Intercropping Fodder Trees: A Case Study from Somalia

Michael H. Madany

Editor's Note: This paper is a must read for anyone who is trying to implement new practices.

Range development projects in Africa have rarely, if ever, been successful. Failure has been blamed, alternately, on either poor project design of expatriate developers or stubbornness of traditional pastoralists (Ellis & Swift 1988, Roe 1989). Thurow et al. (1989) recently discussed major issues concerning pastoral development projects in Somalia. In this paper, I report on the feasibility of intercropping leguminous fodder trees in an agropastoral community in southern Somalia.

The Homboy Agroforestry Project is small-scale and was designed to use informal on-farm trials backed by extension work. The primary objective was to provide high-protein cattle fodder during the dry-season by intercropping leguminous trees, such as *Leucaena leucocephala* (NAS 1984, NFTA 1985) and *Gliricidia sepium* (Atta-Krah & Sumberg 1987). As elsewhere in the semi-arid tropics, livestock (particularly cattle) suffer from poor quality diet during the dry season. By the beginning of the rainy season, cattle tend to have lost considerable weight and most cows are not lactating. Our hope was to introduce the idea of intercropping fodder trees and then to use the leaves of these trees as protein supplement during the long dry season. This supplement should increase milk production, thereby improving the diet and family income of the local agropastoralists. Secondary benefits from intercropping leguminous fodder trees can include wood products (poles, fuel), soil improvement via nitrogen fixation, and reduction of wind velocity.

Project Area

Homboy (42° 53'E, 0° 24'N) is located in Julib District, approximately 360 km southwest of Somalia's capital of Muqdisho. It lies in the Shabeelle River valley about 15 km upstream of where the flow of the Shabeelle occasionally enters the Jubba River. The village of approximately 5,000 people is built on a sandy ridge rising a few meters out of deep vertisol (black cotton clay) deposits of the valley. The water table lies between 18 and 20 m below the surface. Homboy is 20 m above sea level and approximately 50 km inland from the Indian Ocean. Rainfall averages 600–700 mm per year, occurring in a bimodal pattern; the main *Gu* rains begin in April and end in June. This is normally followed by the *Xagaa* season: a period of showers and overcast skies that usually ends in August. The *Dayr* rains, less reliable than the *Gu*, begin in mid-October and end by late December. The *Jiilaal* dry season occurs between the *Dayr* and the *Gu;* it is the most severe time of the year with the highest temperatures and essentially no rainfall. Temperatures range from 20–40° C and relative humidity is usually over 60%.

Author is with World Concern, Box 61333, Nairobi, KENYA

Major funding for the Homboy Agroforestry Project was provided to World Concern by CIDA and De Verre Naasten. Seed was provided by British Forestry Project Somalia (ODA); CSIRO, Division of Forest Research, Canberra, Australia; and Oxford Forestry Institute. The author would like to thank Ian Deshmukh, Dennis Herlocker, Richard Holt, and Tom Thurow for their helpful critique of early drafts of this paper. Above all, the author would like to acknowledge the cooperation of the community of Homboy.

Agropastoral System

The Shabeelle floodplain is farmed within a 10 km radius of Homboy. Aerial photography reveals a mosaic of cropped land, newly abandoned land, seral stands of *Acacia nilotica* (5–30 years old), and uncropped savanna bushland. While the proportion of the cultivated land tends to decline with distance from the village, there are also substantial areas of fallow land near Homboy. Much of this land had been cultivated continuously for many decades and was abandoned to fallow after crop yields declined.

Virtually all residents of Homboy cultivate some land. The most important food crops are maize *(Gu)*, sorghum *(Dayr)*, sesame and cowpeas. Cotton has been an important cash crop since its introduction to the Homboy area in the 1950's (Menkaus 1989), and is intercropped with maize and cowpeas. Cotton is planted in the *Gu* shortly after maize and is harvested early in the *Jiilaal* after sorghum and sesame.

Most members of the community own cattle, goats and sheep. Nomadic pastoralists living beyond the zone of cultivation herd these classes of livestock as well as large numbers of camels. From conversations with residents, it seems the number of sedentary families without livestock has increased. This probably reflects a decline in the local economy over the last 20 years (Menkhaus 1989) and possibily an increase in tsetse fly infestation. Livestock are very important for residents of Homboy, in terms of economy, culture and diet. Camel milk is brought by nomads to Homboy and is sold there, as well as marketed to Jilib, and other villages in the Jubba River valley. Cow milk and butter from both nomadic and villagers' herds are also sold in the towns and villages along the Jubba. In the latter area, tsetse fly infestation is much higher and livestock numbers are correspondingly lower.

Participation in Planting Fodder Trees

Technical constraints of growing fodder trees in a semi-arid environment are ultimately not the most important considerations. The challenging part of a project is devising viable options that allow the agropastoralists to improve their existing system. From our experience in

Homboy and elsewhere in Jilib District, successful grassroots development results from a close relationship between the person advocating change and the residents of an agropastoral community (Kerkhof 1990, Thurow et al. 1989). Agricultural or range extension work depends more on attitudes than techniques. We learned that many activities not directly related to our agroforestry work per se help to overcome barriers of suspicion. My wife's work with village women in terms of building fuel-conserving mud stoves, providing informal health education, and advising the village community health workers in difficult medical cases are examples of this. I was occasionally called on to be an ambulance driver, since we had the only 4-wheel drive vehicle in Homboy. Visiting people in their homes and trying to be part of the community also became part of the overall effort to promote a new farming practice. Had all of this been attempted by occasional visits from a distant city, I doubt whether the amount or quality of participation would have been the same. As Kelly (1990) had pointed out, Western science must "cross the boundary" before new techniques are adopted. Traditional agropastoralists have their own standards of proof for success.

Agropastoralists in Homboy are as conservative in their response to innovations as most farmers and ranchers around the world. This is particularly true when the innovations are brought by a foreigner. Given the ecological and economic problems facing Homboy farmers, there are very limited resources to risk in any new venture. Naturally, their first priority is to obtain food from crops and livestock for survival; if a surplus exists, there are a host of competing needs for cash before consideration can begin of substantial re-investment in, or expansion of, cropland or herds.

I was fortunate to have a nearby example of intercropping fodder trees at the Labadaad demonstration garden where I worked for 3 1/2 years before moving to Homboy. I was able to bring groups of village elders to view the plantings of *Leucaena leucocephala* and other leguminous fodder trees in the period when I was preparing to move to the project site. This helped to vividly demonstrate the potential for growing fodder for the dry season. During the first long *Jiilaal* dry season after the beginning of the project, I brought 50–60 kg of fresh *Leucaena leucocephala* leaves per week from the Labadaad demonstration garden to Homboy. This was distributed to 2–4 farmers; two were key participants and received at least 20 kg per week. The others were various interested livestock owners. This three-month period prior to the project's second planting season was important for building up interest in planting fodder trees. Seeing that the trees would grow was one thing, but observing their prize lactating cow eagerly devouring the *Leucaena* leaves had an even more profound effect on the opinions of the villagers. I advised participants to use the fodder for only one or two special animals from within their herd. It usually took a few days for cattle to become accustomed to the new feed. However, once this took place, the green *Leucaena* leaves were eaten rapidly. Initially, *Gliricidia sepium* leaves were not eaten very eagerly, even by goats. This is due to the strong odor present in freshly cut leaves; however, once livestock become accustomed to this fodder, they will eat it willingly.

Leucaena leucocephala *begins its prolific production of seeds as early as eight months after planting. (photo by Adam Buchanan)*

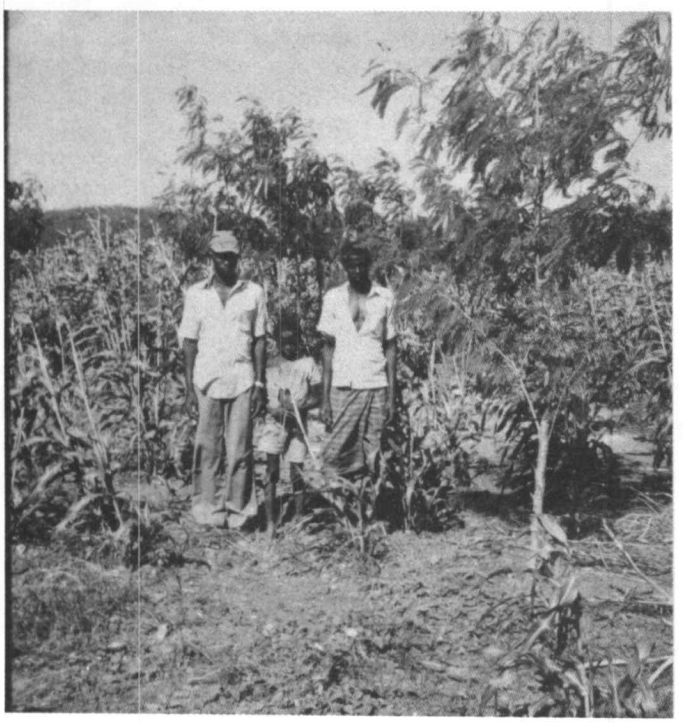
Perhaps the most important field trip was taken nearly a year after I moved to Homboy. I took two key participants and several nursery workers to visit plantings of *Leucaena leucocephala* in farms 200 km NE of Jilib District. What impressed the farmers was that these plantings were made by other Somali farmers, not by some expatriate project. Gaining acceptance of the idea would have been difficult if I had not had the possibility to show them demonstration plantings 15 km and 200 km away.

Eleven agropastoralists participated in the 1988 planting season and 28 in the 1989 planting season (5 of these had also participated the previous year). They participated by allowing on-farm trials to be made on their land and, especially in 1989, by helping with the planting. Increased enthusiasm for the project can be attributed to the effect of seeing that trees planted the year before were doing well and that their foliage was highly palatable. In the first planting season, the mayor of Homboy had volunteered part of his land, as did several of the village elders. The other participants requested plantings of fodder trees on their farms. Likewise, in 1989, there was a steady

The author discussing management of fodder trees with a participant; a six-month old planting of Leucaena leucocephala *is visible at the rear of the field of sorghum. (photo by Adam Buchanan)*

flow of requests for tree planting, beginning before the *Gu* rains and continuing during the planting season. Commonly, farmers neighboring a plot of land where tree planting was taking place would ask to become participants. Participants came from a wide variety of economic, clan, age, and educational backgrounds, and included three women.

Fodder tree seedlings were grown in polyethylene bags in a nursery at project headquarters and were transplanted to farms at 3–5 months age. Care was taken not to over-water seedlings while in the nursery, so as to promote "hardening off" and to minimize excess growth. However, all seedlings were heavily watered just prior to planting. None of the seedlings (or trees resulting from direct seedings) were ever given water after planting. Seedlings were transported from the project nursery to fields by truck, ox-cart or on foot, depending on how muddy the roads were. During transplanting, an effort was made to construct micro-catchments (.5 m diameter in width with .2 m depth) for each seedling; during the *Jiilaal* season of 1989 some were dug in advance on a few participants' farms. Trees were often planted along the boundary of a farm, with a spacing of 0.5 m with additional rows planted within the farm. The location and orientation of rows was decided upon by the owner.



A 1 1/2 year old Leucaena leucocephala *in one participant's field. (photo by Michael H. Madany)*

Based on records kept while planting 160 trees on 4 farms, it takes an average of 12 minutes to plant a tree and make a micro-catchment. Tree-planting coincides with the most crucial time of the year for the agropastoralists, who are planting, cultivating and weeding their staple crop of maize. Since transplanting seedling stock is labor-intensive and must take place at a time of an extreme labor demand, we experimented with direct seeding of the most important fodder tree, *Leucaena leucocephala.*

In 1988, *Leucaena leucocephala* was planted by direct seeding on three farms, while in 1989 direct seeding took place on 26 of the 29 farms used for on-farm trials. The technique of planting was simple: seeds were treated with boiling water the day before and allowed to soak overnight (Brewbaker 1987). The planting crew used the technique for planting *Leucaena leucocephala* as they were accustomed to with planting maize or cowpeas. A small depression was made by a hoe, seeds were dropped in, and then covered with soil by action of the foot. I

instructed the workers to use 5–7 swollen seeds (indicating that dormancy had been broken by the hot water treatment) per location, with 0.5 m spacing. One person could plant 100 locations in less than 15 minutes.

Since plantings were made on farmland under active cultivation, the owners could simultaneously weed their crops and the fodder trees. In nearly all cases, the plantings were kept free of weeds during the growing season. Rows of crops were planted adjacent to fodder tree rows, with a typical spacing between the rows of .4–.6 m.

Preliminary Results

In 1988, 151 *Leucaena leucocephala* and 94 seedlings of other leguminous fodder species were planted on participants' farms. Survivorship over the year is illustrated for *Leucaena leucocephala* in Figure 1. Overall survivorship of all species was 41%, while for the best adapted varieties of *Leucaena leucocephala,* it was 54%.

In 1989, 555 *Leucaena leucocephala* were planted on 29 farms. In addition 245 seedlings of 11 other fodder species were also planted. In early 1990, I was only able to assess results of 1989 plantings on 14 farms, due to the beginning of the civil war. These farms were chosen, as much as possible, to represent the various farmland zones within a 5 km radius of Homboy. *Leucaena leucocephala* survivorship was 60% and 51% for the two

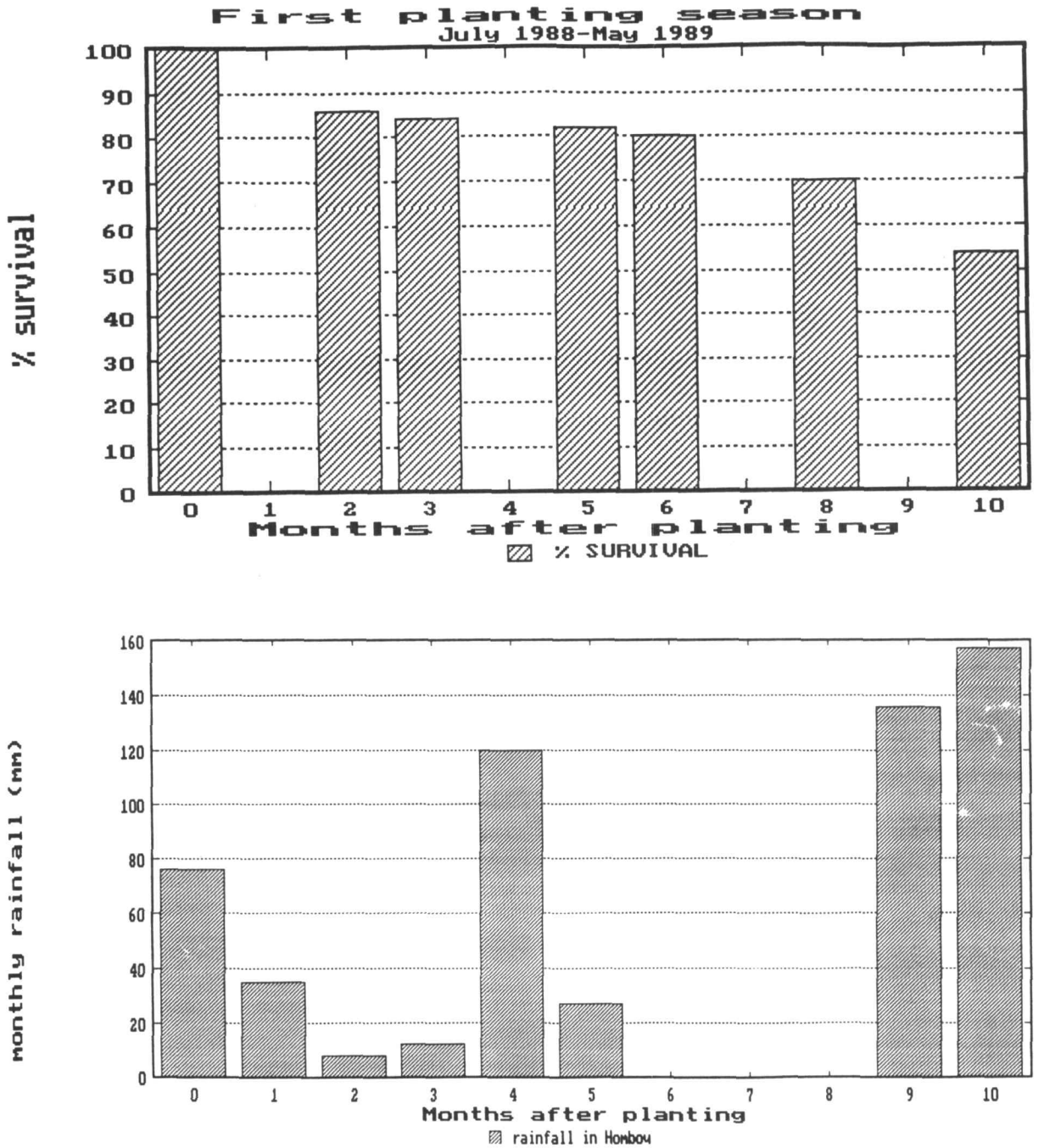


Fig. 1. *Survivorship of* Leucaena leucocephala *seedlings in on-farm trials at Homboy during the first ten months. Monthly rainfall during the same period is plotted below.*

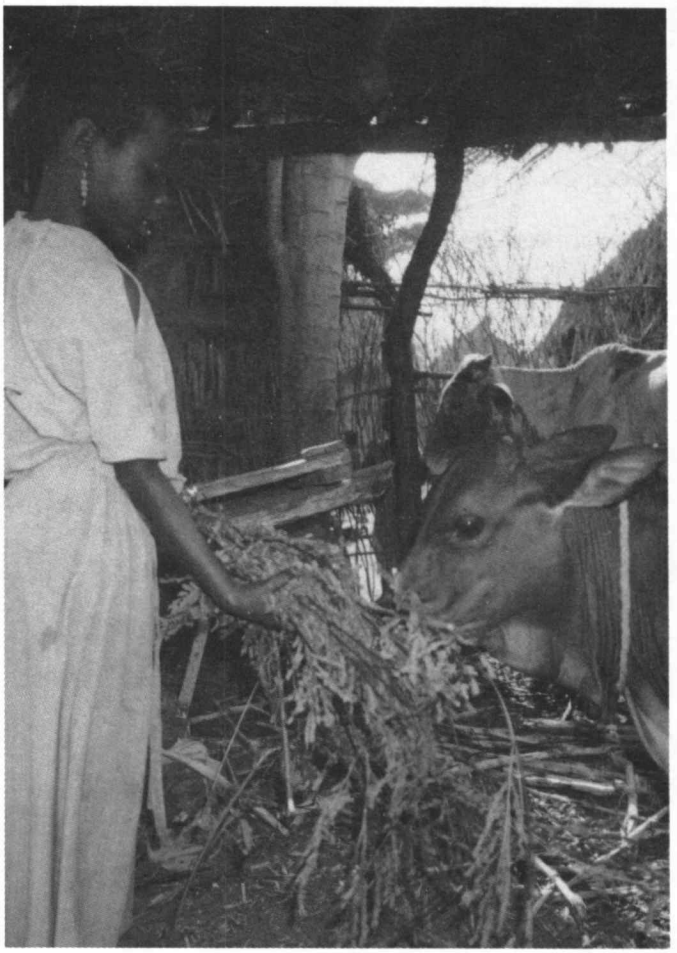
provenances used.

Of the farms revisited in January, 1990, direct seeded *Leucaena leucocephala* were surviving at 281 of the total of 1,435 locations seeded (20%). Total survivorship of *Leucaena leucocephala* from direct seeding was quite variable from farm to farm, varying from 0 to 56%. Height also varied from 0.3 m to 3 m (the latter being comparable with *Leucaena leucocephala* seedlings planted at the same time).

Project worker standing by a row of Gliricidia sepium; *behind him are* Acacia stenophylla *and* Leucaena leucocephala. *(photo by Michael H. Madany)*

Based on our observations, we believe intercropping fodder trees such as *Leucaena leucocephala* (as well as other leguminous trees such as *Acacia (Faidherbia) albida, Acacia bivenosa, A. holosericea, A. ligulata, A. maconochieana, A. salicina, A. sclerosperma* × ligulata, A. stenophylla, Enterolobium cyclocarpum, Gliricidia sepium, and *Samanea saman),* is feasible in higher-potential sites in lowland tropical areas receiving at least 600 mm of annual rainfall. It appears that establishment of these trees by planting seedlings can occur even if the accompanying maize crop does not produce well (as occurred in some farms in 1989). By contrast, establishment of *Leucaena leucocephala* by direct seeding will be a success only in years with a good maize crop. However, we would recommend using only 2–3 seeds per planting location, provided these have swollen following hot water treatment.

Direct seeding is likely the only method that the average agropastoralist can afford. Assuming a year of suboptimum rainfall, 30% survivorship, and 600 seeding locations planted an hour, then a morning spent at direct seeding (four hours) could yield 720 trees. With more favorable weather in the month after direct seeding, 60% survivorship would yield 1,440 trees. Due to soil characteristics and topography at Homboy, conventional means of enhancing moisture at the planting locations may not



Participating livestock herders were encouraged to feed the Leucaena leucocephala *as a dry season supplement to selected animals from their herd, such as calves, lactating cows and draft oxen.*

be beneficial, since they could lead to flooding. However, the best strategy seems to be planting midway through the heavy rains of the *Gu* season, and, if possible, in locations where flood waters are receding. Considering that the lifespan of *Leucaena leucocephala* is measured in decades, the return on such an investment of labor (which would begin within less than a year of planting) is considerable. The attractiveness of such a proposition should bring the concept of intercropping fodder trees within the threshold of possibility for traditional agropastoralists in sub-Saharan Africa. A rapid return on investment is an essential ingredient in the success of most rural development projects (Harrison 1989) and this is difficult to achieve in most situations involving range development.

It is axiomatic that stimulating pastoralists to plant trees is a difficult proposition (Kerkhof 1990). The reasons why agropastoralists in Homboy appear to be favorably inclined towards planting *Leucaena leucocephala* are twofold. First, the tree grows rapidly and seems to be able to withstand dry season browsing in most locations. Secondly, and more importantly, the enthusiasm that local cattle have shown for this fodder during the dry season makes a vivid impression on their owners.

It is premature to announce the success of the Homboy Agroforestry Project. However, the last report I received from workers maintaining the project nursery was that the fodder trees in both the demonstration garden and the participants' farms were generally in good condition (Ibraahim 1990). This letter mentioned that the agropastoralists were realizing a great benefit from the trees. The extent to which this is true awaits a comprehensive survey of the participants' farms. This in turn, hinges on the ending of civil strife in the general region.

Literature Cited

Atta-Krah, A.N., and J.E. Sumberg. 1987. Studies with *Gliricidia sepium* for crop/livestock production systems in West Africa. pp. 31–43. *In: Gliricidia sepium* (Jacq.) Walp.: management and improvement. Nitrogen Fixing Tree Association Special Publication 87–01. NFTA, Waimanalo, HI, USA. 258 pp.

Brewbaker, J.L. 1987. Leucaena: a multipurpose tree genus for tropical agroforestry. pp. 289–323. *In:* Agroforestry: a decade of development. (Eds. Steppler, H.A. and P.K.R. Nair). ICRAF, Nairobi, Kenya.

Ellis, J.E., and D.M. Swift. 1988. Stability of African pastoral ecosystems: Alternate paradigms and implications for development. J. Range Manage. 41:450–459.

Harrison, pp. 1989. The greening of Africa. Breaking through in the battle for land and food. IIED-Earthscan, London. p. 318–338.

Ibraahim Ciise Xasanow. 1990. Personal communication, 26 June 1990.

Kelly, M. 1990. Western idealism; Third World pragmatism. ILCA Newsletter 9(2):10.

Kerkhof, P. 1990. Agroforestry in Africa. A survey of project experience. PANOS, London. 216 pp.

Menkhaus, K.J. 1989. Rural transformation and the roots of underdevelopment in Somalia's lower Jubba Valley. Ph.D. Diss., Univ. of S.C., Columbia. 471 pp.

National Academy of Sciences. 1984. Leucaena: promising forage and tree crop for the tropics. Second Edition. NAS Press, Washington, DC 100 pp.

Nitrogen Fixing Tree Association. 1985. Leucaena forage production and use. NFTA. Waimanalo, Hawaii. 39 pp.

Roe, E.M. 1989. Six myths about livestock rangeland develpment south of the Sahara. Rangelands 11:217–221.

Thurow, T.L., D.J. Herlocker, and A.A. Elmi. 1989. Development projects and Somali pastoralism. Rangelands 11:35–39.

EVP Report *(continued from p. 196)*

I believe that one of the most important current activities in this regard is the strategic planning process which is under the direction of the Strategic Planning Committee, chaired by Murray Anderson. I plan to assist that Committee in any way that I can and I encourage each of you to participate in the process that will help define the mission. In a volunteer, non-profit organization such as SRM, it is the *mission* that defines the goals, the *goals* that define the results—the results that make the difference. To this end, I look forward with great anticipation.

Bud Rumburg, Executive Vice-President, SRM