Currently, there is little private sector involvement in marketing tree seeds because of lack of economic opportunity. In fact even fruit trees, which have a more easily demonstrated value, are not yet sold through input distribution shops in most parts of the country. The Government of Kenya for a long time used to have a tree-planting day when seedlings were given free. There are also organisations distributing free seed, which may need to change their policies if a market is to develop. A system for marketing calliandra based on free market rules may not be feasible at present; a subsidised system may be the most realistic option.

Promotion activities

Training and education on calliandra use and management was ranked highly as an important way to facilitate expansion. While this may be true, it may not necessarily translate into tree planting. Despite 80% of the farmers saying calliandra had a noticeable effect on milk production, 60% of the farmers did not have enough trees to feed their animals. There are several reasons for the low number of trees: some farmers lack planting material, and others prefer to expand their numbers gradually.

As long as the dairy sector is managed well and the milk prices are attractive, there is adequate incentive for farmers to adopt and for cooperatives and marketing associations to promote fodder trees. Reliable and profitable milk markets in central Kenya will therefore be an important factor in promoting expansion of calliandra in the region. Farmers need to be educated to appreciate that they can increase their income by lowering the cost of milk production when they substitute calliandra for dairy meal. Unfortunately, however, the milk market is at present unreliable and seasonally variable. Many farmers are unable to sell their milk on a regular basis and are therefore not interested in new technologies to increase milk production. This is a major constraint to scaling up adoption of calliandra, and one that needs to be addressed at the policy level.

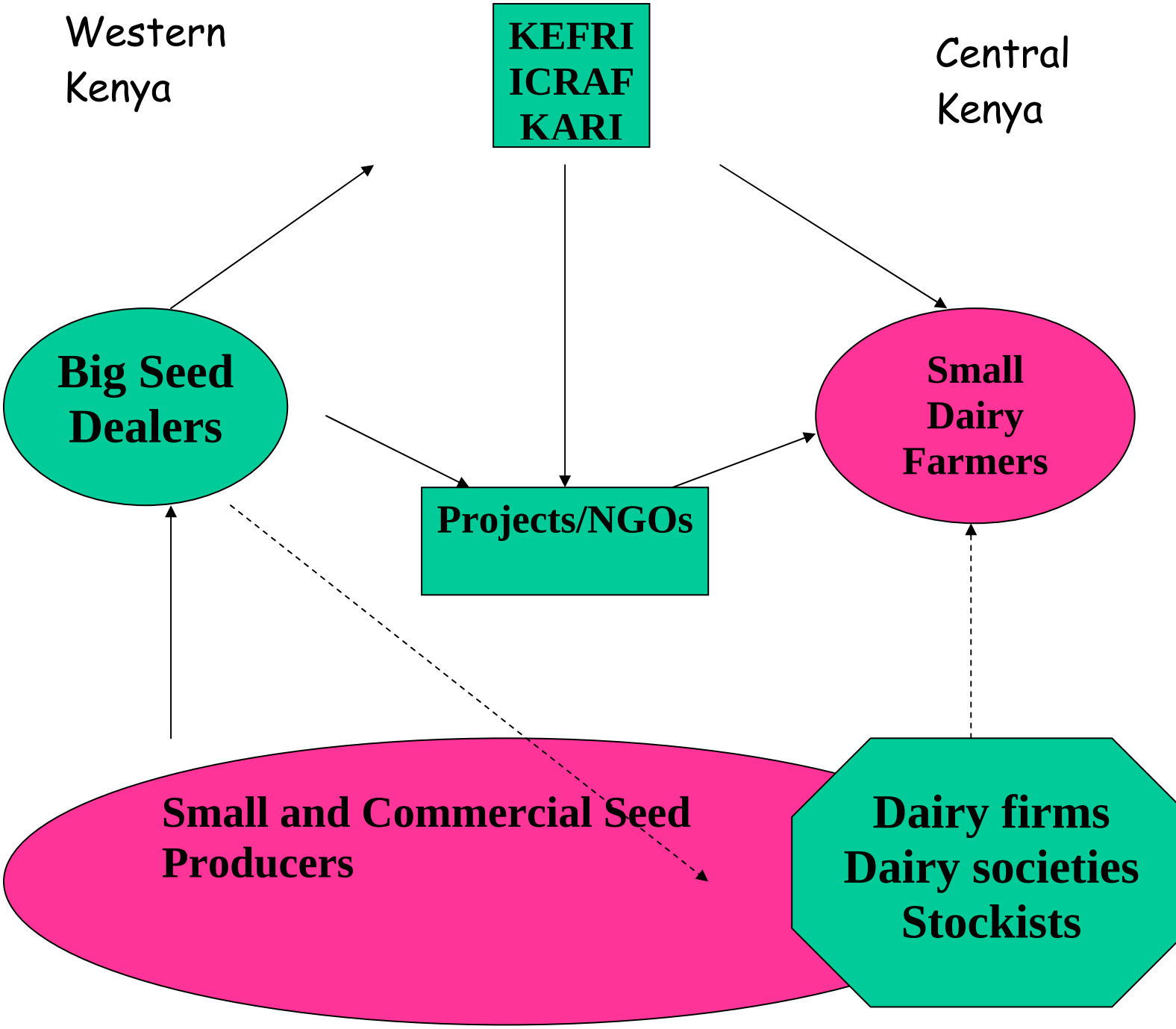

Diagram 1: Market chain for calliandra seed

RECOMMENDATIONS

Seed distribution and marketing options

Marketing and distribution of calliandra seed is currently operating as an unstructured system that results in confusion for market participants. Diagram 1 shows existing seed distribution channels. The broken arrows show key channels that need to be explored to ensure dairy farmers get seed. There is much market distortion and the ground is not level for the participants. At the same time, due to the undeveloped demand for calliandra, it is doubtful that a market-driven system will emerge on its own. Seed distribution and marketing, especially through the formal systems, will require the approval of KEPHIS. Negotiations with KEPHIS however can give room for experimentation before enforcing any rules.

To facilitate expansion, the following options for calliandra distribution and marketing should be tried and assessed to see which ones work best.

1. Linking seed marketing to other economically attractive activities ("piggy-backing" approaches)

Promoting calliandra as a stand-alone product has not been very successful. Promotion needs to be part of a larger package together with other development initiatives. Owing to the long time taken to see the benefits of the tree, farmers will need to experience other motivational benefits to initially adopt the technology and thus buy seed. Seed sales need to be attached to other economic activities, especially milk production and sale as suggested below:

- ***Through farmer associations and co-operatives***

Without a market for milk a farmer has no motivation to increase production. Milk marketing associations and co-operatives would therefore be a logical place to channel information and seeds. This channel of seed distribution would work especially well if these milk businesses are also offering animal husbandry training and selling animal feed.

- ***Through milk processing companies***

Private sector milk processing companies that give extension services to farmers (Brookside Dairy and Spinknit Dairies) need to be explored to see how they can be used to distribute planting materials as well as extension information for calliandra.

- ***Link calliandra seed marketing to marketing of other forage***

Other forages that are of high nutritive value and preferably take a shorter time to reach maturity can be promoted together with calliandra. This will give the farmer choice and variety and reduce the risk inherent in focusing on only one product.

2. Partnership with organizations and institutions

- ***Include calliandra seed marketing in wider promotion packages***

NGOs and companies that are working with farmers to increase production and marketing of milk need to be encouraged to include calliandra in their promotion package. For example, HPI may require farmers to plant a certain number of trees

before they receive a heifer. Organisations such as TechnoServe and Land o' Lakes can use the associations they are working with to channel information and materials to farmers.

- ***Include calliandra in other seed promotion initiatives***

Partner organizations involved in promotion of seeds, e.g. SCODP, which have a wide network of stockists, can buy seed from farmers and middlemen and repackage and promote it through their system. The shop attendants would then be trained in the basics of calliandra management and serve as sources of information.

3. Private sector seed/seedling distribution systems

Private sector marketing systems usually develop as a result of market forces of demand and supply. Entrepreneurs driven by a profit motive will usually evaluate and take up a business opportunity that is demonstrated as profitable. Existing seed vendors in western Kenya have survived by selling to institutions that later give out the seed for free to farmers. This is an artificial market situation that would collapse if the institutions pull out.

Seed marketing for crops like maize and annual vegetable is known to be competitive because of the high turnover of these products. Farmers have to buy fresh seed all the time and seed production requires specialized skills. The produce is also marketable. For crop varieties where the farmer can use his own farm-saved seed, however, most farmers do not buy seed (TechnoServe, 2000). Calliandra falls into the second category, since seed production does not require specialized skills. The turnover for seed is also low, because once a tree is planted it has a long life. It is therefore difficult to develop a profitable long-term private sector seed marketing system. However the following activities can be carried out:

- ***Focus on development of seed marketing in areas where calliandra planting is expanding***

In the areas where calliandra is expanding, the private sector can be used alongside other channels to improve supply of seeds. The following pilot trials are suggested:

- ***Develop the seed vendors***

Currently, vendors in western Kenya lack markets for their seed. They can be trained in business and technical skills and assisted to package seed in small packs and sell it through appointed stockists in central Kenya and areas where calliandra growing is expanding. The assistance to the vendors would be mainly in form of information and linkages to sources of finance and equipment.

Some local vendors should also be encouraged to buy seed from farmers and groups in central Kenya. Such pooling of seed from several farmers will maximise genetic diversity. Some progressive farmers, such as those in Nyeri who are already harvesting and selling seed, could be encouraged to collect seed from other farmers for resale. Entrepreneurs with tree nurseries might also be good candidates to buy and resell calliandra seed.

- ***Sell through existing private nurseries***

ICRAF studies have found an extensive network of private nurseries throughout central Kenya. Existing nurseries can be supported with training and linkage to sources of seed. Most of these nurseries already have reliable water sources, which is a limitation to most individual farmers.

- ***Sell seed through appointed stockists***

In areas where calliandra is expanding, it is recommended that a pilot project be developed to sell seed through appointed stockists who can buy seed from vendors and resell. Stockists who have refrigeration services (mainly those selling livestock vaccines) should be preferred because of storage of rhizobia and the seeds. The stockists can receive brochures with simplified information that they can give to those who buy seed. This approach would ensure that seed could be available to all who could buy it, and do away with the mystery of lack of seeds or availability to only those who are in groups.

Promotion activities

The selling themes for fodder trees need to be emphasized: for example the "calliandra story" that with only 500 trees per cow, farmers do not need to buy protein feed. Awareness should be raised among dairy farmers so that when they think of a protein feed, they think of fodder trees such as calliandra. Possible promotional methods include:

- ***Free samples for first introduction of calliandra to a new area***

When entering a new area, groups can be given free seed for the first nursery demonstration that they establish but thereafter they should buy the seeds. It is expected that farmers who are early adopters are the only ones who may be willing to buy seed before they see the demonstrated benefits of the fodder tree. However, it is important to attach value to the tree at an early stage.. Seed should be available for sale from the start since small free samples alone will not provide enough seedlings to give clear benefits, and the farmers will therefore have no incentive to expand.

- ***Market seed in small, affordable packs***

Seeds should be packed in small packs that farmers can afford. Basic tree management and use information could be included in the sachet. A reasonable pack could contain the amount of seed required to establish trees enough to show the effect of feeding one cow. Assuming 100 trees are required per cow, and the tree survival rate is 50%, 200 seeds will be required. With a kilogram of seed having approximately 20,000 seeds, sachets of 10g will be appropriate, giving 100 sachets per kilogram. Assuming a price of Kshs 1500/kg, 10g would cost Kshs 15. Including the cost of packaging, the price could be Kshs 20 per 10g sachet.

- ***Publicity***

Promotion that reaches wide and relevant audiences is required. Newspaper releases and easy-to-read brochures and handbills can be used to provide basic information. A video can also be developed and used for promotion, e.g.,working through Regional Reach television shows in rural areas. This kind of promotion should be used when the basic structures of seed distribution and extension services

are in place. The key selling point of calliandra as a partial or complete substitute for dairy meal should be emphasized.

Training activities

Being a new product, calliandra requires intensive extension to large numbers of dairy farmers with information on management and use. Moreover, because of the long period between planting and feeding (about one year), information is needed at different times. Extension staff must return some months after planting, to explain to farmers how to feed. It is therefore important to:

- ***Ensure extension staff have accurate and up-to-date information***

Extension staff of networking organizations needs training in calliandra management and continual updating on research findings to maintain accurate information. Local government officials who enforce tree-cutting bylaws also need training to understand calliandra use, so that they do not inadvertently hinder expansion.

- ***Exchange visits to demonstrate benefits to farmers in new areas***

Farmers who are opinion leaders need to be facilitated to visit areas where calliandra has been successfully grown and used as animal feed. The testimonies of other farmers will give them the desire to try it out as well.

- ***Private farmer extension***

Individual entrepreneurial farmers should be developed to have model farms that demonstrate the management and use of calliandra. Such farmers would then charge a small fee for entry to their farms.

Economies of Scale in Seed Production

- ***Encourage seed production and marketing only in areas with high potential for calliandra to set seed***

There was a general observation that trees did not seed very well in some areas of central Kenya. This finding needs to be verified by researchers. Moreover, farmers in central Kenya lack sufficient area to grow many calliandra trees for seed, because, unlike pruned trees grown for fodder, seed trees interfere with crops growing near them. There is need to find areas where seeding levels are good and land is available, and to encourage production of high quality seeds in those areas.

Coordination Activities

- ***Facilitate development of links and markets***

There is need for a business-oriented secretariat to coordinate and facilitate production, distribution and marketing of calliandra seed. Working with collaborators and partners this secretariat would:

- promote value/price-based distribution of calliandra among partners
- facilitate collection and dissemination of market Information
- develop linkages among partners in seed distribution and marketing
- co-ordinate extension services
- prepare training programmes
- give feedback to research and disseminate new information.

ICRAF has, to a large extent, been playing this coordination role, and it may be the best-placed organisation to continue this role in the short term, since the distribution of tree fodder seed is still quite undeveloped. However, in the long term, there is need to facilitate development of distribution systems that do not require continuing institutional support.

ACKNOWLEDGEMENT

This publication is an output from a research project funded by the United Kingdom for the benefit of developing countries. The views expressed are not necessarily those of DFID. Project R6549, Forestry Research Programme.

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ANNEXES

ANNEX I: SEED VENDORS GROUP FINDINGS

Description of seed vendors and their businesses

Three seed vendors, considered to be among the largest in Western Kenya, were interviewed. These were:

1. Angela Wekesa: Seed seller based in Kitale
2. Charity Muriuki: Seed seller based in Kitale
3. Patrick Musamula: Seed producer and seller based in Vihiga

These vendors deal with a variety of tree seeds that they buy from Tranzoia, Busia, Maseno and Kakamega areas. Most of the seed is bought from Busia where there are farmers with seed stands. Other farmers mainly plant seed trees along contours. The highest volume bought from farmers in one lot is about 10-20 kg per year. Each vendor has about ten farmers from whom they collect seed. These farmers would usually have received seeds from other farmers in the neighbourhood so the vendor does not have to move from farm to farm. Vendors also buy from middlemen who collect from the farmers.

The vendors run their businesses from their homes. Seeds are usually bought seasonally and stored in airtight containers. Cutting open a random sample of seeds with scissors, or sending seed to ICRAF for laboratory testing, are methods sometimes used to determine the seed viability. In most cases seeds are bought from well-trained seed producers. The maximum volume traded by an individual vendor is 100kg per year.

Reasons for going into seed business

Two of the vendors realised the opportunity for trading in tree seed when they were in employment. Charity was a former employee of VI Agroforestry Project responsible for seed purchases. Patrick initially worked for the Forestry Department. Another trader, Angela, had began to sell tree seeds on her own; she was then trained as a seed seller by VI, realized that agroforestry institutions were frequently looking for seed, and set up her own business.

Tree seed markets

In some cases seed was bought and stored, hoping for orders, while at other times seed was bought to supply an order. Seed was sold to a variety of buyers including:

<u>Local markets</u>

- Energy centre Busia
- KWAP
- Small scale farmers
- Livestock Development Program, Kisumu
- Forestry Action Network (Muranga and Kiambu)

- ICRAF Embu
- Evangelical Lutheran Church of Kenya, Kisumu
- ELCK West Pokot
- VI Agroforestry project
- LEVMP (Lake Victoria Environmental Management Programme)
- World Vision, Marakwet (for Casuarina)

Export markets

- NTSP Tanzania
- Netherlands Embassy, Dar-es-Salaam, Tanzania
- ICRAF Kabale, Uganda
- ICRAF programme in Butare, Rwanda
- IUCN Mbale ,Uganda
- World Vision Zambia (for Sesbania)

Promotion

The following promotional techniques were used: good business name, brochures, farmer meetings, chiefs' barazas, collaboration with primary schools, and contacting NGOs involved in tree promotion. One of the vendors had held a field day to promote seed production.

Pricing

The selling price for the seeds by vendors was based on KEFRI prices and those set by institutional buyers. Dealers were unhappy with these prices, which ranged from Kshs 700 to 1000. The buying price paid to the farmers ranged from Kshs 200 to 700.

Distribution

Seed was mainly transported by public means, sent by courier or buyers would collect it for themselves. Seed for sale was packed in sacks, brown paper bags and plastic containers. Storage chemicals were not being used.

Challenges faced

Seed vendors said they faced problems in seed marketing because of lack of systems, inconsistent orders, expensive business premises, high reliance on ICRAF facilitation, excess seed, pests, and farmers lacking knowledge on seed collection methods.

Other problems mentioned were low profit margins due to high sourcing costs, selling price, defaults in payments by organizations, competition from ICRAF/KEFRI staff involved in selling seed privately, and lack of collaboration between the sellers.

To improve marketing of seed the farmers suggested that ICRAF should buy seed through a tender system to ensure there was transparency, establish a farmers' information network, introduce regulations and systems, provide information on

markets, establish a seed website, provide commercial seed sellers with refrigerators for proper storage on a loan basis, and stop giving away free seed. Facilitation is also needed in acquiring equipment for seed packaging, training, drawing up production agreements with farmers, getting credit for buying seed, and paying seed processing costs.

ANNEX II: SMALL-SCALE SEED FARMER RESPONSES

Five small-scale seed farmers were interviewed as a group in Maseno (western Kenya). The following are the findings from their discussions.

Uses of calliandra

The farmers said they found calliandra useful for firewood, fodder for animals, bee keeping, soil conservation and enhancing soil fertility.

Sources of planting material

The farmers got their calliandra planting materials from various places over the years as follows:

1. MoARD, Ahero Multi-Purpose Centre – 1984
2. CARE (Kenya), Siaya -1986, 1998
3. Busia FTC during farmer field days – 1996
4. KEFRI , Maseno - 1999
5. ICRAF –2000, 2001

Challenges in marketing calliandra

Small-scale seed farmers faced various challenges, including lack of markets, farmers expecting to be given free seedlings, some trees planted in early 1990's drying up, farmers not understanding or appreciating the uses of calliandra, lack of polythene tubes to pot the seedlings and theft. Prohibitive by-laws restricting farmers from cutting trees in their own farms also make them wonder why they should plant more trees.

Solutions to challenges

To develop markets for planting material, the farmers suggested that NGOs should buy seeds or seedlings from suppliers, and demonstrate with other farmers. Seed dealers should also visit seed farmers to brief them about their seed requirements, and leave contacts for the farmers to follow up. Seedling farmers also need to promote calliandra among their neighbours.

ANNEX III: LISTS OF RESPONDENTS

List 1: Farmers interviewed by district (central Kenya)

Name	Village	Location	Division	District
David Gatune	Kiaragana	Kieni	Runyenjes	Embu
Joseph M'itonga	Kathigau	Mwangabia	Abuthoguci East	Meru Central
Fabian Biicia	Kaongoru	Mwangathia	Abuthoguci East	Meru Central
Joseph Thogo Gitonga	Mungaria	Aguthi	Tetu	Nyeri
Daniel Gathimba	Lugutu	Sigira	Central	Laikipia
Wanjiku Gakindu	Migiti	Gakundi	Mukurweini	Nyeri
Grace Nyaguthii	Kagarii	Gakundi	Mukurweini	Nyeri
Francis Muya	Mbioene	Gakundi	Mukurweini	Nyeri
Victoria Wangui Mutu	Migiti	Gakundi	Mukurweini	Nyeri
Lawrence Kamande	Thoome	Tigithi	Lamuria	Laikipia

List 2: Institutional Respondents

Institution	**Name Of Respondent**	**Title**
MoARD - Meru Central District	Silas M Kamundi	Divisional Livestock Extension Officer
ACK Diocese Of Embu-Development Office	Sicily Muthoni Murei	Development Coordinator
Catholic Diocese Of Embu, Integrated Rural Development	Elias Njagi	Nursery and farm worker
Farm Africa, Meru District	Anthony Mureithi	Senior Monitoring Assistant
KARI - National Agroforestry Research Project	Lucy Ireri	NARP Technical Assistant
KARI - National Agroforestry Research Project	Kiruiro Erastus Mbugua	NARP Project Manager
MoARD Nyeri District	Mr Gichungu	District Livestock Production Officer
MoARD – Mukurweini Division	Kareithi David	Divisional Extension Coordinator
Forestry Dept – Municipality Division, Laikipia District	Margaret Mwangi	Divional, Forestry Extension Officer
MoARD – Nyeri District	Mureithi J Munyiri	District Soil Conservation Officer
Ministry Of Energy –Bukuria	Patrick Kodhek	Nursery Worker
ADRA Kericho	Stella Wanjau, Everlet Wafula	Project Officers
VI Agroforestry Project	Juliet Cheptoo	Extension Officer

List 3: Commercial seed farmers

Respondent	Village	Location	Division	District	Address	Tel No
Patrick Musamula	Iduku	Wumuruma	Vihiga	Vihiga	Box 1402 Maragoli	733865264
Peter Ogolla Makokha	Bululo	Nangoma	Matayos	Busia	Box 100 Matayos	
Wilfred Egesa Wede	Muyafua	Nangoma	Matayos	Busia	C/O S Wabwire Box 90 M	
Joseph Asina Odhek		Nyamninya		Siaya	Box 41 Yala	
Jerusa Ogolla	Nyambula	Malachi	Butula	Busia	Box 77 Murumba	
Rhoda Wanjala Sisa	Muyafua	Nangoma	Matayos	Busia	Box 90 Matayos	
Liyala Christopher	Nyambula	Malachi	Butula	Busia	Box 77 Mulumba	

List 4: Seedling sellers (nursery operators)

Respondent	Business Name	Address	Tel No.	Village	Location	Division	District
Saberio Mugambi	Kathigau Dairy Goat Project	Box 379 Mwanganthya		Kathigau	Mwanganthya	Abothoguci East	Meru Central
Daniel Gathimba	Gathimba Tree Nursery	Box 579 Nanyuki		Rugutu	Thigira	Central	Laikipia
Lucy Gathoni	Gatakaine Catchment & Nursery	Box 55 Karatina		Data Not Collected	Data Not Collected	Dia	Kirinyaga
Gerald Juma	Kagaria Catchment	Box 5 Gakindu		Gakindu	Gakindu	Mukurweini	Nyeri
Jane Waringa	Laikipia East Tree Seed	Box 330 Nanyuki					Laikipia
Tilikia Joseph	Ministry Of Energy-Wambugu	Box 1400 Nyeri	0722-855235			Municipality	Nyeri
Julius Aduo	ICRAF Program Ii	Box 5199 Kisumu	035-51163/4				Kisumu
Group Members	Milimani Women Group	Box 2006 Kitale	0325-20139				Transnzoia

List 5:Farmer groups

Name Of The Group	Village	Location	Division	District
Meru Goat Breeders Assoc	Igane	Mwanganthya	Abothoguci East	Meru Central
Kiawanja Catchment	Kiawanja	Gaturi	Nimbale	Embu
Kagarii Catchment	Githunguri	Gakindu	Mukurweini	Nyeri
Gatakaine Catchment & Nursery	Data Not Collected	Mugoi	Dia	Kirinyaga

List 6: Institutional partners in agroforestry

Partners
Department of Forestry
MoARD
KARI
ICRAF
Farm Africa
Meru Dryland Farming Project
Ministry of Energy
Wambugu Farmers Training Centre.
Plan International
Catholic Dioceses
Kenya Neem Foundation-ICIPE
KEFRI
Bukura Agricultural College
Kerio Valley Development Authority
Universities and colleges

ANNEX IV: PROCEEDINGS OF DISSEMINATION WORKSHOP HELD IN NYERI ON 30/10/2002

At the end of the study, a one-day workshop was held in central Kenya, attended by some of the respondents in this study (see list of participants below).

Workshop objectives:

- To report to different stakeholders the findings of the calliandra distribution and marketing study
- To discuss, confirm and modify the study findings
- To seek suggestions on how to improve the report
- To exchange information between the participants on relevant issues

Workshop discussions:

Seed production and distribution

According to the participants, seed production was not a problem, although harvesting was a challenge because of the explosive nature of the pods and the height of the trees: some seed-bearing pods are too high to reach. There is therefore a need for advice on seed collection methods. Seed viability was also mentioned as an issue that needs attention. A representative from KEFRI felt there was adequate seed supply in central Kenya. However, farmers from the region disagreed, saying that seed supply was quite low.

Slow adoption was attributed to calliandra being a new species in the area and the culture of expecting instant benefits. Calliandra takes a long time to mature, and it is easier just to buy dairy meal and see results immediately, if money is not a constraint. Lack of knowledge on calliandra use and management was said to be a major hindrance to adoption: if farmers understood the benefits of calliandra, they would look for the planting material. Training of extension officers and other extension providers is therefore of paramount importance in accelerating the adoption of calliandra. It was generally agreed that to scale up calliandra adoption, there should be more emphasis on raising awareness and conducting training on calliandra management and use.

It was recommended that calliandra promotion should emphasise the multiple benefits of the tree for fodder, firewood, beekeeping, soil conservation and as a windbreak on horticultural farms,, but that the nutritional benefits of the fodder should be the main focus. Since increased milk production is hindered by both quantity and quality of fodder, calliandra promotion should address both these aspects, possibly by looking also at other bulk source of livestock feeds such as Napier grass. New ways of using calliandra also need to be explored, such as its incorporation in processed feeds.

Promotion should also include other fodder trees in order to give farmers more options. Packaging of seed should be appropriate to the needs of the farmers and available to all socio-economic strata. Labelling of the packs should give key

information, such as how to plant and how many trees are needed to feed one cow or goat. The issue of KEPHIS involvement should also be addressed.

Free seed samples

Giving free seed was seen as hindering adoption instead of enhancing it. Free seed samples result in too few seedlings to have a perceptible impact, so that the farmers have no incentive to expand from that level. The issue of whether to provide free seed samples initially, or to sell seed from the beginning, needs to be addressed if there is to be a harmonized approach to seed and seedling distribution. This is complicated as it involves many actors who approach the issue in different ways, Developing a unified approach would be a major challenge.

Extension

Innovative extension approaches with a variety of learning methods should be explored. For example, extension methods involving private farmers should be encouraged. Such farmers would probably charge a small fee for entry to their farms, or receive payment in kind from sponsoring institutions, such as free or subsidised inputs. Institutions should complement the private extension sector and avoid introducing approaches that would compete with them, such as giving free seeds in areas where the private sector is already selling the seeds. Distribution of technical brochures and other written materials should be accompanied by extension services, so that farmers can easily understand them.

Other questions and reactions by participants

Q.1- Why is it that most of seed production is in western Kenya while the majority of farmers growing calliandra are in central Kenya?

REACTION: Most farmers in western Kenya leave the trees to grow for seed production, unlike in central Kenya where they grow calliandra for fodder production purposes.

Q.2 -Why is there no expansion on calliandra stands established by farmers on their farms as far back as 1994?

REACTION: Reception of calliandra was not good owing to:

(a) Poor economic situation in central Kenya.
(b) Poor milk marketing system.
(c) Lack of adequate information on the benefits of calliandra.
(d) Inadequate information flow mechanisms.

OTHER OBSERVATIONS:

- Viability of seed up to 5 years is possible if stored in airtight containers at low temperatures (4°C).

Dissemination workshop: List of participants

1. Margaret Wanjiku Mwangi
   Forester
   Ministry of Environment Forest Department
   P.O. Box 330
   Nanyuki.

2. Peter Muriuki Kimotho
   Agribusiness Dev. Officer
   ABLH
   P.O. Box 1127
   Kerugoya
   Tel 0163-21676

3. Joseph Muniri Mureithi
   District soil & water Conservation Officer
   Ministry of Agriculture & rural Development
   P.O. Box 899
   Nyeri.
   Tel: 0171-2420

4. James Gathu Gitahi
   District Irrigation Engineer
   Ministry of Agric & Rural Dev
   P.O. Box 222
   Kiambu.
   Tel: 0154-22928
   Fax: 0154 22655

5. Joseph Thogo Gitonga
   P.O. Box 12406
   Nyeri
   Tel 0722 639707

6. Gerald Juma Gichohi
   Kagaria Catchment
   P.O. Box 5
   Gakindu.

7. Boniface Mbogo Gitonga
   Technical sale representative
   FARMCHEM
   P.O. Box 18407
   Nairobi.
   Tel: 0733-576418
   Fax: 02-540595/551207

8. J.M. Muturi
   Research Officer
   KARI
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   Embu.
   Tel: 0161 20116

9. Esther Karanja
   Extensionist/Sale promoter
   SCODP/FIPS
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   Nairobi.
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10. Paul Tuwei
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    Email: H.Mukhongo@cgiar.org

13. Joseph Kihanya Mwara
    Field Officer
    Ministry of Agric & Rural Dev
    P.O. Box 222
    Kiambu.

14. Sicily Muthoni Mureithi
    Development Coordinator
    ACK- Emmbu
    P.O. Box 189
    Embu.
    Tel: 0161-20618/20264
    Email: ACK-embu@maf.co.ke
    secily@beatnetcybetcafe.com

15. George Nganga Gichungu
    DLPO-Nyeri
    MOA&RD
    P.O. Box 899
    Nyeri
    Tel: 0171-4392

16. Joseph Tilikia
    Center Manager
    Wambugu Energy Centre
    P.O. Box 1400
    Nyeri
    Tel: 0171-4342 /0722 855235

17. Lucy Mwaura
    ICRAF
    P.O. Box 30667
    Nairobi.
    Tel 02-524000
    Email: l.mwaura@cgiar.org

18. Dr Steve Franzel
    Agric Economist
    WAC ICRAF
    P.O. Box 30677
    Nairobi.
    Email: s.franzel@cgiar.org

19. Jens-Peter LillesØ
    Seed Supply specialist
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    Nairobi
    Tel: 02-524220

20. Charles Wambugu
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ANNEX V: QUESTIONNAIRES

1 Farmer Questionnaire

2 Key Informant Interview guide

3 Large scale seed producers / Dealers Questionnaire

4 Calliandra seed and seedling Dealers Questionnaire

5 Group Interview Guide

CALLIANDRA MARKETING AND DISTRIBUTION STUDY Code_____

Date_____

ENUMERATOR_____

FARMER QUESTONNAIRE_____

To understand the Institutional, economic and cultural forces shaping the market for calliandra seed and to define factors to be in place for sustainable seed production.

1. Name of respondent: _____
2. Village _____Location_____

   Division _____District_____
3. Age of respondent_____ Sex: Female _____Male____

PRODUCTION DATA & USE

4. Which fodder shrubs and trees do you grow in your farm?_____
   _____
5. When did you start growing calliandra? _____
6. How many calliandra trees do you have on your farm?_____
7. Where do you get your calliandra planting materials (seeds and seedlings) from?_____
   _____
   a. If you buy them, at what price? Price of seeds /kg_____
      Price per seedling_____
8. How many trees have you left for seed production?_____
   a. How much seed do you produce per season? _____
      No. of seasons _____Total production per year? _____
   b. What do you do with the seeds that are produced?

_____
_____
_____
_____

9. How many more trees do you hope to plant in the near future?_____
10. What benefits do you get from growing calliandra? _____
    _____
    _____

ANIMAL FEEDS; MILK PRODUCTION & MARKETS

11. Describe your livestock/ practices/activities in the table below:

Description/Activity	Cows	Goats
Number of dairy animals		
Number being milked		
Milk production (litres per day)		
Volume of milk sold daily		
Selling price per litre		

12. Do you have enough fodder trees to sufficiently feed your cows/goats?
    1.Yes_____2.No_____

    Explain_____
    _____
    _____
    _____
    _____
    _____
    _____

13. Does feeding calliandra on your dairy cows and goats have a noticeable change on their milk production? 1. Yes_____ 2. No_____

    Explain_____
    _____

14. What challenges do you face in milk production and marketing?
    _____
    _____
    _____
    _____
    _____

    a. What solutions would you suggest to solve these challenges?
       _____
       _____
       _____
       _____
       _____

CALLIANDRA MARKETING AND DISTRIBUTION STUDY Code_____

Date_____
ENUMERATOR_____

KEY INFORMANT INTERVIEW GUIDE

To understand the Institutional, economic and cultural forces shaping the distribution and marketing of calliandra seeds/ seedlings and to define factors that need to be in place for sustainable seeds/seedlings production and distribution.

This questionnaire will be used to collect information from key informants in institutions (KARI, Farm Africa, Ministry of Agriculture and any other)

1. Name of institution_____
2. Address_____Tel:_____
3. Names of respondents:
   _____
   _____
   _____
4. Describe the agro-forestry activities that you are you involved in.
   - Activities_____
     _____
     _____
   - Partners_____
     _____
     _____
   - Groups (No? type?)_____
     _____
   - Other_____
     _____
     _____
5. Does your organization distribute calliandra seeds or seedlings to the farmers
   - 1. Yes_____ 2. No_____
6. What is your mode and mechanism of calliandra distribution

	Mode of distribution (free, subsidized, at cost, market price)	**Price for seed**	**Price for seedlings**
Groups			
Institutions			
Individuals			

7. Where do you get the seeds or seedlings from?
   _____
   _____
8. What are the prevailing prices for calliandra seeds/seedlings in this area?

   Price for seeds(Ksh/kg)_____
   Price for seedlings(Ksh/seedling)_____
9. Are these prices reasonable? 1. Yes____2. No _____

Explain_____
_____
_____
_____

10. In your opinion, what is the percentage of farmers that is growing fodder trees in this region?_____

11. In your view what are the necessary pre-requisites to speed up calliandra adoption concerning the following:

a. Seed production (Methods/ systems? Scale? Cost? Promotional activities?)

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

b. Seed distribution/marketing (Institutions? Free seed? Subsidized? At cost? Privatisation? Farmer participation? Etc)

_____
_____
_____
_____
_____
_____

12. What challenges do you face in promoting calliandra?

_____
_____
_____
_____
_____

13. What can be done to overcome these challenges?

_____
_____
_____
_____

14. Any other comments?

CALLIANDRA MARKETING AND DISTRIBUTION STUDY Code_____

Date_____

ENUMERATOR_____

LARGE SCALE SEED PRODUCERS / DEALERS QUESTIONNAIRE

To understand the Institutional, economic and cultural forces shaping the distribution and marketing of calliandra seeds/ seedlings and to define factors that need to be in place for sustainable seeds/seedlings production and distribution.

BIO-DATA

1. Farmer's name/Name of respondent_____
2. Sex: Female _____Male_____
3. Village_____Location._____

   Division._____District._____
4. Address_____ Tel No._____

PRODUCTION

5. How long have you been producing calliandra seed?_____
   a. How many calliandra trees do you have in your farm?_____
   b. How many calliandra trees have you left for seeds production_____
6. Do you produce your own seedlings? 1. Yes_____2.No._____
   a. If yes, how much of these do you sell to other farmers? _____
   b. At what price? _____
   c. If no, where do you get planting material (seeds/seedlings) from?

   SOURCE **PRICE**

   _____
   _____
   _____
   _____
7. On average, how much calliandra seed do you produce?

   Per season?_____ No. of seasons._____Production per year?_____

8. On average, how many trees have you been planting at a time?_____

    a. How many of these trees survive_____

9. How much do you think it costs you to manage your calliandra farm per year/ Per season for the following activities?

ACTIVITY	**COST (Kshs)**	**REMARKS (Acreage, No. of trees, No. of seasons, etc**
Land preparation		
planting costs		
Manure cost		
Fertilizer Cost		
manure & fertilizer application costs		
Weeding		
Pruning		
Pest control - spraying		
Harvesting		
Drying and Threshing		
Packaging		
Others (specify)		
Total		

10. Do you buy calliandra seed from other seed farmers? 1. Yes___2. No___

    a. If yes, about how much per season _____Per year_____

    b. At what price do you buy the seed? _____

11. Who are your customers for seed and about what volumes do they buy (based on your sales in recent years)?

Type of customer (Name of institution, individuals, etc)	***Volume of seed bought***	Selling price/kg	Remarks

12. How do you transport the seeds for sale?_____

    a. What is the cost of transport?_____

13. Are there any times you don't meet your customers' demand?
    1.Yes___ 2.No—

    a. If yes, by about how much?_____

13. Are there times when you have no market for your seeds and seedlings?

1.Yes---------- 2.No---------

If yes, what do you do with the excess seeds

_____
_____
_____

14. How do you market/promote your seeds (forum, ways)

_____
_____
_____

15. Among these marketing ways and forum, which have you found to be the most effective and why

_____
_____
_____
_____

16. How can you increase your sales for calliandra seed/seedlings?

_____
_____
_____
_____

17. What are your customers/ farmers' general comments on calliandra seeds/seedlings, trees?

_____
_____
_____
_____
_____

18. What challenges do you face when marketing calliandra seeds and seedlings?

_____
_____
_____
_____
_____
_____

a. What would you suggest as solutions to these challenges?

_____
_____
_____
_____
_____
_____

19. What other comments do you have about calliandra?

_____
_____
_____
_____
_____

CALLIANDRA MARKETING AND DISTRIBUTION STUDY Code_____

Date_____

ENUMERATOR_____

CALLIANDRA SEED AND SEEDLING DEALERS QUESTIONNAIRE

To understand the Institutional, economic and cultural forces shaping the distribution and marketing of calliandra seeds/ seedlings and to define factors that need to be in place for sustainable seeds/seedlings production and distribution.

1. Name of Respondent / Business owner's name _____
2. Business name _____
3. Sex: Female_____ Male_____
4. Address_____ Tel No._____
5. Town/ Market/Village _____ Location_____
   Division_____ District_____
6. Number of years in business? _____
7. Number of employees? _____
8. What products do you sell and at what price?

Product	**Price Per…..**	**Remarks**

9. About how much calliandra seed/seedlings do you sell?
   Per season?_____ Per year?_____
10. When did you start selling calliandra seed/seedlings?_____
11. Where do you buy or get your seeds from?_____
12. What is your:
    a. Buying price for seed? Kshs_____Per_____
    b. Selling price for seeds? Kshs_____Per_____
    c. Selling price for seedlings? Kshs_____Per_____

13. What approximate volumes of calliandra have you sold in previous years?

Year	Seeds (amount)	Selling price	Seedlings (No)	Selling price	Remarks

14. How do you compare the sale of calliandra to that of other products that you sell:_____
_____
_____

15. Who are your customers for calliandra seed/seedlings and about what volumes do they buy?

Type of customer (Name of institution, individuals, etc)	***Volumes bought***	***Remarks***

16. How do you transport the seed/seedlings?_____

17. Are there any times you don't meet your demand? 1. Yes_____2. No___

    a. If yes, by about how much?_____Explain:
_____
_____
_____

18. Are there times when you have excess of seeds or seedlings (no market)?

    1. Yes _____ 2No_____

    a. If yes, what do you do with the excess seeds or seedlings

19. How can you increase your sales for calliandra seed/seedlings?
_____
_____
_____

20. What are your customers' general comments on calliandra, seeds/seedlings?
_____

_____
_____
_____
_____

21. In your view, do farmers around here know the benefits of calliandra?

    1.Yes_____ 2.No_____

    Explain:_____
    _____
    _____
    _____
    __

22. What do you think can be done to increase calliandra planting in this area?
    _____
    _____
    _____
    _____
    _____
    _____

23. What challenges have you faced in marketing calliandra?
    _____
    _____
    _____
    _____

24. What can be done to overcome such challenges?
    _____
    _____
    _____
    _____

25. Any other comments that you could be having concerning calliandra?

CALLIANDRA MARKETING AND DISTRIBUTION STUDY Code_____

Date_____
ENUMERATOR_____
GROUP INTERVIEW GUIDE

To understand the Institutional, economic and cultural forces shaping the distribution and marketing of calliandra seeds/ seedlings and to define factors that need to be in place for sustainable seeds/seedlings production and distribution.

1. *Name of group---------- Number Interviewed----------*

2. *Village ----------Location----------*

   Division ----------District----------

3. When did you start this group? ----------

4. Group membership: Male--------- Female---------- Total----------

5. What activities is this group involved in? Which organization supports you?

   Activity Organization

   a. ----------
   b. ----------
   c. ----------
   d. ----------

6. When did this group start growing calliandra?----------

7. Are there group members who do not grow calliandra? 1.Yes------2.No----
   Explain

   ----

6. What is the average number of calliandra trees planted by each group member? ----------

7. What do you see as the most important benefits of calliandra?

   a. ----------
   b. ----------
   c. ----------

8. Has the group distributed calliandra seeds or seedlings to non-members and to local institutions? 1. Yes------ 2. No----------

   If yes please indicate the following information:

Name or No. of farmer/ institution	Amount of seeds	Amount of seedlings	Mode of distribution (sold or given free)	Remarks

9. What challenges/problems do farmers face in production of fodder trees?
---------- ----------

---

10. What do you suggest as solutions to those challenges? ----------
- ----------

---

11. How is this group promoting calliandra planting in this area? ----------
---

---

12. What can be done so that many more farmers adopt calliandra?----------
---

---

13. What can be done to improve seed distribution to farmers in this area?

---

14. What is a reasonable price for:

    a. One calliandra seedling?---------- b. One Kg. Seed?----------

OTHERS

15. What other sources of income do you have?

    a. On-farm_____
    _____

b. Off-farm_____
_____

16. Have you introduced other farmers to calliandra growing?

1.Yes_____2.No____ Explain
_____
_____
_____
_____
_____

17. What challenges have you faced in growing fodder trees?
_____
_____
_____
_____

a. What solution do you suggest to these challenges?
_____
_____
_____
_____
_____
_____

18. Do you receive advice from any extension agents? 1.Yes___2. No___

a. If Yes, who?_____

b. What type of advice_____
_____
_____
_____

19. Any other comments?
_____
_____
_____