

Full Length Research

Review on the Evolution of Forage Seed Production in Ethiopia: Experiences, Constraints and Options

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Feed shortages and the poor quality of available feed are the major constraints to increased livestock productivity in Ethiopia. The development of an improved forage crop or improving an existing natural pasture through over-sowing require a reliable source of seed or vegetative planting material of a well adapted species to the targeted area. The objective of a forage seed programme is to make available quality seed or vegetative material that is suited to farmers' needs for livestock production. In Ethiopia, forage development programmes have been initially started through the introduction of improved forages species that enabled to achieve a significant increase in forage production. However, all too often, insufficient attention was given to ensuring an adequate and sustainable supply of seed of those improved forages. This lack of seed has now been identified as the major constraint to increased forage production that must be seriously considered in order to realize substantial increment in livestock productivity basically through wider utilization of improved forage and pasture crops. Suggested strategy options for forage seed production may include: creation of an incentive to produce forage seeds, farmers based seed production, involvement of Ethiopian Seed Enterprise, local producers and business men and NGOs; and improvement on marketing systems. Recommendations on seed production and marketing detailed in this report are believed to convey important technical, institutional and policy measures to be considered in the effort of achieving sustainable forage seed production in Ethiopia. The recommendations are targeted to achieve not only production of good quality forage seeds, but also to increase forage production in terms of both quality and quantity, that consequently lead to increased livestock productivity.

Key words: constraints and options, development projects, forage crop, seed research, seed yield

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INTRODUCTION

The low productivity of Ethiopian livestock is a result of several limiting factors among which feed is the major one. For the country as a whole the existing feed does not meet the amount required by livestock. Natural

pastures are the most important livestock feed resource. In most parts of the country natural grasslands are confined to degraded shallow upland/highland, fallow crop lands and soils that cannot be successfully cropped

due to physical constraints such as flooding and water logging. They are low yielding and their production is insufficient and grazing conditions are only favourable for four to five months per year. For several decades, grazing areas have been shrinking and likely to continue to do so because of rapid expansion of cultivated land for crop production to provide food for the ever-increasing human population. As a result, there is always likely to be limited feed resources for the existing livestock population. Therefore, selection of high-yielding and better-quality forage varieties, and development of improved forage production systems are critically important.

In the past four decades, extensive research and development has been carried out in Ethiopia to test and evaluate the adaptability and performance of different forage species under different agro-ecological zones. An array of potential grass, legume and browse tree forage species have been selected for development programmes. The selected species showed better yield and quality than those in the naturally occurring swards. The introduction and development of selected forage species into the farming system was expected to help solve the severe forage deficit that the country is presently facing. However, the extension and promotion of improved forage production packages is lagging behind and not progressing as expected (except for a few development projects and programmes). This is due to a number of limiting factors; among which scarcity of forage seed is the foremost. In the past-recent years, a few agricultural development projects tried to multiply and produce forage seeds, but were not able to satisfy the demand. The success of forage development depends upon the establishment of a local seed production system that can ensure the supply of adequate quantity of good quality forage seed.

In Ethiopia, there are large potential areas with diverse altitude, climate, soil type and farming systems for the production of diverse forage species seeds. Despite the conducive soil and climatic resources of the country, the progress in forage seed production has been insignificant. The Ethiopian Seed Enterprise (ESE), which has a national mandate to produce the required agricultural seed, is currently involved in the production of cereal, legumes and oil seeds. ESE has very limited involvement in forage seed production; producing oats and vetch for use by some commercial private and state dairy farms. It is commonly observed that most smallholder Ethiopian farmers with the exception of some commercial-oriented dairy farmers are reluctant to accept the production of improved forage crops, because they prioritize their land and labour to the production of food and cash crops rather than forages. In spite of this, there is an increasing demand for forage seed especially from dairy farms. Government and non-government institution sponsored natural resource conservation programmes.

These demands are for the most part met by national and international research institutions. Research and development activities on forage seed production carried out by institutions over the last decades in Ethiopia are outlined in the foregoing discussion. This paper discusses such development efforts, constraints, options and recommendations on forage seed production in Ethiopia.

Forage research and development projects

Ethiopian Institute of Agricultural Research (EIAR)

The Ethiopian Institute of Agricultural Research (Ex- IAR) started forage research as a national program in the mid 1960s. Research on forage seed began only in recent years, and due to lack of trained manpower in seed technology and poor facilities its contribution in solving forage seed scarcity has been far below expectations. A list of some temperate (tropical highland) forage species and their seed yield potential is presented in Table 1 based on the research that was undertaken in the 1990s. Other observations, made on seed production potential of some forage crops in sub-humid altitude areas of Ethiopia indicates that *Chloris gayana*, at an optimum seeding rate and row spacing can yield up to 700 kg/ha of seed; *Panicum coloratum*, *Desmodium uncinatum* and *Stylosanthes* gave seed yields of about 500, 400 and 350 kg/ha, respectively. In a trial conducted at Holetta Research Centre to determine the optimum maturity dates at which high seed yield would be obtained from four indigenous *Trifolium* species, the average seed yield was found to be 401 kg/ha and 433 kg/ha when harvested a week after flowering on red soil and two weeks after flowering on black soil, respectively (Table 2).

International Livestock Research Institute (ILRI)

Recognising the need to promote access to forage seed, ILRI (ex-ILCA) established a Herbage Seed Unit in 1989. The Unit aimed to address the problem of foundation seed in sub-Saharan Africa, and enhance the incorporation of forages in feed resources development program (Table 3). Over the course of the project years (1989-1993), major emphasis was placed on establishing basic seed production to supply to the regions, and building a broad information base to support national seed production and development efforts. Although several forage species were identified as being promising for livestock feed, there was little information available about their seed production potential, methods of seed harvesting, threshing, and storage. ILRI Seed Unit has prepared a 'fact sheet' on herbage and seed crop

Table 1: Seed yield (kg/ha) of grass and legume species at Holetta

Species	Seed yield
<i>Chloris gayana</i>	250
<i>Panicum coloratum</i>	200
Oats	1500
Vetch	600

Source : HRC Progress Report (1993, 1994, and 1995) , Ethiopia

Table 2: Average seed yield (kg/ha) of *Trifolium* species harvested at different stages of maturity on two soil types at Holetta

Species/variety	Weeks after full flowering				Mean
	1	2	3	4	
	Red Soil				
<i>Trifolium quartianum</i>	292	255	241	95	221
<i>T. rueppellianum</i>	385	377	150	69	245
<i>T. steudneri</i>	571	438	471	347	457
<i>T. decorum</i>	356	266	150	81	213
Mean	401	334	253	148	284
	Black Soil				
<i>Trifolium quartianum</i>	500	560	445	265	443
<i>T. tembense</i>	345	318	184	78	231
<i>T. steudneri</i>	379	264	226	240	277
<i>T. decorum</i>	343	590	481	199	403
Mean	392	433	334	196	339

Source: HRC Progress Report (1993, 1994), Ethiopia

Table 3: Number of forage species identified as promising for livestock feed by ILRI

Forage category	Semi-humid	Sub-humid/humid	Highland	Total
Grasses	5	9	4	17
Legumes	13	34	25	72
Browse	4	4	4	12
Total	22	47	32	101

Source: ILRI-Reports 1994, Ethiopia

husbandry techniques for major forage grass and legumes species and made available online at ILRI website. Besides its research programme, ILRI is distributing forage seed in small quantities together with information on their pedigree and agronomic characteristics. ILRI's Seed Unit has also been involved in training of researchers and development agents on forage seed production, processing and post-harvest management.

Forage Network in Ethiopia (FNE)

The Forage Network in Ethiopia was a professional society organized in 1980 to conduct and promote forage research and development work at a national level. It also

assisted communications between researchers and development workers through its newsletter (FNE newsletter). Collaborator institutions were research, higher education, development organizations and NGOs. The network conducted trials like natural grassland inventory and assessment, germplasm evaluation, multi-locational trials on grass/legume mixtures, seed production, etc. FNE produced seeds of the more popular fodder crops like vetch, oats, alfalfa, dolichos, stylos, etc, and arranged the distribution of forage seeds for national research and development programmes and beyond.

Arsi Rural Development Unit (ARDU, ex-CADU)

ARDU started forage seed production in the mid 1970's.

Table 4: Forage seeds produced in Ethiopia under the CADU and ARDU projects

Species	Area (ha)	Yield (kg/ha)	Sites
Oats	50	1000 – 1500	K, D ,B, ALF, G/K
Vetch	20	500 – 800	K, B, ALF
Fodder Beet	20	400 – 500	B, G
Rhodes	40	300 – 500	K, ALF
Panicum	20	300 – 400	K, ALF
Setaria	15	300 – 400	K, ALF
Phalaris	15	200 – 300	B, G
Cocksfoot	20	150 – 200	B, G
Buffel	10	150 – 200	D
Sorghum	15	600 – 800	K, D
Desmodium	5	200 – 350	K
Lablab	10	500 – 1500	K, D
Trifolium	3	200 – 300	G

Site: K = Kulumsa; D = Dera; B = Bekoji, ALF = Asella Livestock Farm; G/K = Gobe/Kofele;
Source: Alemayehu Mengistu, ARDU Annual Report 1998, Ethiopia

The major emphasis was on the production of forage seed to be used by the dairy development cooperatives and associations. Major forage crop species whose seed were multiplied included grasses such as oats, rhodes grass, phalaris, cocksfoot, panicum, setaria, forage sorghums, buffel, and elephant grass; legumes like vetch, lablab and few seeds of alfalfa, desmodium, trifolium spp and few medics; and root crops such as fodder beets and turnips. In the late 1970s, commercial forage seed production was started by ARDU Seed Multiplication Centre; and target species were: oats, vetch, rhodes grass, panicum, and forage sorghums. Farmers were also contracted to produce oats, vetch and fodder beet. Table 4 shows the different forage species seed produced by ARDU, including seed yield and production sites. ARDU was the only supplier of forage seeds throughout its project life. Its clients were EPID, IAR, ILCA, Alemaya Agricultural College, Jimma, Ambo, Debre Zeit Agricultural Schools and the National Soil and Water Conservation Programme. The pioneer work of ARDU under the framework of 'systems approach' involving crop, livestock, forage and seed production and extension activities paved the pathway for the subsequent establishment of the various development activities such as the Animal Feed and Nutrition Team (MoA); Livestock Development Projects like: FLDP, SSDD and NLDP; and National Resource-Soil and water conservation and other governmental and non-governmental organizations.

Fourth Livestock Development Project (FLDP)

Realizing the fact that the success of any forage development program is heavily dependent upon an establishment of seed production mechanism, the FLDP of the Ministry of Agriculture introduced the seed contract

system of forage seed production in 1988 that extended up to 1993/94. The aim was to produce high-quality seed locally at a lower price in greater quantities. The system involved producing seed under contract with individual farmers and cooperatives. This system enabled the production of larger amount of seed per unit area and at lower cost of production per kilogram of seed as compared with that produced under daily paid labour system on large farms. The seed contract system was legally agreed between the farmers and the project. Based on this contract, the project provided the initial seed at planting including the necessary technical advice and supervision. The project subsequently purchased the produced forage seed at a fixed price. On the other hand, farmers were obliged to follow the technical advice on forage seed production; and in return, produce and deliver clean seeds to the project in a specified time. The contract system placed emphasis on the production of herbaceous and tree legumes and a few grass species like Rhodes grass, buffel grass and phalaris. Under this system of production, over 2,000 farmers (individual and cooperatives) were involved and the total annual production reached 150 tonnes, contributing substantially to reduced importation (Table 5). Apart from the contract seed system, forage seeds were also harvested on an opportunistic basis from forage plot primarily established for feed purposes. Herbaceous legumes, tree legumes and grasses were opportunistically harvested/collected from government ranches, state dairy farms; Ministry of Agriculture extension program nurseries and demonstration plantings around farmers' backyard; over-sown grazing lands along road sides and stock exclusion areas, and from under-sown croplands. The experience of FLDP on forage seed production of the various types of forages including grasses, herbaceous and tree legumes is shown in Tables 5 and 6. Due to its large amount of forage seed production capacity, the FLDP

Table 5: Seed production by Fourth Livestock Development Project (tonnes) under farmers contract, and from existing plantings in government ranches and nurseries

Period	Local production	Imported	Total	Imported (%)
1986/87	-	0.7	0.7	100
1987/88	7.6	8.7	16.3	53
1988/89	37.9	18.7	56.6	33
1989/90	83.2	29	112.2	26
1990/91	80	20	100	20
1991/92	80	-	80	-
1992/93	100	12	112	10
1993/94	150	10	160	0.3

Source: Alemayehu Mengistu, 1994- World Bank Progress Report, Ethiopia

Table 6: Major forage seeds produced by FLDP (1988-1993)

Grasses	Yield kg/ha	Herbaceous Legumes	Yield kg/ha	Tree legumes	Yield kg/ha
Oats	1,500	Vetch	1,000	Sesbania	1,500
Rhodes	400	Lablab	500	Leucaena	2,000
Buffel	150	Cowpea	800	Tree lucerne	1,500
Phalaris	300	Axillaris	400	Pigeon pea	1,000
Panicum	300	Siratro	400		
Setaria	300	<i>Desmodium spp.</i>	300		
		<i>Stylos spp.</i>	400		

Source: Alemayehu Mengistu, FLDP Progress Report 1993/94

Table 7: Forage seed (Oats, vetch, sesbania, leucaena and tree lucerne) production by smallholder dairy development project (SDDP)

Regions	1997		1998	
	Area (ha)	Seed yield (kg)	Area (ha)	Seed yield (kg)
SNNPR	27.5	14575	5	5000
Oromiya	47.5	44825	57	58800
Amhara	62.5	53825	79	68600

Source: SDDP- Project Document-1995/1998; SNNP: Southern nation nationalities peoples region

was able to promote the forage development strategies in a wide range of agro-ecological zones and farming systems. FLDP trained its senior staff, as well as the development agents (DAs) and farmers in forage seed production techniques. It also produced a manual on forage seed production.

Smallholder Dairy Development Project (SDDP)

The SDDP started its operation in 1995. The forage component of the project aimed to train farm families to become self-sufficient in improved forage production and feed their dairy cows. SDDP adapted the FLDP's forage development strategies and seed production systems.

The project contracted dairy farmers to produce forage seeds. It also produced and harvested seed from government ranches that were assisted by the project. Seedlings of tree legumes and cuttings of elephant grasses were raised in nurseries established in various locations. Forage seed produced by SDDP is shown in Table 7.

National Livestock Development (NLDP)

NLDP which started in 1999 represented an important further step to improve the productivity of the country's livestock resources. The major objectives of NLDP were to achieve sustainable increases in household income.

Table 8: Selling prices of forage seeds by region (Ethiopian birr/kg)

Type of Seeds	Amhara	Oromiya	Tigray	SNNPR (1999)	SNNPR (2001)
All Grasses	5	5	5	10	15
Vetch	3.5	2	3	2	2
Lablab	2.5	2	3	2	2
Cow Pea	3	2	3	2	2
Pigeon Pea	3	2	3	2	2
Sesbania	3	2	3	2	5
Leucaena	3	2	3	2	5
Tree Lucerne	3	2	3	2	5
Calliandra	-	-	-	2	-
Desmodium	10	10	-	10	20
Macrotyloma	5	-	-	5	20
Alfalfa	2	2	-	-	-
Stylo	8	-	-	-	-
Siratiro	5	-	-	5	5
Oats	2	2	-	2	2
Fodder Beet	5	25	-	-	-

Source: NLDP Report, 2001; Currently 1 USD= 21.89 Ethiopian birr

Assessment of forage seed produced by farmers, ranches and nurseries at different Regions, Zones and Weredas were conducted by NLDP. In 1999 the Amhara Region produced a total of 23290 kg, Oromiya 53500 kg, Southern Nations Nationalities Peoples Regional State (SNNPR) 2200 kg and Benshangul and Gumuz produced 930 kg forage seeds. On the other hand some regions procured forage seed from other regions. The SNNPR, Gambela and Afar purchased 1150, 920 and 870 kg of forage seeds from Oromiya, respectively. The NLDP assisted with inter-regional forage seed procurement and a total of 92760 kg were distributed to project regions. The forage seed produced and procured consisted of oats, vetch, cowpea, Sesbania, Leucaena and tree lucerne.

Constraints to forage seed production and marketing

The current need for forage seed is expected to continue as the demand for feed increases to support the growing market demand for livestock. In order to support seed production farmers, private investors, government, NGOs and other partners need to play their share of responsibility in producing and supplying forage seeds. To meet the anticipated forage seed demand, strengthening the national capacity for forage seed production is highly needed. There are many reasons why forage seed production in Ethiopia remains at a low level. During implementation of FLDP, national forage seed production reached 150 tonnes per year but this was not sustained after the completion project. The major constraints include lack of financial incentives for seed prices; high cost of forage seed production by government agencies; lack of seed storage and transport

infrastructure; poorly developed marketing system for forage seed; under-financing of the present system of contract seed production; low priority attached to forage seed production by farmers; lack of knowledge about forage seed production among extension staff; and lack of inoculants and shortages of basic seed supply are the main ones. Some of the critical constraints are discussed and elaborated in the following sections.

Lack of incentive for production

One of the major constraints to forage seed production is the lack of a financial incentives to promote forage seed production. As shown in Table 8 below, with the exception of SNNPR and to a very limited extent the Amhara Region, the purchase prices for forage seed are still based on those used by FLDP and SDDP. Judging the majority of these prevailing prices, there is no real financial incentive to produce forage seeds in Ethiopia. In the recent past and at present, there is little incentive for the production of forage seeds. This is because many of the previous development programmes supplied forage seeds at highly subsidized rates or for free in order to encourage uptake of the improved forages. Although understandable as it sounds, this policy had negative effect on promotion of sustainable seed production. In addition, although the government institutions had introduced a system of contractual seed growers, those programmes had failed to develop sustainable system of marketing. As could be learned from the projects history, contractual forage seed production system would not continue any longer when the projects phase out, simply because there were no funds available for purchase of seeds from the contract growers.

High costs of production by government agencies

The costs of seed production by government agencies at Zonal and Wereda level are much higher than those for farmer-based production. This is because of their much higher labour costs and administrative overhead costs. High cost of production meant that forage seed could not be distributed to users at affordable price.

Lack of sustainable marketing system

In the past, after the completion of the various programmes or projects, funding simply ceased and Zonal Agricultural Bureaus (ZABs) were no longer able to purchase seed. This resulted in delays in disbursing monies to producers due to the inefficiency of the various Regional, Zonal and Wereda accounting procedures.

The present system of contract seed production

Under the previous-present system of contract seed production, the Regional Agricultural Bureaus (RABs) contract farmers to multiply seed and sell it back to the RAB. The RABs provided the initial planting seed and organised distribution and collection. This system has been used for a number of years but suffers from persistent funding problems since new funds have to be mobilised each year (either from the regional government or federal or donor sources), in order to pay the farmers. It also entailed heavy burden on the RABs in terms of transport and storage facilities. There are many stages in both the seed production and seed distribution systems, each of which requires both physical and financial transactions, and has the likelihood for delay. The organisational structure of a commercial seed industry in some cases can be simplified, as forage farmers can purchase seed directly from the Seed Growers Association or cooperatives. In the simplified system, there are only two links in the chain between seed grower farmers and forage producer farmers.

Options for seed production and marketing

Creation of an incentive to produce forage seed

The previous practice of most forage development programmes was to issue seed free of charge, in order to encourage their use, but this in effect removed any incentive for improved forage production. In recent years, regions have been offering a nominal price for forage seed in order to encourage some production, but those prices are still based on the previous FLDP and SDDP prices and were far too low to offer any real incentive.

During a field visit to SNNPR many years ago, it was observed that, in response to complaints of seed producers for low seed price and at the same time in order to encourage seed production, the RAB had introduced a significant increment in the seed purchasing prices. This had, as might be expected, resulted in a significant increase in the amount of seed production by farmers that was made available for purchase by the RAB. What was even more significant was that a farmer who had produced a total of 35 kg of forage seed was making nearly as much income from his seed production as that from milk production. This illustrates that there is a definite potential for a truly commercial small scale forage seed production as long as marketing system is improved. There is a real need to agree on an increased level of prices and a new pricing structure, which brings about farmers' satisfaction in terms of increased income. Additional advantage of increased pricing structure is that it would help to encourage a move from opportunistic system of production towards specialist production system of forage seed, which would definitely help to increase the yield and quality of seed production. This is so because under the opportunistic system, the seed produced may well have a low germination percentage, due to lack of uniformity in seed maturity, caused by differences in tiller maturity at harvest. Under the specialist system, the forage crop is actually planted for the purpose of seed production, and as such, tends to be given greater managerial attention, which is more likely to result in higher yields of high quality forage seed.

Farmer-based forage seed production

Farmer-based forage seed production is much lower in cost than Wereda or Zonal production due to much lower labour and overhead costs. However, collection and transport costs of farmer based production are high, due to the scattered nature of the production. The cost of transport for seed collection, supply of inputs and supervision could be significantly reduced if greater efforts could be made to cluster seed producers initially into informal groups. These would then become the nuclei for Seed Grower Associations (SGAs). The intention would be that members of the SGA would bring their forage seed to one focal point for collection and that they would also collect their inputs from that same point. This formation of SGAs would have several other benefits, in that the SGA would be in a far better position to negotiate seed prices than individual farmers and would also be a focal point for farmer training programmes, field days and etc.

Forage seed production by government agencies

Forage seed has been produced in nurseries and

multiplication plots under the Zonal Agricultural Bureau (ZAB) and the Wereda Agricultural Bureau (WAB) system. However, as stated above, this production system is comparatively high cost, due to higher labour costs and administrative overheads. There are opportunities for the ZABs to rationalise the present Wereda-based production, by concentrating efforts into fewer more efficient sites. This would reduce their operational costs, reduce the frequency of supervision and the transport costs incurred for the supervision. It should also be noted that, in general there is too much concentration on the production of grass seed as compared with that of legumes which would be vital for promotion of the production of legume-based herbage and legume seed. There are two other options, which would help to reduce WAB costs, which are involving of local farmers or perhaps an SGA in a self-help scheme whereby they provide some labour and receive payment in kind or in the form of seed; and leasing of surplus land or spare lands (after initial rationalization) to SGAs, and payment for such a lease could be effected in kind (by seed).

Sustained improvement in the present system of marketing

Continue and improve on the present system of RAB marketing, through the formation and promotion of SGAs. This would be achieved by clustering the existing and additional forage seed producers, initially into informal groups, which would later be formalised into SGAs. This formation of SGAs would help to reduce transport costs and travelling time for supply of inputs, supervision and collection of seed. It must also be noted that the formation of clusters into groups and their formalisation into SGAs would almost certainly be a lengthy and time consuming process, which would require a considerable extension input.

Greater involvement of the Ethiopian seeds enterprise (ESE)

Linkages have already been established with the ESE, which has agreed to be involved in forage seed production, particularly of those seeds which are difficult to produce under small farm conditions. Considerable benefits could result from a greater involvement of the ESE. In addition, the use of the seed-testing facilities at regional and perhaps Zonal level, would fulfill an important function and more importantly, avoid duplication of such facilities. It may also prove possible, to use the ESE seed cleaning facilities, for any necessary cleaning of forage seeds. This would require some

adaptation of their existing machinery, but would be a better option than the purchase of new machinery, which might not be fully utilised. However, the ESE is a commercial organisation and its involvement is almost certain to be dependent on the level of profitability to be achieved from forage seed production. This would of course be greatly improved by any upward revision of forage seed prices. It is also possible that the ESE could become involved in the marketing chain. It is understood that the ESE has direct contact with the Weredas. Therefore, once the revolving fund had been set up, there would be considerable advantages to be gained, if the funds could be channelled through the ESE, direct to the Weredas. This would effectively short-circuit the lengthy chain of marketing and distribution. Additional incentives as far as ESE is concerned would be the introduction of a forage seed crop as a rotational break into their cropping system; and the harvesting and sale of any crop residues remaining after the harvesting of the forage seed, which would increase the return per hectare from the land involved.

Involvement of local businessmen

Significant progress towards commercialisation could be achieved, if local businessmen, who might be grain traders, local millers, or commercial farmers, could be involved in the chain of production and marketing of forage seed. It is suggested that this could be achieved, through the involvement of such businessmen to act as a focal centre for a cluster, group or a seed growers association. This innovative step would have immediate advantages, in that the businessmen would already have storage facilities and probably some form of transport, which would provide much needed storage and reduce RAB expenditure on transport. The initial intention would be that the businessmen would act as middlemen between the farmer and the RAB zonal staff, and would gradually play a more important role, leading to a greater degree of commercialisation.

Encourage the involvement of NGOs

In order to achieve more flexibility, there would be some benefits to be achieved from the involvement of NGOs already involved in the use of forage, to carry out the role of co-ordination at Regional or Zonal level. Some NGOs already have a considerable involvement in both forage and livestock production and the establishment of closer linkages between RABs and ZABs and WABS with those NGOs would certainly prove beneficial. Previous discussions with some NGOs have indicated that in some cases they have been able to work directly to the Weredas, if given the necessary clearance by the RABs.

If such an arrangement could be negotiated, it would effectively remove two and possibly four links from the lengthy chain of forage seed marketing and distribution.

Recommendations on the marketing of forage seed

Continue with the existing informal/ farmers based forage seed production system

There is a definite scope for improving the existing system. The formation of SGAs would certainly help to ease some of the logistical problems. It would also help to reduce transport costs for collection of seed, provision of inputs, and supervision. It would also ease the problems of general extension work, in that the SGAs would be a focal point for extension agents and there would be a greater degree of clustering. In addition, the influence of the farmers-based seed production would help bring a more market-oriented approach to the existing system.

Greater involvement of the formal forage seed production system/ESE

Involvement of local businessmen

It is considered that this innovative initiative represents the best way forward, towards the establishment of a commercial forage seed industry. The involvement of local businessmen into the chain of marketing and production would have the benefits of the introduction of a commercial outlook; the availability of seed storage; and the possible availability of some form of transport. These would lead to immediate advantages to minimize the constraints of storage and transport at Zonal and Wereda level. The eventual intention would be for the businessmen to gradually play a more important role in the chain of production and marketing. This would obviously require some form of incentive, which could be achieved by providing a small handling charge or "mark-up".

Considerable benefits could be obtained through a further strengthening and exploitation of the existing linkages established with the ESE. ESE's further involvement in forage seed production will certainly depend on the proposed revision of forage seed prices. In addition to its production function, ESE could also play a very useful role in the marketing chain as the direct link at Wereda level and thus short-circuit the existing RAB system. However, ESE would not be able to offer the same degree of local contact with small farmers, as would be possible through a local businessman. This is because their main production from out-growers is from large commercial farms. The most immediate benefits to

be obtained from a greater involvement of ESE, would be from access to their seed testing facilities as a back-up to Regional and Zonal testing facilities. It is also possible that if in the future there is a need for mechanical cleaning of forage seeds that the ESE might agree to the adaptation and use of some of their seed-cleaning equipment.

Greater involvement of NGOs

Several NGOs already have a considerable involvement in forage and livestock production. If it proves possible to involve those NGOs into some form of a co-ordination role at Zonal level, they would be able to inject some much needed flexibility into the present RAB system. It seems possible for NGOs to work directly with the Wereda, provided that they can get the necessary clearance from the RAB's. There is no question that NGOs involvement in forage development and livestock production would be of considerable assistance in the development of a sustainable forage seed industry. In situations where the desired direct linkage of NGOs to Wereda level fails to materialize, it will still be very important to maintain, foster and develop linkages of NGOs at farmers level, as they do have some very definite advantages to offer, due to their close contacts with the farmers and experience in the fields of forage development and forage seed production.

Monitoring and evaluation

The objective of a monitoring and evaluation system of any project, or programme, is to measure the progress of a project or programme and to evaluate its successes, or in some cases, failures. In order to evaluate progress, the first step is to establish a starting point or baseline. This is absolutely essential as a basis for future comparison. With respect to forage production, the basic information required are types of strategy used; numbers of farmers per strategy; areas of forage grown, or lengths of rows grown in the case of fodder hedges; and present production levels. With respect to forage seed production, basic information required are number of farmers; types of strategy/system; numbers of nurseries/multiplication plots; forage species being grown; areas grown; quantities of seed presently being produced; and quantities sold and price information. With respect to seed requirements, it would be extremely useful to also get feedback on the major forage species used for each strategy, and the quantities of seed employed.

WAY FORWARD

The following elements are considered as critical for a successful commercial forage seed production in Ethiopia.

Identification of partners: There is a need to identify national partners who are potential collaborators. These could be the potential forage seed producers, fodder and livestock producers who will buy the seeds; the Livestock Extension Service and farmers; the Ethiopian Seed Enterprise or the big commercial seed producer; the Ethiopian Seed Agency; the National Research Institutions; NGOs; private business; etc.

National policy and regulation: Formulation of a national policy to support the seed producers and partners in the operation system is important. Flexibility of the national policy to support local level forage seed production is necessary. For example, national policy and regulation may not allow sales of varieties that are not officially released by the national seed release committee.

Need assessment: Assess farmer's needs, constraints and existing indigenous knowledge in target seed production areas. These need to be done before large production venture takes place as farmers are the potential end users of seed produced.

Availability of variety for research: The need for local and improved forage varieties for the start and replacement of obsolete varieties from time to time should be assessed and secured partly through forage seed research.

Training and availability of training manual and guideline: Training of technical staff on seed production and management, training of supervisors, DAs and farmers; provision of field manuals and guidelines is necessary.

Extension efforts on forage seed production and distribution: Promotion and dissemination of forage and seed production to seed producers and forage producers and users through the extension system should be strengthened.

Institutional linkages and support needs: To ensure continuity of forage seed production systems, institutional linkages should be established locally and outside the country. Each institution should have commitment along the chain from initial forage seed production to marketing systems.

Marketing: The demand of the consumer who in the case of seed is the farmer should be assessed. This is due to the fact that if the farmer doesn't believe the seed is best suited to his/her need, there will be no seed demand.

Economics of forage seed production: Any farmer entering the seed enterprise likes to maximize economic

returns out of the business. Therefore, understanding the basis of forage seed production economics is crucial and important.

CONCLUSION

Implementation of the recommendations contained in this report is expected to deliver good quality forage seed available at affordable prices; increased forage production in terms of both quantity and quality; and increased livestock productivity. The recommendations establish a methodology to achieve sustainable forage seed production in Ethiopia, leading to the development of a commercial forage seed industry which can sustainably supply forage seed with minimal government involvement. If successfully implemented, this will provide a model for forage seed production which would be suitable for replication throughout sub-Saharan Africa. A country which does not produce its own agricultural seed is a country without agricultural technology of its own and ultimately a country without sovereignty.

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