THE CASE FOR THE DEVELOPMENT OF THE PRIVATE LIVESTOCK EXPORT INFRASTRUCTURE

SOMALIA

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FINAL REPORT

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2

TABLE OF CONTENTS

		PAGE NUMBER
I.	SUMMARY	1
II.	INTRODUCTION	3
III.	BACKGROUND	5
IV.	DISCUSSION	9
	A. Fodder Production	9
	B. Livestock Feeding	14
	C. Dairy Production	16
	D. Transportation	16
	E. Private Livestock Holding Facilities	17
	F. Public Policy	17
	G. Public Infrastructure	22
V.	RECOMMENDATIONS	26
	A. Credit	26
	B. Applied Research	28
	C. Training and Outreach	31
	D. Public Livestock Export Infrastructure and Public Policy	32
VI.	CONCLUSIONS	33

I. SUMMARY

Livestock exporting is Somalia's most important foreign trade enterprise, accounting for 80% of all hard currency exports. However, since the 1983 ban on imports of Somali cattle by Saudi Arabia, cattle exports have decreased and although alternative markets are being pursued, Somalia faces intense competition from other suppliers, some of whom are subsidized by their governments. Not only are cattle exports down but sheep and goat exports are also in danger of reducing. Camel exports have already become less important. The reason given by livestock importers for shifting their business to other countries is that Somalia is an unreliable supplier. An indicator of this unreliability is the fact that in any given year up to 40% of the letters of credit (LC) opened are never filled. Somali exporters explain that the reason why they cannot fill orders is that they are hindered by a host of internal constraints which include the lack of private export infrastructure, inadequate public export infrastructure and public policies detrimental to livestock exporting. In order to compete in an increasingly sophisticated market, Somalia must modernize its exporting infrastructure. Livestock exporters, for their part, have started to invest in the infrastructure necessary to market better quality animals in a more timely and efficient manner. The private infrastructure that they are in the process of developing include fodder farms, livestock feeding facilities, private holding grounds, marshalling yards, and an improved livestock transportation system.

To make these investments in private infrastructure effective, exporters need the removal of institutional constraints, such as improvements in the public livestock exporting infrastructure. Some government functions that are currently inadequate and require reform or improvements includes the need for a modern telecommunications system linking all of the regions in Somalia with each other and with the countries on the Arabian Peninsula. Quarantine stations must be constructed and the holding grounds, marshalling yards, and other export facilities need upgrading. The veterinary service needs to be better paid and equipped and have more opportunities for better training. This, of course, is only part of the overall need for civil service reform. Research in fodder production, animal nutrition, agricultural economics, agricultural engineering, range management, and socio-economics must be supported and expanded. The agricultural extension service needs training in fodder production, livestock production, range management, and farm financial planning. In addition they need the resources to reach the producers. Finally, the credit system must become responsive to the total financial needs of the livestock export sector.

Along with the improvement of private and public facilities and infrastructure, certain public policies that are detrimental to the livestock export sector need to be reviewed by the policy makers. These policies increase the cost of Somali livestock exports, making them uncompetitive in key foreign markets, and thus reducing overall exports and earnings. Whereas competing countries provide cheap credit, low cost facilities, tax remissions and subsidies to their livestock export sector, Somalia imposes heavy taxes and institutional constraints on its livestock exporters. A list of the policies most detrimental to the development of private export capability includes: Unfair foreign exchange regulations and excessive export taxation and bureaucratic red tape; the requirement that all shipping be negotiated through a parastatal shipping monopoly and that a state insurance agency provide shipping insurance; the exclusion of international banks and the discouragement of foreign investments in livestock production and infrastructure; there is also an inadequate land tenure policy and land registration system; and finally the exclusion of a private veterinary service and the private importation and distribution of veterinary drugs.

There is an opportunity to enhance Somalia's ability to export healthier, younger, and heavier livestock. The private export sector has already begun to invest in the necessary infrastructure. With the elimination of GSDR policies detrimental to livestock exporting and with improvements of the public infrastructure, the private export sector will increase its investments in private export infrastructure. The interventions needed from outside Somalia to support the development of a modern export industry include a comprehensive credit program, undertaking fodder and livestock production research, and supporting the growth of the extension service. Only a coordinated and long-term commitment will result in an enhanced capability to export livestock.

5

II. INTRODUCTION

The "Somalia Agricultural Sector Survey: Main Report and Strategy" of February 25, 1987 identifies the livestock sub-sector as the "major contributor to GDP, employment, and exports in Somalia." The report goes on to say that "exports will take time to regain lost markets, but will be the source o future growth, along with domestic demand." Livestock will continue to be Somalia's most important enterprise. Livestock exports have provided up to 80% of Somalia's export income. The 1983 ban on Somalia's cattle was a severe blow to the economy. In addition, Somalia has been facing severe competition from other suppliers of sheep and goats as well as cattle. Nonetheless, the fact that traders can not fulfill all of the orders received (up to 40% of the letters of credit "LC" opened in any given year have not been filled) indicates that Somali livestock exporters are facing severe internal constraints.

It is important that the marketing of Somali livestock be improved. Existing markets need strengthening, old markets need to be regained, and new markets must be created. Accomplishing this is dependent on the elimination of the internal constraints to livestock exporting. These constraints, both in matters of public policy and in the lack of public and private infrastructure, severely limit Somalia's existing export possibilities. In the words of one influential livestock trader, "There is no doubt whatsoever that the major setback is marketing inefficiency. The proof of that statement is to be found in the fact that Australia, which also experience droughts, is several thousand miles away from Saudi Arabia and can supply live animals to that country more reliably and at a cheaper price."

The continuing ban on the import of Somali cattle into Saudi Arabia, the physical problems encountered by livestock exporters, and the lack of profitability in the past 1986 season is not sufficient cause to look at the livestock export sector with an air of pessimism. There are many reasons to be very optimistic about the development of the livestock export sector. In 1986, recorded exports of cattle jumped to 47,500 head in contrast to the 20,000 head in 1985. Projections for 1987 are already well ahead of 1986. In addition, Kenya is proving to be a large and growing market even though these exports do not appear in the official statistics. Perhaps the most important reason for optimism is the fact that the livestock traders are making major investments in private livestock exporting infrastructure. Fodder farms, livestock feeding facilities, private livestock marshalling yards, new commercial groupings , and an association representing the interests of the livestock

exporters are all new developments. In private conversation, livestock exporters state clearly that in order for them to be competitive in an increasingly sophisticated market, they must have better control of the export process and able to offer a higher quality product.

III. BACKGROUND

Livestock development interventions are normally aimed at the producer that is the supply side of livestock production. Rangelands projects, veterinary services, water development, etc., generally try to serve the primary producer. Sometimes these projects find themselves in conflict with the pastoralists they are trying to benefit. The economic rationale of the pastoralist is not necessarily the same as the "market oriented" view of the expatriate or government experts designing the projects. We have, however in Somalia, a situation where the demand side (the exporters) is already investing in the infrastructure needed to improve their marketing efforts. Their desire is to be able to offer the better quality animal demanded by the importing countries and deliver it in a timely and efficient manner.

Fodder production is the key to all private infrastructure development. Fodder is needed to: (a) supply the animals in the ports and on the ships; (b) for the quarantine process; and (c) above all, to improve the quality and the weight of the exported animals. Fodder farms are already an integral part of the livestock export system in northern Somalia. The port of Berbera is located across a strip of very harsh desert and erosion and range deterioration are very advanced in parts of northern Somalia, forcing livestock exporters to invest in fodder farms. In the southern regions, however, fodder is a commodity that is harvested from the wild. The Shabelle and Juba rivers are very close to the port cities of Mogadishu and Kismayo where sufficient wild grass could always be cut from along the rivers, irrigation canals, and among the banana and grapefruit plantations to meet the export needs. However, with the livestock importing countries demanding heavier and younger animals, serious consideration is being given to investing in irrigated fodder farms.

One of the most important aspects of fodder production is that it is the conservation of resources currently being wasted. For instance, in the northern regions of Somalia where as much as 50% of the rangelands is seriously eroded, fodder farmers are investing in water diversion systems to control and spread the run-off water coming from the eroded hills and plains. Land is being protected and the precious water is being conserved. In the southern regions, fodder is cut from along the river and canal banks and within the plantations. When this fodder is cut in a young and growing stage, its nutritive value is considerably greater than if it is allowed to mature. Traditionally, because of trypanosomiasis animals can only graze near the river in the dry season after the grasses are fully mature and thus of lower

quality. If instead this grass is harvested and conserved it has the same affect as increasing the tonnage. The nutritive value of properly harvested and conserved fodder can be as much as twice that of grasses allowed to grow into full maturity.

Livestock "feeding" or "fattening" is an idea that the public sector has promoted for many years in Somalia. There have been many attempts at creating livestock fattening units, both in the form of research units and parastatal production farms. As commercial ventures, these attempts have been unsuccessful since none are currently operating. The private sector is now interested in attempting to successfully commercialize livestock feeding. However, the basic economics of cattle feeding as it would be attempted in Somalia is unknown since there is no successful model on which to pattern the management. Theoretically there should be an opportunity to make a profit if animals are purchased in the dry season when prices are low and the animals are in poor condition. During the "jilal" dry season (January through March) herders are often forced to sell superfluous livestock because there is insufficient feed to maintain them. The market for these animals is generally very poor because no one has the feed available to keep them. These weakened animals would be able to make rapid weight gains at a minimum cost per gain and would be ready for resale at the higher prices common during the rainy season. Livestock "fattening" or "feedlots" is perhaps not the proper concept for Somalia. A more appropriate concept is the need to "condition" animals in advance of marketing or export. The market in the Arabian Peninsula does not demand "fattened" meat. Livestock importing nations are complaining about the low weights and quality of Somalia's animals. This is a problem that must be addressed if Somalia is to compete against Europe and Australia. Providing high quality fodder for a "conditioning" or "growing" period prior to export would be sufficient to satisfy this requirement. The feeding of high "concentrate" diets as the term "fattening" implies would be a needless expense. One attractive aspect of having a "conditioning" period for the livestock prior to export is that one of the easiest ways to increase Somalia's exports by 10% is to export animals that are 10% heavier. Using 1985 export figures, it would require a 55% increase in banana exports to match the income generated by a 10% increase in livestock exports. Increasing export weights by 10% is certainly an attainable goal and would greatly benefit Somalia's economy.

Increasing the weight of the animals tends to also decrease the age at export time. Importers want younger animals and more tender meat. Another beneficial effect is that animals can be taken off of the rangelands at an earlier age,

7

resulting in a net decrease on the demands put on the range. Range ecologists seem to be at odds over the exact level of overstocking, but it is safe to say that Somalia's rangeland is at or near its maximum capacity. In the northern regions 50% of the range land is considered by some experts to be in a seriously eroded condition. It is in the most overgrazed portions of the country where land is being protected by the "enclosure" movement. In order to assure grazing and fodder for their animals livestock producers and exporters fence portions of rangeland. These enclosed areas, protected from overgrazing, often recover from its previously devastated state. As more land is reclaimed from desertification and more investments are put into improving that land's productivity, it is possible that Somalia could increase its net livestock off-take.

However, producers face many constraints to the successful introduction of a modern livestock export infrastructure in Somalia. These constraints include public policies that are detrimental to the profitability of livestock exporting, and the lack of public infrastructure necessary for efficient exporting. This situation of high costs, low profit margins, and high risks, does not encourage livestock producers and exporters to invest in the private infrastructure needed to efficiently export livestock. Monetary and foreign exchange regulations have had a serious negative effect on the export industry, bureaucracy, red tape and excessive taxation have also hindered the livestock export industry, forcing some exporters to circumvent the law in order to profitably export livestock. The requirement that all shipping be negotiated through a para-statal shipping monopoly has increased costs as have the inadequate shipping insurance available through the state insurance agency. The exclusion of foreign banks and the discouragement of foreign investors have stopped infrastructure development through the lack of capital. An inadequate land tenure policy and land registration system make investments in fodder farm and other land improvements risky. The exclusion of a private veterinary service and the public control of veterinary drugs has resulted in an inadequate animal health care system. These failures of public policies are detrimental to the development of a modern livestock export industry. The impact of these policies will be further discussed in Chapter IV.

The lack of public livestock export infrastructure also makes exporting very difficult. However, it is in this area that the most improvements are being made. Some necessary infrastructure that is currently inadequate is the lack of a modern telecommunications system. Communications between the major cities in Somalia is virtually non-existent and communicating with the livestock importers on the Arabian

Peninsula can only be accomplished from Mogadishu. Functioning quarantine stations are needed to lift the Saudi Arabian ban on Somali cattle. A better paid and equipped veterinary service is a must. Research covering fodder production, animal nutrition, agricultural economics, agricultural engineering, range management, and socio-economics is very inadequate. Perhaps most importantly, a credit system responsive to the total financial needs of the livestock export sector is needed.

The key to the successful development of a livestock export sector capable of enhanced livestock exports is profitability. It is an absolute requirement that public policy allow exporters a reasonable profit. A liberal public policy coupled with a credit system that encourages livestock exporters to invest in the infrastructure needed to modernize their business will help insure the future of Somali livestock exports.

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IV. DISCUSSION

A. Fodder Production

The task of maintaining the existing livestock export markets in the face of serious competition from more developed countries and of ultimately increasing livestock production and off-take, requires the development of a modern fodder industry. It is important to understand that there is already a very extensive fodder industry in Somalia. This industry is easy to overlook because it exists mainly within the traditional economy and consists mostly of feeding crop residues and harvesting wild grasses. The economic value of crop residues to the farmer/livestock producer is very high and may rival the value of the primary crops--maize and sorghum.

There are three segments of the existing, or developing, fodder industry that are more cash oriented than that which feeds livestock on crop residues. The most visible is the fodder markets supplying the dairy animals in the major cities. For instance, the business of supplying Mogadishu with its daily requirements of fodder is very complex. During its annual peak period as much as 125 MT are being supplied daily. As a business it seems to be reasonably profitable and consists of harvested wild grasses and maize and sorghum stover. Most of the grass comes from along the banks of the Shabelle river and the irrigation canals supplying the plantations. In addition, there are what might be considered "fodder farms" scattered in the stabilized dune areas close to Mogadishu. Enclosures protect the grass, and after the rains have finished, this grass is harvested and sold. The urban fodder market puts a premium on fresh grass: consequently, no grass is harvested and preserved for sale during the dry season. At the height of the dry season, after all of the local grass supply is exhausted, the urban milk animals subsist on maize and sorghum stover. During an extended dry season, such as the "jilal" of 1987, stover was transported from as far as 300 km and the cost per kilogram exceeded the cost of maize itself (19 ShSo/kg vs 15 ShSo/kg). Although there is a steady and predictable demand, fodder suppliers have not seen fit to produce domesticated fodder varieties or to harvest and conserve fodder in order to take advantage of the higher prices during the dry season.

The fodder industry in northern Somalia is the most organized. As many as thirty years ago, livestock producers and traders started to reserve and protect

private grazing areas. One of the first investments made were water catchment systems (burkets). Now these people are in the process of fully developing their land into fodder farms. At considerable cost they are clearing and leveling their land and constructing irrigation and water diversion systems. The reason for this effort is that uncontrolled grazing has caused serious denudation of the rangelands, and fodder is an absolute requirement for exporting sheep and goats to Saudi Arabia.

The primary fodder producing areas in the north are located within 50 kms radius of Hargeisa and Burao. These two cities serve as the main staging area before the animals are trucked to the port city of Berbera. Since Berbera is located on the other side of a strip of inhospitable desert, there are no closer areas to produce fodder than Hargeisa (at a distance of 158 km from Berbera) and Burao (148). The export process requires that the sheep and goats spend one and a half days in Berbera and four and a half days on the ships in transit to Jidda. The average yearly export of sheep and goats is 1.3 million head, and at a very minimal feed intake of 1 kg/head/day means that 7,800 MT of fodder is being produced and transported to Berbera annually.

The way a fodder farm in the northern regions is created is for a livestock trader (or fodder producer) to fence a relatively small portion of land (up to 100 hec. in size) and register it with the government as agricultural land. Since this land is often located in areas where the farmer's family has lived for many generations, there does not appear to be land tenure conflicts. These "farmers" clear the land and construct water catchment and diversion systems that take advantage of the huge quantities of water that can flow from the surrounding hills during the rainy seasons.

One reason these farms are being created is that continuous overgrazing has so denuded the rangelands that there is little vegetation left to interrupt the downhill flow of water. In the vicinity of Burao there is evidence of up to 3 meters of sheet erosion. In the words of one researcher familiar with the problem in East Africa, "Water, no doubt, is the key factor to full use of land resources, no matter what the land's capabilities are for crops, pasture, or forest. These resources cannot be used as they should unless the water-supply problem is solved." (David S. Mbakaya, Infiltration and Soil Loss as Influenced by Vegetation and Cover Types). In other words, as a result of

overgrazing the land is eroding and the rain is not entering the soil in the place that it falls. With less water in the soil there is less growth of plant life and hence a vicious cycle of continuous degradation. "Some of the important consequences of inadequate soil water are seasonal variability of herbage growth, which makes it difficult to maintain live weight gains of grazing animals throughout the year; early maturity of grasses and herbs; and incomplete soil cover, which increases the danger of soil erosion." (UNESCO/UNEP/FAO, Tropical grazing land ecosystems. A State of Knowledge.) Fodder farms are a necessary adaptation to a deteriorating range situation.

Range experts estimate that rangelands in northern Somalia have the natural capacity to produce up to 1 metric ton (MT) of forage per hectare. However, when there is not enough grass left to hold the rain, the land erodes. Effectively, less water is available to raise grass and the lands productivity decreases to somewhere between 0 and 0.5 MT per hectare. In the valleys when runoff water is diverted and managed, the native grass yield can increase to 4 to 5 MT per hectare. The evidence is that the land in northern Somalia, if prudently used and protected, will rapidly regain its natural ability to raise one or more MT per hectare. If it is developed to use and conserve runoff water, the land can then quadruple its productivity. The long-term implications are that Somalia could raise more animals. These animals could grow faster and be marketed at a younger age and people of Somalia could be less affected by drought.

Fodder production technology currently in use in Somalia is very rudimentary. For the most part it consists of hand cutting wild grass with a knife and bundling up the grass with string. Only in the north is there a systematic attempt to promote the growth of grass. After the land has been cleared and leveled and the water diversion system put in place, the fields are plowed in order to promote the growth of the native Cynadon and Cenchrus species of grass. These grasses are very prolific and are probably highly nutritious. Given the low rainfall patterns of the northern regions, the grass grows very quickly and probably cures while standing. If this is indeed the case, much of the nutritive value of the grass is preserved since the plants do not have the opportunity to fully mature. The common production practice is to allow the grass to remain standing in the field until it is needed. At that time, it is cut by hand, bundled, and loaded into

trucks. The most reasonable estimation is that 2 MT of fodder can be loaded in a 6 ton Nissan Truck. Generally the cutting process is paid for by giving one half of the crop to the work crew. In the summer of 1986 during the peak of the Haj trade (most sheep and goats exported to Saudi Arabia are destined for sacrifice during Haj), a truckload of fodder in Berbera sold for 30,000 ShSo. 15,000 ShSo of this cost being for transportation. In November of 1986 a truck load of fodder sold for 45,000 ShSo with transportation still amounting to 15,000 ShSo. Fodder prices did not exceed this amount because sheep and goat exports ceased after December such that there was little demand during the dry season. During periods of serious drought, fodder prices have exceeded 100,000 ShSo per truckload and have been transported from as far away as Mogadishu.

The fodder industry as it has developed to supply livestock exports from the southern ports is not as sophisticated as it is in the north. Traders simply have wild grasses harvested when and if they need it. Should this period of need fall in the dry season, the fodder that is supplied to the export animals tends to be fully matured, dry grasses low both in nutrition and palatability. The cost of this fodder is usually little more than the cost of cutting and hauling it to the ports. Only one organization has made a systematic attempt to supply fodder. The Trans-Juba Farm (a mostly non-functioning parastatal whose original purpose was to produce fodder and feed cattle) near Jamama uses its fodder harvesting machinery to cut and bale wild grasses along the Juba river. The quality of the fodder varies with the season and the farmgate selling price of 4500 ShSo per MT is below the cost of production.

The most common suppliers of fodder in the southern regions are the men and women working on the fruit and vegetable farms along the Shabelle and Juba rivers. On days off or after work they cut fodder which is then transported (in the case of the Afgoi and Balad regions) by donkey cart to the fodder markets of Mogadishu. The Mogadishu fodder markets put a high value on fresh fodder and therefore very small quantities of dried grasses are available in the market. If an exporter needs a number of tons of fodder he will commonly hire a crew to cut and load river grasses or hire a contractor who does the same. Only on the trans-Juba farm are mowing machines and balers used for forage harvesting. However, this technology is not used to its full capacity. Wild grass is cut in areas that are relatively flat, but these "fields" have not

been prepared for efficient mechanized fodder harvesting. In addition the bales of fodder produced weigh less than 10 kg. At this small weight and size the only real purpose of baling hay (i.e. decreasing the transportation costs) is totally nullified.

There is a lot of talk on the part of livestock exporters about investing in modern fodder farms. However, they have virtually no experience with either the introduced varieties of fodder being contemplated or with the technology necessary to harvest that fodder. In general, those traders closest to being ready to invest in modern fodder farming stop short of the actual investment. Choosing the proper fodder varieties, importing the seeds and other supplies, ordering the equipment, and finding a manager capable of carrying out the process is a formidable hurdle.

In the case of purchasing the necessary equipment, there is an almost total lack of experience. There are no machinery suppliers in Somalia capable of recommending or servicing fodder production machinery. People simply do not understand these machines or their capabilities. Potential fodder farmers are therefore very hesitant about investing. Realistically this attitude is commendable because machines such as mowers and balers are relatively complex and prone to all manner of breakdowns. Very small and simple parts, when broken, can incapacitate this type of machinery. Should the export industry become more dependent upon higher quality fodder, they will definitely need to mechanize. Labor shortage during critical harvest periods are already cited as a major problem.

The constraints to investing in modern fodder farming exist, making the hesitation on the part of potential fodder farmers understandable, yet the fodder industry must be encouraged to grow and develop. Somalia will not be able to improve the quality of its animals or substantially increase its export potential without a more organized fodder industry. It is necessary that the GSDR address the numerous constraints. Basic research is needed to answer the technical questions about improved production. Technical expertise is needed in the extension service to train the fodder farmers in the technology of fodder farming. And, most important credit coupled with financial planning is needed to facilitate investments in fodder farming.

16

B. Livestock Feeding

There have been many attempts on the part of the GSDR to introduce livestock feeding into Somalia. Some, such as the attempts by the Livestock Development Agency, were aimed at exporting higher quality animals. The goal of the Trans-Juba project near Jamama was to supply improved animals to the Kismayo Meat Factory. These two examples and others were mostly unsuccessful as commercial ventures. Although the history has been generally negative, the interest continues. Many of the large livestock export companies have prepared feasibility studies for large fodder farms that include livestock "fattening" components.

The need for Somalia to be able to offer higher quality animals for export is undeniable. Algeria will buy Somali cattle if they average 450 kg. Egypt is willing to accept 350 kg. animals but would prefer that they be around 3 years old. The facts are that the bulls offered for sale from Somalia rarely exceed 300 kg. and are often 10 years old. Exported sheep and goats often do not average 25 kg. and are at least 2 years old. Compared to the choice and prime steers and lambs offered by the Australians as well as those from the subsidized European suppliers, Somali traders are at a distinct disadvantage. Somalia's only real advantage is that it is closer to the Arabian peninsula and thus has lower transport costs than do the Australians or the Europeans.

If there is a single major "design" reason for the failure of the various parastatal cattle feeding attempts, it is that they were based upon American, Italian, or Russian models. The realities and the opportunities of a Somali-based system were not fully appreciated. This is also a weakness in the various cattle "fattening" schemes currently being promoted by the livestock export companies. Cattle "fattening" is not the proper concept for Somalia. The market does not require "fat" beef in the sense that the USA market requires "fat" or "marbled" beef. This market requires younger animals that carry more "flesh". Livestock "conditioning" is a more appropriate concept. It must be clearly understood that the enemy to young, well conditioned animals in Somalia is the long harsh dry seasons. Were it not for the dry seasons, Somali livestock would be as big, fat, and productive as anywhere in the world.

A successful livestock conditioning operation in Somalia must take into account that animals are in

their worst condition in the dry season. Therefore, any feed will result in rapid and relatively cheap weight gains. Under these conditions cattle can double their weight in as little as 70 days. Also during the dry season the price of the animals is lower because the producers are forced to reduce herds. A successful conditioning operation should not rely on expensive concentrates or supplements. High quality forages are sufficient for the needs of the animals and for the needs of the market. It must also be recognized that the cheapest feed is the feed that the animal harvests by itself.

Livestock feeding or "conditioning" in Somalia is in too infant a phase to be promoted as an independent industry. For a livestock conditioning enterprise to be successful, it must be tied to a guaranteed market. An example of this approach is the first private livestock feeding enterprise in Somalia, which just recently began operations. This company has a contract for bulls in the Arabian Peninsula. One other possibility for marketing improved livestock is the growing demand in Mogadishu for better quality beef. However, this luxury meat market is very small and could easily become saturated. Any entrepreneur attempting to supply it should be tied to a retail outlet such as a restaurant.

Large feedlot type operations or feedlots coupled with improved grazing opportunities such as the ones currently being considered by the large exporting companies are not necessarily the only way to organize the livestock "conditioning" industry in Somalia. In fact, the large feedlot type enterprise probably has a limited future. Although there is infinite experience in livestock production there is very little Somali experience in managing livestock in a concentrated environment. There is even less experience in managing complex capital and technologically intensive enterprises such as large fodder and livestock feeding enterprises. A system that should be explored is a linkage between exporters and the villagers living in the riverine areas. These villagers have access to the necessary grass and could possibly contract with exporters to condition cattle. The small scale approach to livestock "conditioning" eliminates many of the technological and management problems that the large farms would face.

18

C. Dairy Production

Dairy production does not on the surface have anything to do with livestock exports. However, since the development of a fodder industry is so important to the future of the exporting industry, the promotion of dairies in this context becomes logical. Whereas livestock can be adequately conditioned on the wild grasses cut in an early nutritious stage, dairy production will benefit most from high protein introduced varieties of fodder. Since ultimately there is the need for the adoption of mechanized fodder technology, the more demand there is for the machinery, the lower the cost and the risk for each individual investor. Enhanced dairies will also serve as a source for high quality bulls for export.

The need to augment the dairy industry is in itself important. Somalia is a milk-consuming country and it is estimated that Somalies consume 221 liters of milk per year per capita. However, in Mogadishu, milk production meets only 25% of the local demand. Ten million US dollars of milk powder is imported annually to meet this demand. The development of a fodder industry that can help increase milk production would be a worthwhile addition to Somalia's dairy industry.

D. Transportation

Although fodder production and livestock conditioning capabilities are the two major infrastructural needs of the private sector, there are other infrastructural investments that need to be made. One area is transportation. There is a substantial transportation sector in Somalia and statistics show there is considerable unused capacity. For instance, the Mogadishu region has the highest loaded to unloaded ratio for heavy trucks and that is only 50%. However, there is virtually no transport specialized in moving livestock. All animals, except camels, shipped from Berbera arrive in Berbera by truck. Yet very few truckers double deck their trucks, since they prefer to have their trucks free to backhaul goods from the ports. This keeps trucking costs higher than necessary since fewer animals can be transported on a single deck truck. There is a growing desire on the part of the livestock exporters to control a portion of their own transportation requirements. During the frenetic activity of peak export season supplying the "Hajis" with sheep and goats is a period when large triple decked livestock carriers would greatly facilitate the movement of animals. In addition, between April and October, the

19

Indian Ocean is too rough to ship sheep and goats by sea. With the new highway linking Mogadishu with Berbera it is conceivable to transport sheep and goats overland. Large specialized carriers would greatly reduce the per unit cost. One point of future concern is the need to be able to transport cattle from the quarancine stations to the ports. Any cattle quarantined at the stations being built to service the ports of Mogadishu and Berbera will require transportation. The one thing that is hindering the investment in specialized livestock transportation is economics. The cost of a specialized carrier is considerably higher than the cost of a general transport truck and the demand for its services is more seasonal. As matters currently stand, there is a sufficient transportation potential to meet Somalia's livestock transportation requirements. This livestock transport is more expensive than it needs be but unless the economics of trucking changes in Somalia it is more advantageous to invest in a general transport than in specialized livestock transport.

E. Private Livestock Holding Facilities

One other potential area for investment by livestock exporters are private holding and marshalling facilities. It is a complex endeavor to gather thousands of animals in advance of exporting; they must be kept some place. In the past the animals could be grazed in the vicinity of the port or transhipping area, but increasing urbanization and the enclosure of land on the outskirts of the cities is making it necessary for the exporters to invest in their own holding facilities. These holding facilities will need water, livestock handling pens, and in some cases dipping tanks. Getting clear title to the land needed for these facilities is one important issue as, of course, receiving the necessary credit to make the investments.

F. Public Policy

Public policy very naturally has great impact on the performance of the livestock export industry. When policy hinders the development of such an important industry, it harms the entire economy. Somalia's position in the livestock export business is very tenuous. Livestock exporters must compete with subsidized livestock from Europe and highly efficient export industries such as Australia's. Every law and tax that hinders Somalia's exporters jeopardizes Somalia's long-term interests. These laws and taxes

should be carefully reviewed on a regular basis by the policy makers to see if their continuation is truly necessary in the context of Somalia's long-term interests. Some of the policies that are currently most harmful to livestock exporting are:

1. The requirement that 100% of the export earnings be exchanged at the current auction exchange rate.

2. Excessive internal taxation and red tape.
3. The requirement that all shipping be negotiated through a parastatal shipping monopoly.
4. Inadequate shipping insurance.
5. The exclusion of international banks.
6. The discouragement of foreign investments in livestock production and infrastructure.
7. Inadequate land tenure policy and land registration system.
8. Exclusion of a private veterinary service and free importing and marketing of veterinary drugs.

As of June, 1987 a new foreign exchange regulation requires that all hard currency earned through livestock exporting be exchanged at the current auction rate. The impact of this regulation is not yet fully understood. The immediate effect on the livestock exporters is negative but what the long-term effects will be are yet to be determined. The regulation that this new regulation replaces was very damaging to Somalia's livestock export industry. The old regulation required that 50% of the foreign exchange earned through livestock exporting be converted at the official rate. This amounted to a 20% tax on the gross income, which is an extremely heavy tax burden on an industry that is struggling to compete in an increasingly sophisticated market and against competitors who receive subsidies (Europe) or tax remissions (Australia and Turkey). The livestock exporters needed desperately to invest in private infrastructure but with profits taxed from them "off the top", they had little left to invest in improving their businesses. The strategies the livestock exporters devised to protect their income added to Somalia's reputation as an unreliable supplier. Those exporters that did not engage in the outright smuggling of livestock, under-invoiced their shipments or made private "under the table" deals for prices in excess of what was declared to the government. In all three cases, the exporters were at the mercy of the buyers who could elect not to honor the arrangement. In a business that is becoming more sophisticated with contracts happening aboveboard through international banking channels, Somalia's

reputation of being an unreliable supplier where deals are always made "under the table" was being reinforced. What is important is that the new foreign currency exchange regulation gives livestock exporters the opportunity to profit honestly. The immediate effect of new regulations is to put the 1987 export trade in jeopardy. The price of sheep and goats was bid so high that a net loss was built into the export transaction. Livestock exporters were calculating on using the hard currency earned to import consumer goods for their profits. With the new regulation, the exporters are required to surrender all hard currency to the auction system. Not only do they not have the hard currency with which to finance their importing business, they do not know in advance what the exchange rate will be. They are free, however, to repurchase hard currency through the auction for their importing needs. In this case, however, they will come under importing regulations and taxes that will severely limit the possible profits. If the new system is fair and aboveboard and succeeds in stabilizing the economy, all will be for the best. If however, the exporters are forced to continue their "smuggling" activities in order to profit, the long-term effect is that the livestock exporting system will not improve.

Livestock exporters are plagued by a large number of minor taxes and authorizations. As many as nine or ten various branches of the government must be consulted for authorization to export (Table 13 on page 47 of the annex to this report gives a list of export taxes and fees). Not only are the combined charges excessive but the time involved in paying these fees and taxes is burdensome. What is worse is there is too much opportunity for minor officials to hinder the export process. Purchasing animals, collecting them, vaccinating and dipping them, collecting enough fodder, and transporting the animals to the port on the day the ship arrives is already an immense and expensive undertaking. Policy makers should review the taxes and authorizations in view of eliminating as many as possible and simplifying the process. One possibility is to unify the necessary fees and taxes under one administration.

Maintaining a shipping monopoly through the Somali National Shipping Agency is also against Somali's long-term interests. Somali exporters have to compete with well run shipping services. To enjoy the maximum flexibility, exporters should be able to arrange their own freight services. Other public sector monopolies that adds extra cost to the export sector are the State

Insurance Company and the Shipping and Clearing Agencies. Both charge fees well in excess of those levied by private agencies in other countries while providing uniformly poor or non-existent services. There is no reason why private enterprise cannot provide these services.

Somalia is in desperate need of the expertise and resources of international commercial banks. The lack of dependable credit is a major impediment to the growth and development of a strong and modern livestock export industry. The credit available for the purchase of livestock in advance of export is inadequate. As it is now, exporters can only borrow up to 50% of the value of a letter of credit. To be sure of meeting export commitments, they need to be able to purchase animals in advance of contracting. Inadequate financing leads to the situation where up to 40% of the letters of credit are never utilized, adding to Somali's reputation as an unreliable supplier. Credit is also needed to finance the development of modern fodder and livestock feeding farms along with other private infrastructure to make a well-functioning livestock export industry.

Although the Somali Development Bank and the Commercial and Savings Bank apparently have the funds to lend for infrastructure development, in practice very little money is lent. These banks suffer from all of the ailments associated with public sector credit institutions, in need of thorough reform and competition. It is important to have a credible public lending system as well as a strong private banking system. In order to develop the private export infrastructure the banking system needs to be in a position to offer full-range banking services. Exporters need long-term credit for farm and infrastructure development; medium-term credit to purchase equipment; and short-term credit to operate their businesses. Without a banking system that can make a long term commitment to its borrowers, infrastructure development will never take place. Large businesses need the flexibility and resources of the private banks and the small- and medium-size businesses need a committed public banking system. The two together will make a partnership that can guide and participate in the development of a strong livestock export industry. Although there is a general need for reform in the banking system the credit needs of the livestock export sector should be met as soon as possible. Special funding and an innovative administrative approach would be one way to provide the livestock exporters the necessary credit.

There is now a new law addressing foreign investments in Somalia which is particularly positive development for livestock exporters. These exporters need to be able to enter into joint ventures with foreign investors. Many of the fodder and livestock feeding farms currently under consideration by the livestock exporters are of a size, cost, and sophistication that foreign money and expertise is needed if these enterprises are to succeed. Other types of joint ventures should also be explored. One possibility is a system where livestock are partially fed (or conditioned) in Somalia, exported, and the feeding period is finished in Saudi Arabia. Somalia could even furnish the fodder for such a system. The important consideration is that livestock importers from the Arabian peninsula will be encouraged to invest in Somalia and develop close commercial ties with Somali businessmen. These investments would insure long-term markets.

A recent law (Ministerial Decree Number 4 of May 1986) requiring that all exporters form companies could have a negative impact on livestock exports. In general, the nature of the livestock business does not allow for corporate decision making. Producers, middlemen, and buyers prefer to deal with individuals, relying on the integrity of each person involved. Where and when companies have evolved in the livestock business has been a natural development that depended upon the circumstances and personalities of the people involved. Requiring that companies be formed increases the complexity of successfully exporting animals. Natural economic and social forces should be allowed to decide in which instances companies function better than individual endeavors. It may prove in the long run that a rather small group of individuals will control the livestock exports but in the near term the current organization should not be restricted. It has been expressed by some government officials and livestock exporters that too many small exporters inflate the market, and the solution is to restrict the number of people allowed to export. A policy limiting the number of exporters would definitely not be in Somalia's interest. Making livestock exporting a monopoly of just the largest exporters would result in exporting becoming less efficient, not more. As it is now, it is export inefficiencies that is harming Somali's position in the market. The small exporters are the most dynamic innovators, the people who are experimenting with the technologies so important to Somalia's future. The interests of the primary producer, the nomad, must also be considered. After all he is the rock the rest

of the system stands on. He must be allowed a fair opportunity to profit. Restricting his income through arbitrary regulations would only hinder the overall development of Somalia.

The lack of private veterinary services is another area of public policy that seriously constrains the development of the livestock export sector. The government veterinary service has not proved capable of meeting Somalia's animal health care needs. There has been a recent policy change removing some of the government monopoly on veterinary drug imports. This is a very welcomed change. Now the chronic drug shortage has a chance of being relieved. There is still a need to allow veterinarians to have private practices. Veterinarians employed by the various government agencies are too often constrained by resource shortages to be effective. Privatization of veterinary services along with the privatization of drug importing and distribution would make the individual veterinarian responsible to organize the equipment and medications necessary will result in a more efficient veterinary system. The proper role of government is to regulate the industry and license the veterinary practitioners.

Land tenure laws need to be reviewed to insure that they allow for the creation of fodder and livestock feeding farms. The law as it now stands is designed to allow only for the development of agricultural land. The enclosure of land for livestock production is a practice that in many parts of Somalia is very controversial. It is important that the regulations protect the right of people developing fodder and livestock feeding farms. In addition, it is necessary that the law be applied uniformly across the nation and that officials understand under what circumstances such farms can be legally registered.

G. Public Infrastructure

The GSDR is making rapid improvements in providing the needed public sector infrastructure. The Livestock Marketing and Health Project (LMHP) in particular is working to provide the needed services and facilities. Quarantine stations, soon to be constructed will provide the opportunity to reenter the Saudi Arabian cattle trade and insure continued access to the markets already being served. The LMHP is also operating and improving the livestock holding facilities, port marshalling yards and portions of the veterinary services. In so far as these services are given the proper financial and physical support, this will be a

great benefit to the livestock export industry. Another function recently begun by the LMHP is domestic and international market information. The domestic market information service will allow policy-makers to determine livestock production trends and gauge the profitability of the livestock trade. The international market information services will allow for high level diplomatic efforts to promote livestock marketing. These services should be encouraged and reinforced.

One major area where the public sector service is inadequate is in the domestic and international communications network. Effective livestock marketing depends upon communication and one important complaint of livestock importers is the difficulty of communicating with traders in Somalia. International communications are only possible through Mogadishu whereas most sheep and goats are exported from Berbera and most cattle are exported from Kismayo. In addition, there is no direct communication between Kismayo and Mogadishu or between Hargeisa, Burao, and Berbera. For that matter the smaller towns, such as those in the Central Rangelands where the bulk of the sheep and goats are raised, are totally devoid of a public communications system. There are also no radio communications with the ships coming to Berbera or Kismayo, and inadequate communications with ships coming to Mogadishu. Efficient livestock exporting requires efficient communications. The communications system in Somalia is simply inadequate to maintain an efficient and modern livestock export industry. Although better public telecommunications is a general need, an interim approach might be to set up special communications channels for livestock exporters and traders within Somalia and more lines targeted to the Arabian countries.

As stated above, the veterinary service should be privatized, but those portions of the veterinary service that continue under government control must be given better resources. It was an inadequate veterinary system that prompted the Saudi Arabian ban on Somali cattle and gave Saudi Arabia an excuse to continue the ban. The cost to Somalia in lost sales has been enormous. There is no reason that given an adequate public and private veterinary service that Somalia should not be able to eliminate the threat of major communicable diseases and satisfy all international veterinary health requirements. Although the needs of the veterinary service is singled, their needs are part and parcel of the overall need for civil

service reform. Veterinarians, like other government workers, need proper monetary and leadership incentives along with the resources with which to do their jobs.

There is a lot of talk by government representatives and private entrepreneurs about the need for modern fodder and livestock feeding industries in Somalia, but there is very little support for establishing the necessary foundation for these industries. Baseline information on fodder production and livestock feeding is not available. There is no information on what types of fodder to grow in any given set of circumstances. There is very little information concerning which varieties respond best to Somalia's environment. There is no information on probable yields of most types of fodder or any other information upon which to calculate the cost of producing a fodder crop. The same is true in feeding animals. No one knows the nutritive value of the various feeds or the response of the indigenous animals to that feed. There is no information concerning which micronutrients are limiting or which feed supplements are most beneficial. For that matter, finding a reliable supply of any needed feed supplement is a major obstacle. In addition the economics of feeding animals is completely untested. There are in existence today only two fodder research projects. One funded by the Ministry of Agriculture is very small in scope. The other, under the Ministry of Livestock, is more ambitious but has very short-term funding. Currently there is no research on livestock nutrition, and no work being done in economics of fodder production, or livestock feeding.

Without the ongoing commitment to basic practical research, which is the foundation for developing a fodder and livestock feeding industry, it is impossible to have a program of agricultural extension that can carry the technologies to the people. It is irresponsible to promote investment in expensive equipment and technology without having the basic information available to ensure technical and economic feasibility. To the extent that information is available, there needs to be a system to conserve and transfer that information. Agronomists and animal scientists working in the GSDR need to have an institutional method to learn about changing recommendations and concepts. Students at the University need to be able to learn about fodder production and livestock feeding. They also need to be able to get "hands on" practical experience. By the same token, farmers and livestock producers need to have a system where they can receive training and guidance. It is important that steps are

taken to improve the extension and training system in order to promote the orderly development of the fodder and livestock feeding industry.

V. RECOMMENDATIONS

The livestock export industry in Somalia is in a unique position. Both the public sector and the private sector are in agreement that exports must be protected and expanded. The GSDR is very anxious to see that the livestock export industry improve and modernize its capabilities and the exporters are equally anxious to enhance their export capability. The private export sector is already in the process of making major investments to enhance its export capacity. Fodder farms are being created and improved, irrigation and water diversion systems are being constructed, livestock conditioning facilities have started operations. Exporters, traders, and farmers from one end of Somalia to the other are asking for advise in fodder production, livestock feeding, and farm planning. Clearly, there is a serious movement on the part of the livestock export industry to modernize and enhance its own export capability. This is an opportunity for the GSDR and the Donor Agencies to enhance this spontaneous movement to modernize Somalia's livestock production and export system.

There are five classes of interventions needed if the livestock export industry is to enhance its capabilities :

1. A credit system dedicated to meeting the needs of its borrowers.
2. Basic research to test the economic viability of various technological interventions.
3. An extension or outreach system to impart the research information to the target group.
4. Improvement of the public livestock export infrastructure.
5. Reform of the public policies constraining the livestock export industry.

A. Credit

The single most important item needed to enhance the modernization of the private livestock export infrastructure is a credit system responsive to the needs of the people. The types of credit needed to expand Somalia's livestock export industry range from large blocks of venture capital to very small loans. Credit is needed for short periods to finance the shipment of a load of livestock and for very long periods in order to develop an integrated fodder and livestock conditioning farm.

One type of loan that is needed is short-term credit that will allow exporters to purchase livestock when opening a letter of credit. As the situation is now,

the Commercial and Savings Bank of Somalia will only advance 50% of the value of an LC. In order to purchase sufficient livestock, exporters must often promise to pay premium prices to the pastoralists on the condition that they wait for payment until after the shipment is complete. This premium price is in effect the same as borrowing capital at 40% to 50% interest per annum. This is a practice that benefits the pastoralists, but it does add to the unprofitablity of the livestock export industry. As the capacity to hold and condition animals increases, livestock will have to be purchased well in advance of export and this will require credit to finance the purchases.

Another type of specialized credit needed are relatively large loans to develop integrated fodder/livestock conditioning farms. There is a limited potential in Somalia for these types of large agricultural enterprises, since management, equity capital, and technical expertise are major constraints. However, selected individuals and certain livestock marketing companies do have the capability to develop and manage such farms. On a case by case basis, credit should be available to finance the development of a small number of these farms.

The largest and most important credit program needed is a comprehensive system that will provide long-term, medium-term, and annual operating loans to medium size exporters and farmers. These are the people who are already providing their own capital and management to develop the private export infrastructure. Since they are directly involved in the management of their farms, they have been experimenting with solutions to production problems. As one such man put it, he was finding ..."Somali solutions to Somali conditions". This is the type of entrepreneurship that must be supported and enhanced. What these people need is a credit system that is committed to serving them.

In the northern regions, water diversion systems are the key to enhanced productivity which often require extensive work with heavy machinery. These types of investments should be amortized for up to twenty years. Farms being developed in the riverine area of southern Somalia usually require extensive brush clearing and the construction of irrigation canals. Such investments are even more expensive and require long term financing. Many of these farms will need a certain level of mechanization and most will require imported supplies such as fencing materials and water pipes. Hard currency loans with a five to seven year repayment

schedule will be needed to purchase these items. Annual operating credit coupled with a project to review annual farm management plans is the third necessary component. The lack of operating capital can put long-term investments at risk. A financial service that couples farm management planning, technical advice and farm operating credit would go a long way towards developing a modern and efficient livestock exporting industry.

Besides providing loans and encouraging the very big and the medium size farmers, the small traditional farmers should also be encouraged. In fact the possibilities of encouraging fodder and livestock conditioning enterprises among the people living and working along the Shabelle and Juba rivers could be very important. These are the people who with the smallest investments could provide the greatest production increases. They are in some instances very well organized. For example, these are the people who supply Mogadishu with up to 125 MT of fodder daily. A credit and technical assistance program that encourages the planting of fodder, the development of small dairies, and the feeding of livestock could be very beneficial. Livestock feeding by the inhabitants of the riverine area can provide a method to condition large numbers of cattle for export. Encouraging small traditional farmers to produce fodder for the markets, for dairy production, and for livestock conditioning can be one of the most effective ways of improving the livestock export capability of Somalia.

B. Applied Research

Modern fodder production and livestock "feeding" are totally unproven practices in Somalia. Common sense says that it is technically possible to produce fodder and harvest it with modern machinery just as it is possible to feed livestock. What is not known is the "economics" of fodder production and livestock feeding. It is equally obvious that certain agronomic practices or livestock management systems are more cost effective than others. What these "cost effective" practices are,is the information that is lacking.

Fodder production research in Somalia is in an infant stage. One line of research conducted by the Ministry of Agriculture at Afgoi, which is unfortunately very small in scope, has been concentrating on identifying the varieties of the major fodder crops that do best in this environment. A second line of research also at Afgoi is conducted by the Ministry of Livestock,

Forestry and Range and the FAO. This effort has larger plots and is designed to identify the production techniques and the constraints of a number of major fodder species. It will also provide information on yields and costs of production. With research efforts such as these we will be able to identify which fodder crops will have the greatest potential to be profitably raised in the Middle and Lower Shabelle region. Fodder research is in the very beginning stages and needs to continue and be expanded. It is important that research be initiated in the lower Juba, in the dry land portions of the middle and lower Shebelle, and in the Northern regions.

Identifying the fodder species with the greatest potential and clarifying the production practices necessary to raising crops successfully is only the beginning. Finding how fodder farming can be integrated into the existing farming practices is next. Questions of labor and equipment constraints must be answered. Solutions to the lack of specific agricultural supplies must be found. One issue that should not be under emphasized is the marketing of the new fodder crop. The experience of one farmer who experimented with Leucaenia production was that no one wanted his product. Reasons behind such attitudes must be explored. What is needed, therefore, is basic research into "farming systems": (a) how fodder production can integrate with other production, (b) what are the comparative economic advantages, and (c) how can production and marketing constraints be overcome.

The same process is needed to solve the basic questions concerning animal feeding. The nutritive value of the various forages now available in Somalia is unknown. Nor is it known what the comparative nutritive value of the potentially introduced fodder varieties are when raised in this environment. These very basic questions need to be answered before we can proceed to the next step which is how to integrate livestock feeding into the production system. Here also come to play the basic economic and social questions:

- How much does it cost to feed an animal?
- Will someone pay for the enhanced product?

Livestock are commonly marketed by the "head" in Somalia, and although the domestic market makes some quality distinctions, the export market often does not. Livestock are not weighed so higher prices to compensate for weight gains are a matter of judgement. Undeniably there is a need for Somalia to be able to

export better quality (ie. younger and heavier) livestock. However, the people supplying this quality animal need to be compensated for their efforts. What this phase of the livestock production research need to focus on is the economics of livestock feeding. It needs to identify how livestock feeding can integrate with fodder and crop farming. The labor and technical constraints need to be addressed as does the marketing acceptability.

In sum, what is needed is very basic research in developing "farming systems" that can integrate crop production with fodder production, livestock feeding, and dairy production. This information needs to be produced not only for large scale mechanized farms, but also for semi-mechanized farms and traditional farms. Each type of farm has its particular constraints and advantages. The large farms already in existence (bananas, etc.) have the management capability along with many of the necessary machines. Should fodder production, livestock feeding, and dairy production prove to be profitable, some of these farms will be able to integrate these enterprises into their operations. New large mechanized farms will probably find it harder to operate at a profit. High land development costs coupled with the lack of farm management experience will be the major constraints. The medium-sized, semi-mechanized farms, especially those in the northern regions are the farms that are already the most advanced in fodder production and livestock feeding. These farmers are very anxious to benefit from cost effective technologies and will make a very willing target group. The small traditional farmers, especially those located along the Shabelle and Juba Rivers have a very great potential to increase fodder, livestock, and dairy production. It is these people who are already supplying the Mogadishu fodder market. Research aimed at investigating their farming strategies and assessing their labor and technological constraints could very well suggest some interventions that could induce them to produce higher quality forages, feed livestock, and produce more milk. These traditional farmers with the proper inputs have the potential to very rapidly increase production.

- Better and cheaper techniques of land preparation and water diversion system construction need to be developed. Presently, land clearing, leveling, irrigation system construction, and water catchment and diversion system construction all depend upon the use of large crawler tractors. Other types of machinery, such as roadgraders, that could do some of the same jobs

cheaper and more easily should be introduced. Better designs for irrigation systems, and water diversion systems could make it possible to construct and maintain these improvements with very simple and inexpensive equipment. In addition, farming practices could benefit from the introduction of different types of equipment. There is a great need to study the local conditions and identify the equipment that could most effectively be used to farm and develop it.

Fodder production and livestock feeding research needs to closely align itself with the basic research being done in range management and the study of the ecology of Somalia. Not all fodder production will be irrigated; much will come from rangeland enclosures. One of the most important methods of improving livestock quality will be feeding livestock on such pastures. The point at which traditional nomadic production and livestock "improvement" meet will be always imprecisely defined. By the same token, where range management specialties and fodder and livestock production specialties meet will also be imprecise. Therefore, these various research efforts must work in coordination.

One line of basic research that needs to be continued and reinforced is socio-economic research. It is of critical importance to understand what people are doing, why they are doing it, and how they are willing to change. Fodder production and alternate methods of livestock production depend upon changing patterns of living, family economics, land tenure, etc. These are issues of critical importance to any society. Researchers and policy makers need to have as clear a picture as possible of these issues. Making interventions without a clear understanding of the reasons behind production systems or of the displacements that might result in inviting disaster.

C. Training and Outreach

The fruits of a research effort depend upon a system of trained professionals to carry the message to the producers. Currently there is no system or cadre of professionals to spread information about fodder or livestock production. There are, however, a number of University graduate agronomists and livestock specialists who need specific and practical training. The farms used for the practical level research should also function as training and demonstration centers.

The different disciplines that come together to form a

successful extension system for fodder and livestock production include agronomy, livestock production, veterinary science, range management, agricultural engineering/mechanics, agricultural economics/finance, socio-economics, and farm management. All of these specialties need to be trained in the practical realities of fodder and livestock production. Government employees and University students need training at these farms as do private farm managers. The training should be "hands on" practical training, where the trainees have the opportunity to actually participate in production process. In addition, of course, the farms need to function as demonstration centers where groups of farmers can observe the crops and techniques employed.

After the training of a cadre of professionals, there is the need for an extension or "outreach" program. A team approach where the different disciplines can all come to bear upon each "client's" needs would be one possible way to organize such an outreach program. A team might consist of a farm management specialist, an agronomist, a livestock production specialist, and an agricultural engineer. One of the most crucial points that will make this process successful is that a full range of credit services be available to the farmers and that the outreach team be in a position to advise on credit needs.

D. Public Livestock Export Infrastructure and Public Policy

The deficiencies in the public livestock export infrastructure and the public policies that effect the livestock export sector has been discussed in detail in Section IV. Developing a research program, an outreach system, and providing credit is only a part of the necessary steps to successfully stimulate the growth of a modern livestock export industry. The lack of public infrastructure and the poor quality of services are issues that are equally important. Policy makers also need to study the necessity of maintaining policies that adversely effect the livestock export sector. Livestock exporting is the industry that Somalia depends upon. It is also the industry that has the greatest potential for growth. The export sector is experiencing increasing competition from countries much better equipped to export livestock than Somalia. If Somalia is to maintain its export levels the GSDR must support the industry in every conceivable way.

VI. CONCLUSIONS

There is a clear opportunity to simultaneously increase Somalia's share of the livestock export trade and promote desirable changes in the method of producing livestock. These changes could result in a greater offtake and production of healthier, younger, and heavier animals for export. The primary reason that it is possible to promote these livestock production changes is that a certain segment of the livestock production and export industry is convinced that change is necessary and desirable. In fact, these people are spontaneously investing in infrastructure to enhance their capability to export livestock. Land is being registered, enclosed, and protected from encroachment. Fields are being cleared and prepared, irrigation and water diversion systems are being constructed, fodder is being produced and harvested, investments are being made in private holding facilities, and plans are being laid for even greater investments in export infrastructure. In short, the export industry is experimenting with, and investing in all of the things that are necessary to enhance their capability to export better quality livestock in a more timely and organized fashion.

Opposed to this clear opportunity there are a number of serious constraints. Somali cattle are banned by Saudi Arabia. Traditional markets are being taken over by European, Turkish, and Australian suppliers, who have access to all manners of modern and efficient marketing infrastructure. Somalia, which is right next door to the market is at a serious disadvantage. The lack of marketing infrastructure makes exporting a much more complex, risky, and costly enterprise than need be. Somalia's reputation of being an unreliable supplier of low quality animals works to the advantage of the competition. If Somalia is to maintain and improve its livestock exports, it must make a serious, concerted, and long-term commitment to eliminating the internal constraints.

The internal constraints are a combination of the lack of public and private livestock export infrastructure, and public policy that is detrimental to livestock exporting. All of these areas must be addressed if real change is to come to the livestock export sector. The private export infrastructure that needs to be developed include fodder farms, livestock feeding (or conditioning) facilities, private holding grounds and marshalling yards, and an improved livestock transportation system.

The lack of public livestock export infrastructure is the area that is currently being most rigorously improved. A partial list of the necessary infrastructure, some of which

are currently being improved incudes: A modern telecommunications system that can link livestock exporters and traders both within Somalia and internationally. The need for functioning quarantine stations which along with better operated and maintained holding grounds, marshalling yards, and export facilities will facilitate the movement of livestock as well as reassure the importing countries that Somali livestock help meet international health standards. A better paid and equipped veterinary system is also necessary to ensure Somalia meets international health standards. More and better funded research covering fodder production, animal nutrition, agricultural economics, agricultural engineering, range management and socio-economics is a very important requirement as is a better trained and equipped agricultural extension service that can focus on the needs of the livestock export industry. Finally a credit system responsive to the total financial needs of the livestock export sector is an absolute requirement.

The effects of public policy on the livestock export trade cannot be underrated. Public policy can enhance or hinder the trade. Any policy that hinders the trade adds to the overall unprofitability of livestock exporting and prevents investments in private livestock exporting infrastructure. The efforts of livestock exporters to minimize the effects of detrimental policy adds to Somalia's reputation as being a difficult and unreliable trading partner. Past monetary and foreign exchange regulations have been very harmful to the livestock export industry. What is needed are consistent regulations that stabilize the Somali economy and allows exporters a fair opportunity to profit from their efforts. Excessive taxation of the livestock exports and bureaucratic red tape should be eliminated in order to encourage livestock exports rather than hinder them. Private shipping and shipping insurance agencies should be allowed so exporters can purchase these services at the most competitive rate possible. International banks are needed so that the necessary capital to invest in a more modern export infrastructure is available to exporters. Foreign investments in livestock production and export infrastructure must also be encouraged. The land tenure policy and land registration system should be studied in order to ensure that it meets the need of people developing fodder farms and livestock holding pastures. Finally, veterinarians must be allowed to open private practices and have the freedom to import and distribute the necessary drugs and medications.

It will take a concerted effort on the part of the GSDR to remove all of the constraints and promote the changes necessary to enhance the export capability. The rewards could be substantial. Livestock production is Somalia's most important enterprise and not only has important commercial

value but also great cultural importance. With a better marketing system it is possible to increase exports. With changes in the livestock production system it is possible to increase the weights and offtake. Relatively small increases in the percentage of animals exported or in their weights will make large differences in the balance of payment. In this context it is important that the livestock export trade be nurtured and encouraged to modernize.

ANNEX I

A DISCUSSION OF FODDER PRODUCTION, DAIRY PRODUCTION, AND LIVESTOCK FEEDING AS THEY RELATE TO SOMALIA

SUMMARY TO ANNEX

1. Somalia's livestock export industry is receiving severe competition from Australia, New Zealand, Turkey, and various European countries. These countries can provide high quality animals efficiently and at competitive prices. For Somalia to maintain its share of the market in the Arabian Peninsula, it must improve the quality of the animals offered for export and modernize the export system. Market research has indicated that the main constraints to maintaining, or even expanding, livestock exports from Somalia are internal.

2. Approximately 50% of Somalia's population are nomadic. The goal of the Somali nomadic herdsman is to produce milk to nourish his family. The environment for these herds is seasonally highly varied; during the season of rains the rangeland is quite lush, and in the dry seasons grass and water can become non-existent. The result is a feast/famine situation for the livestock and for the people.

This annual cycle results in dramatic weight losses for the livestock which must be regained before the animals are again fully productive. This cycle plus the fact that most of the milk produced is for human consumption, not to nourish the young animal, results in slow growth rates and late reproductive maturity. The consequence is that there is not a large number of young, heavy, male livestock available for the export market.

Although the bulk of the livestock are raised within the traditional system it is not fair to say that the traditional livestock production system does not evolve. As the market for livestock in Saudi Arabia has grown over the last few decades, Somali producers have taken advantage of this market to "cash in" their superfluous animals. There is in Somalia today a considerable "market oriented" aspect to the livestock production system. Besides the regular marketing of males and old females by the nomads, some producer/exporters are purchasing animals and keeping them on the range in anticipation of exporting. Rangelands enclosures and enclosures for fodder production are becoming relatively common in the Central and Northern Rangelands.

Some of these changes reflect responses to positive elements such as the development of markets for livestock in Saudi Arabia and Mogadishu. Other reasons for the changes are negative such as the erosion effecting up to 50% of the rangeland in Northern Somalia. The people involved in the livestock export trade are the ones experimenting with these improvements in the livestock production system. However, there are no clear recommendations on how to proceed or even a system to encourage these "experiments".

Fodder production is seen by many as the key to improvements in the livestock production system. However, there is little "hard" information in Somalia about the technical or economic aspects of fodder production. The purpose of the report is to analyze some of the economic factors relating to fodder production and relate that to livestock feeding and dairy production.

3. In this first analysis, a model of an irrigated fodder farm is developed. The purpose of this model is to test the economics of producing fodder using full mechanization, fertilizers, herbicides, and irrigation. Since there is no regular "market" for farm land in Somalia the analysis proceeds as if virgin land along the river is being cleared and prepared for farming. The farms size was set at fifty hectares which is approximately the size that can fully use one complement of fodder producing machinery.

The cost of land clearing, derooting, leveling, and construction of the irrigation system came to 4,737,500 ShSo, which is 94,750 ShSo per hectare. These costs were extrapolated from the actual costs incurred by people currently clearing and developing farms. These costs represent the "high" end of the farm development costs in that it is assumed that relatively dense bush is being cleared.

The facilities assumed for this model are relatively modest. They consist of an office/storeroom, workshop/machine shed, managers housing, 10 units of staff housing, silage pit, and perimeter fence. The total cost is 2,730,000 ShSo. The equipment assumed for the farm include: 2 tractors, 2 disc plows, 2 disc harrows, a trailer, a mowing machine, a fodder rake, a baler, a pickup truck, a maize drill, a forage chopper, an irrigation pump and motor, and miscellaneous tools and supplies. This equipment plus a 10% contingency fund comes to 18,796,000 ShSo. Equipment costs were calculated using CIF Mogadishu prices converted at 140 ShSo per USD. Twenty percent was added to the cost of each machine for spare parts.

The total cost of developing the farm, constructing the facilities, and purchasing the equipment comes to 26,963,500 ShSo. This includes a 700,000 ShSo working capital fund. The cost per hectare is 539,270 ShSo.

The labor needs are relatively modest as this is assumed to be a fully mechanized farm. Workers on the farm include a owner/manager, a mechanic/tractor driver, another tractor driver, 5 field hands, and 4 guards. The total annual cost of labor is 828,000 ShSo. Supplies and other annual costs provided for include fuel, lubricants, spare parts, equipment maintenance, seeds, fertilizers herbicides/pesticides, and maintenance of facilities. These operating costs plus ten percent for contingencies come to 1,963,500 ShSo.

Total annual operating costs come to 2,791,500 ShSo. On a per hectare basis this is 55,070 ShSo. With the addition of depreciation on the equipment, the total annual costs excluding interest are 108,773 ShSo.

Income assumptions include that 15 ha. are planted to maize and sorghum which can produce 2 crops of 10 MT (metric tons) of DM (dry matter) each. Ten ha. are planted to Sudan Grass which also produces 10

MT of DM per season. An additional 10 ha. is planted to a perennial grass which produces 15 MT per year. Ten ha. are planted to a legume assumed to produce 10 MT annually and an additional 5 ha. is planted to leucaenia with 8 MT of annual production. a "reference farmgate price" of 5000 ShSo per MT was set as the value of the non-baled fodder. This figure is consistent with actual market prices for fodder. The value of baling the fodder was set at 2500 ShSo per MT. The value of legume fodder was set at 2500 ShSo above the "reference farmgate price". Therefore, baled legume fodder would be worth 10,000 ShSo per MT. All of the Sudan Grass, perennial grass, and legume is assumed to be baled. The Leucaenia because of its very high protein content is also assumed to be worth 10,000 ShSo per MT.

Total annual income for the model farm comes to 5,525,000 ShSo. This is 110,500 ShSo gross income per hectare. Using the above costs and income the internal rate of return was found to be 0%. It required a 50% increase in income to result in an internal rate of return of 14%. The model was not as sensitive to decreases in development or operating costs.

The purpose of the model is to test the "upper parameters" or "most expensive" alternative in fodder production. That the cost of production roughly equals the actual market price of fodder is encouraging. This means that fodder production if approached in a careful and economic way can prove to be profitable.

The way to encourage the development of an economically viable fodder industry is to encourage the people who are already engaged in fodder production. This includes the small producers supplying the urban fodder markets, the small exporters supplying fodder for the exports in the north, and the fodder merchants who supply the exporters in the southern ports. What these three groups have in common is that they have developed technically simple, low cost operations that harvests wild grasses and crop residues.

Future efforts in promoting fodder production should concentrate on understanding the economics and technical constraints of these existing producers in an effort to improve their operations.

4. The cost of owning and operating fodder harvesting equipment was analyzed in order to determine under what conditions it becomes economically feasible to invest in such equipment. The machines considered include a 1.5 to 2 meter rotary disc mower, a 3 meter fodder rake, and a standard PTO powered baler. These machines were considered to be powered by 75 to 80 hp. tractor. The mower and the rake were analyzed together and the baler was analyzed separately. The unit cost of operating these machines is dependent upon how much it is being used; "full normal utilization" was considered to be 500 MT of fodder harvested annually. This is around the practical limitation of how much fodder one set of equipment can be expected to harvest. The lower limit of utilization analyzed is 100 MT.

4/

The cost of owning and operating a mower and a fodder rake for harvesting 500 MT of fodder annually is 1576 ShSo per MT harvested. If only 100 MT are harvested the costs rise to 5147 ShSo. These costs must be compared to the cost of harvesting by hand in order to determine whether it is feasible to invest in this machinery. Hand harvesting costs are highly variable and range from around 1000 ShSo per MT in the south to 4500 ShSo or more in the north where harvest crews commonly take one half of the crop as payment. Other issues to consider are whether the fields are sufficiently smooth to effectively use the machines and whether spare parts and maintenance are available.

The cost of owning and operating a baler for harvesting 500 MT of fodder annually is 1627 ShSo per MT. If only 100 MT are baled annually the costs increase to 5147 ShSo per MT. The value of baling fodder is in the reduced costs of transporting and handling the fodder, therefore, the cost of transporting baled fodder must be compared to the cost of transporting it "loose". A six ton truck can only carry approximately 2 MT of "loose" fodder whereas it can carry 5 MT of baled fodder. Trucking costs in Somalia vary with the condition of the road being traversed. Trucking charges range from 4.7 ShSo per MT per km to around 9.4 ShSo per MT per km.

For a fodder producer transporting 500 MT of fodder annually at the low trucking costs of 4.7 ShSo/MT/km. it does not become economical to bale the fodder unless it is being transported in excess of 194 km. However, at the high cost of transportation (9.4 ShSo/MT/km.) it becomes advantageous at 96 km. If only 100 MT of fodder is being transported annually it is never really practical to consider baling the fodder. Most actual situations will fall between these cases. In general, a baler becomes a reasonable investment if 300 to 400 MT of fodder is being transported at least 150 km.

5. The cost of owning and feeding a dairy cow was analyzed in order to determine the economics of fodder production as it relates to the dairy industry. Costs and production assumptions were adapted from a feasibility study entitled Balcad Model Dairy Farm produced by the Planning Department of the Ministry of Livestock, Forestry, and Range.

Results indicate that it would be profitable to produce fodder to feed dairy cows capable of giving 11 liters of milk per day. With such a genetically improved cow there is the potential for 67,000 ShSo of annual profit. Profit margins for non-improved cows that give 5.5 liters per day fall to 7,100 ShSo. Promoting improved dairy production practices, including the raising of high protein fodder, could be very beneficial. Some $10,000,000 of milk products are imported annually to meet the needs of Mogadishu. One attractive aspect of enhanced dairy production is that all levels of producers can benefit from technological improvements.

6. There has been a lot of interest in Somalia about feeding livestock in order to improve their quality for exporting. The economics of feeding was analyzed for both cattle and sheep. The ration for both cases was assumed to consist only of fodder. The market as it now exists in the Arabian Peninsula is for younger more tender meat, not for "fat" or "marbled" meat as would be the case if the animals were put in a feed lot

and given a high concentrate diet. An all fodder diet is cheaper and sufficient to produce 600 grams of gain per day on the bull and 100 grams per day on the sheep..

The FOB value of a bull to be exported from Kismayo is around 102 ShSo per kg. The cost per kg. of gain was computed to be 111 ShSo. This indicates that profiting from feeding bulls is totally dependent upon the purchase price of the bull. One method in which to profitably engage in feeding young bulls is to purchase them in the dry season when their weight and their price are down. This practice would not only benefit the feeder, who would have heavier, better animals to export, but also the primary producer who would have a market for young bulls that otherwise would lose weight and might even die.

The situation for feeding male sheep is very different. The FOB value of a sheep is around 187 ShSo per kg. The cost of gain is around 110 ShSo, which is an attractive profit margin. Although there was a 77 ShSo profit for each kg of gained weight, the analysis showed a net loss for exporting the sheep. This net loss is caused by the high prices currently being payed for sheep and goats, and by the high taxes and fees levied on the exporters.

Somali livestock are not marketed on a weight basis, as this analysis presupposes, instead a grade/size system is used. This will to some extent hinder the development of a livestock feeding industry. Eventually, livestock importers on the Arabian Peninsula will insist on purchasing on a weight basis which will make the Somali producer more weight conscious.

The livestock feeding system as it is currently developing in Somalia is primarily a "range" operation. Livestock destined for export are collected into herds and grazed. Rangeland enclosures and fodder are used as the animals are concentrated near the ports. The entire system is technologically "low intensive" and low cost. Research into the organization and the economics of the "feeding system" should be carried out in order to find methods to encourage its development.

7. Fodder production is a necessary addition to the Somali livestock production system. It is the key to improvements in livestock quality, productivity, and ultimately to protecting the rangelands from overgrazing. As matters are currently organized, livestock in Somalia go through an annual feast - famine cycle. This cycle seriously effects the productivity of the livestock, which naturally effects the nutritive and economic well being of the people. Conserving grass when it is young and nutritious and making it available to the animals during the dry season is the obvious way of breaking this cycle.

It is the livestock exporters who are currently the most dynamic sector in the livestock industry. These are the people who are experimenting with fodder production, livestock feeding, and range enclosures. Research, extension, and credit aid should be directed to these exporters in an effort to promote positive changes in the livestock production system.

I. INTRODUCTION

The livestock export industry is Somalia's most important industry. On an annual basis it provides up to 80% of the foreign exchange earned through exports. However, in the last number of years the industry has been experiencing an increasingly difficult situation. In 1983 Saudi Arabia banned all cattle imports from Africa, and because of Somalia's inadequate veterinary service and lack of quarantine facilities, has not lifted the quarantine. Saudi Arabia was Somalia's most important market for cattle. Concurrent with the Saudi ban came two other developments that have adversely affected Somalia's export industry. First Australia, New Zealand, Turkey, and various European countries have moved into and have taken most of the market that has been Somalia's for generations. Then a downturn in the world economy specifically in the economies of the oil producing nations have frozen the growing need for imported meat.

The livestock importing countries are satisfied with their new suppliers on the three most important criteria: price, quality, and efficiency of delivery. It was precisely because Somalia was not developing a modern livestock production and export system that alternative suppliers have been able to displace Somalia. Livestock importers in Saudi Arabia and elsewhere could not depend upon Somali traders to deliver quality animals in a timely and efficient manner. Traditional livestock production practices have not allowed for the improvement in livestock quality now demanded by consumers in the Arabian Peninsula and an antiquated export system has not kept pace with modern business standards. As of right now, Somalia's only advantages over its competitors are proximity to the market and cultural ties that go back for centuries.

If Somalia wishes to maintain and increase its current export levels it must improve it's marketing and production infrastructure. Proper marketing infrastructure will allow for efficient delivery of the livestock to its port of destination. Improvements in the production system will increase the quality of the animals. However, to be competitive both the marketing infrastructure and the production system must be improved in an economically efficient manner. The purpose of this report is to analyze various aspects of fodder, livestock, and dairy production and determine how these enterprises can profitably develop.

116

2. BACKGROUND

Somalia has one of the largest nomadic populations in the world with up to 50% of the population herding livestock. Traditional livestock production continues to be the norm. Some of the characteristics of a traditional nomadic system include production strategies aimed primarily towards milk production, very dramatic seasonal variations in livestock condition, and insecure land tenure. Milk and milk products are the mainstay of a nomadic Somali's diet and the make-up of the herds reflects this need. Although old and superfluous animals are marketed, when the main production strategy is to produce milk for human consumption the young animals are limited in the amount of milk they are allowed to take from their mothers. Growth rates are very low and reproductive maturity very late. On the whole, it takes over 5 years for bulls and 2 years for sheep and goats to reach export weight and quality.

The dramatic seasonal changes in the quality and quantity of forage and water available to nourish the livestock affects the health, quality, and productive capacity of the Somali national herd. In a good or average rainy season the livestock have more than sufficient forage available to rapidly gain weight and produce milk to the limit of their genetic capacity. However, at the heights of the dry season they often have virtually no food and have limited access to water: every 3 or 4 days in the case of cattle and 4 or 5 days in the case of the sheep and goats. Such incredible changes in the animals environment has a tremendous limiting effect on their overall productivity and health. One consequence is that during the dry phase of the annual cycle the animals in their low general condition can become virtually unmarketable.

Since Somali nomads have no title to their rangeland other than their willingness to defend it, they are naturally reluctant to invest in improvements. Private water development, reserved grazing areas, fodder production, in short, all of the practices characteristic to livestock production in the developed countries, has traditionally not been a factor in the Somali production system. The result is that while the livestock consumers on the Arabian Peninsula are getting used to the younger, heavier, meatier animals available from Australia and Europe, Somalia has not improved the quality of its livestock.

Although the bulk of Somali livestock are still produced within the traditional system, changes in the production system are evident. These changes are characterized by the growing number of rangeland enclosures, fodder farms, and herds of sheep and goats raised primarily for export. There are a number of factors that are prompting these "experiments" in alternate production methods. Some of factors are positive, such as the more or less dependable market for livestock in Saudi Arabia and some are negative, such as overgrazing and environmental degradation.

2.10 Factors Causing the Livestock Production System to Change.

The market for livestock that has developed over the last few decades in the Arabian Peninsula and the growing market in Kenya has certainly been a major positive factor for Somali producers. This demand has created a dependable market for the "non-productive" animals in the herd and allowed for a shift in strategy. This shift in strategy has gone so far that now some producers put together herds of export quality animals and raise them in anticipation of exporting. Somalia's growing urban population and the market that this represents is also a major incentive to change production practices. One very recent development is attempts, by restauranteurs, to fatten animals to meet their luxury meat needs.

Unfortunately, negative factors are also spurring changes in livestock production. Somalia has been subject to two major droughts in the last 15 years and to a very large influx of refugees. This has caused huge shifts in livestock population resulting in environmental damage. The overgrazing is most evident in Northern Somalia where serious erosion has stripped the soil from up to 50% of the rangeland. Water hole development has also had, in some cases, a negative impact on the environment. In the past, because of a lack of dry season water, many areas of Somalia were used as wet season grazing only. This created a rotational grazing system on a national scale. With the development of permanent water in these areas, grazing patterns and livestock numbers have changed dramatically. The long-term effects are not known with any certitude, but the short-term effect has been in some cases serious localized overgrazing.

One method for producers coming under pressure by outsiders encroaching on grazing areas, advancing erosion, and the need to control grazing within a reasonable distance of water has been the creation of rangeland enclosures and fodder farms. The evidence is that rangeland enclosures are a widespread phenomenon in the Central Rangelands. In Northern Somalia where erosion is most advanced, fodder farms are becoming common. The demand for fodder is a localized development resulting from the importance of the Berbera port in the livestock export trade. Exporters need a dependable supply of fodder for their animals as they marshal them in the staging areas of Hargeisa and Burao, during the pre-shipping period in Berbera, and on the ships in transit to their final destination.

Somalia's livestock production system is changing. How it will change and what the ultimate effects of those changes will be are uncertain. Nevertheless, the need and the desire to improve the production practices exist. However, there are no clear recommendations that can be made to guide these changes. Very little is known about the economics of the existing livestock production or the potential economics of the newer technologies within the Somali context. Fodder production is certainly important to any improvements in livestock production. It is the most talked about "new" technology and is promoted by livestock producers,

exporters, government officials, and expatriate experts alike. However, very little "hard" information exists in Somalia about the technical or economic aspects of fodder production.

The purpose of this report annex is to analyze some of the economic factors relating to fodder production and relate this information to livestock feeding and dairy production. In Chapter 3, a "model" of an irrigated fodder farm is developed and the cost of production of this "model" farm is related to the actual market value of fodder. Chapter 4 is an analysis of using fodder production machinery. Chapter 5 analyzes the economic results of fodder production as it relates to dairy production. Chapter 6 analyzes the economic results of fodder production as it relates to cattle and small ruminant feeding.

3. MODEL OF IRRIGATED FODDER FARM.

The fodder farm developed in the following pages is a "model" designed to study the economics of investing in modern fodder farming. First a fodder farm is analyzed in order to determine at what price level it becomes feasible to engage in modern fodder farming. Using the information from the fodder farm model, livestock feeding or "conditioning" and dairy production are analyzed in subsequent chapters. Strictly speaking, a farm devoted entirely to the production of fodder is not possible in Somalia today. There would be no dependable market for the produce. Any farm devoting any hectarage to the production of fodder would also need to engage in an enterprise such as livestock exporting, livestock feeding, or dairy production in order to have a guaranteed market for its product.

The farm model was established at 50 hectares of irrigated land. This is the approximate size farm that will fully utilize one unit of fodder production equipment. Since there is not a well developed market system for land in Somalia the model proceeds as though virgin land along one of the rivers in Southern Somalia is being cleared.

3.1 Farm Development Costs.

3.11 Land Development and Irrigation System:

Farm development costs are summarized on Table 1. Details of the assumptions used to calculate these costs are listed in table 3. These costs were arrived at by interviewing the owners of a number of farms actually under development. Most farms under development along the Shebelli river use bulldozers hired from either the government tractor leasing agency, ONAT, or the military. Official hourly fees for hiring bulldozers have been changing rapidly in the last few months reflecting the inflation rate. However, the official cost and the real costs are not always the same. Incentives must sometimes be paid, especially to the drivers. In addition, fuel must sometimes be supplied, particularly if their is a fuel shortage. An average hourly cost of 2000 SoSh seems to be generally agreed upon. One of the realities of hiring heavy equipment from ONAT or the military is that for many people it is not possible as the need exceeds the supply. If however, it is possible to hire the equipment, the fee of 2000 ShSo per hour is about 1/4 that of the cost of hiring a similar machine in North America.

The cost of constructing an irrigation system is by far the most expensive part of the farm development. There is no easy way to determine an average cost, since there is no average farm. An irrigation system must be individually designed for each farm. The costs used in this model were adapted from a farm currently under development that touches the river at one point. The land is flat, and the soil of a medium texture.

Land development costs calculated for this model are 94,750 SoSh per hectare. The cost of purchasing a farm in North America situated on an alluvial plain would be 10 to 20 times more expensive. Nonetheless, these

costs represent the very high end of land development costs in Somalia. Many farms situated in areas of light bush are able to get by with small irrigation canals or if situated along a project canal could cost 1/3 as much. Farms situated in the Northern regions of Somalia would also be much cheaper to develop. Of course these farms, dependent upon " water harvesting", would have much lower crop yields.

3.12 Facilities

Construction cost for the buildings and facilities are also listed in Table 1. Table 3 provides a list detailing the various items. The cost of the well and the water system was deleted from the development costs because they are not needed in a farm devoted entirely to the production of fodder. However, a fresh water system is mandatory for a farm that feeds livestock. The necessary facilities are relatively modest with the most expensive being the house for the owner/manager.

3.13 Equipment

The equipment necessary to operate a 50 hectare fodder farm are listed on Table 1 with Table 3 providing a short list of explanations. The farm was calculated to be a size that can adequately utilize one compliment of machinery. It is assumed that the fodder crops are mixed annual and perennials. The annuals would be predominately maize, fodder sorghum, sudan grass, and a legume crop such as pigeon peas. The perennials would be Bermuda grass, buffle grass and possibly alfalfa. Not all of these crops , maize for example, can be easily baled, instead maize lends itself well to being ensiled. Therefore two different kinds of machines are required, i.e. a baler and a field chopper. The assumption is that some of the fodder will be baled and held for sale, some ensiled to be fed on the farm during the dry season, some harvested and dried and stacked "loose" for later use, some will be cut and fed green, and some will be pastured.

Machinery costs are estimated CIF Mogadishu plus 20% for spare parts 140 ShSo per USD is the estimated exchange rate. The machines are allowed 7 years for depreciation and then replaced at full value.

3.14 Working Capital

Working capital needs were set at 25% of the annual operating expenses.

3.15 Labor

The labor requirements of the farm are listed in Table 2, "Farm Operating Costs". The labor force is very small since this model is for a fully mechanized farm. Salaries are set at the going rate for the first half of 1987. Although the labor force is small relative to Somali standards it is high compared to North American or European farms. However, farms in those areas have access to a better service infrastructure. In practice it may be necessary to substitute more labor for equipment.

3.16 Supplies

The supplies and inputs needed on the farm are also listed in Table 2 with details in Table 3. Rather than list fuel requirements crop-by-crop and hour-by-hour it was simply assumed that each tractor would operate a full 1000 hrs. each year. The fuel and lubricant needs were then calculated using standard practices (see Table 3). The official price for diesel fuel as of July 1987 is 30 ShSo per liter.

An extra annual maintenance cost for the equipment was added for work on the machinery that would require repairs by expert mechanics or machinists. The annual cost was set at 2% of the new value for equipment with engines and 1% for equipment without engines.

The costs of seeds, fertilizer, herbicides, and pesticides were adapted from the Genale Irrigation Rehabilitation Project Feasibility Study, and the Homboy Area and Small Holder Banana Cultivation in the Lower Juba Valley and Assessment of Agricultural Benefits, Interim Report. These costs were mainly relating to maize production but since fodder, in this model, consists mostly of annual crops such as maize, sorghum, and sudan grass, it was assumed that the same level of inputs would be a close approximation to the actual needs.

An annual maintenance of facilities costs of 1.5% of new cost was included. Repairs to the buildings and fences at this level will keep them in good repair indefinitely.

Total farm operating costs came to 2,753,500 ShSo. On a per hectare basis this comes to 55,070. Depreciation on the equipment is 53,700 ShSo per hectare. The two together are 108,773 SoSh. per hectare for one years operation. The Ministry of Agriculture data for the cost of planting and harvesting one hectare of maize under irrigation and moderate mechanization is 22,000 ShSo per season or 44,000 ShSo per year. This cost also does not include investment in land or facilities but does include depreciation on equipment and direct operating costs. Obviously the production costs for this model and the production costs from the Ministry of Agriculture are widely divergent.

TABLE 1

FODDER FARM DEVELOPMENT COSTS (50 ha.)

	unit cost	cost
I. Land Development		
1. land clearing	12000 ShSo/ha	600000
2. plowing and derooting	7500 ShSo/ha	337500
3. land levelling	6000 ShSo/ha	300000
4. irrigation system	1000000 ShSo/km	3500000
5. sub-total	94750 ShSo/ha	4737500
II. Facilities		
1. office/storeroom		400000
2. workshop/machine shed		150000
3. managers housing		1000000
4. staff housing		500000
5. well		0
6. water storage & dist.		0
7. silage pit		400000
8. perimeter fence	70000/km	280000
10. sub-total		2730000
III. Equipment *		
1. tractor (2)	2856000	5712000
2. disc plow (2)	500000	1000000
3. disc harrow (2)	500000	1000000
4. trailor	850000	850000
5. mowing machine	1260000	1260000
6. hay rake	504000	504000
7. baler	1680000	1680000
8. pickup	2500000	2500000
9. maize drill	750000	750000
10. Forage Chopper	840000	840000
11. irrigation station	1000000	1000000
12. tools		100000
13. misc. supplies		100000
14. 10% contingency		1500000
15. sub-total		18796000
IV. Working Capital		700000
IV. Total		26963500

* all equipment calculated at 140 ShSo per USD plus 20%

TABLE 2

FARM OPERATING COSTS

I. Labor		
	per month	per annum
1. manager	15000	180000
2. mechanic/tractor driver	10000	120000
3. tractor driver	7000	84000
4. field labor (5)	5000	300000
5. guards (4)	3000	144000
6. sub-total	40000	828000
II. Supplies		
	per ha.	
1. fuel and lubricants		380000
2. spare parts & maintenance		325000
3. seeds	1000	100000
4. fertilizer	3500	350000
5. herbicides/pesticides	2000	200000
6. facilities maintenance		50000
7. 10% contingencies		140500
8. sub-total		1545500
III. Total		2373500

TABLE 3

ASSUMPTIONS USED FOR CALCULATING THE DEVELOPMENT OF A 50 HA. FODDER FARM

I. Land Development

1. Land clearing: cost of hiring a bulldozer including official costs, fuel, and incentive to driver equals 2000 ShSo/hr. It requires 6 hrs. to clear one ha. of heavy bush.

2. Derooting and plowing: requires 3 hrs. of bulldozer/ha. plus 5 men working for one day at a salary of 300 ShSo each.

3. Land leveling: requires 3 hrs. of bulldozer/ha.

4. Irrigation system: large irrigation canals will cost 1000000 ShSo/ km. A 50 ha. farm will need on the average 3.5 km of large irrigation canals.

NOTE: These costs can be assumed to be the high end of farm development costs. A farm with very light bush, very level land, and easy to irrigate could have land development costs averaging about one-third of this amount.

II. Facilities

1. Office(40 sq. m), workshop(115 sq. m.), and managers housing(150 sq. m.) are assumed to be modest size, and of local concrete block construction.

2. Staff housing are of traditional construction with steel roofs and concrete floors. Cost app. 50,000 ShSo each.

3. The cost of a well is calculated at 40,000 ShSo/meter. 50 meters is used as an average depth.(not included in final draft)

4. The cost of an elevated water tank of 25 cu. m. is about 300,000 ShSo. The cost of an adequate water distribution system is assumed to be around 300,000 ShSo.(not included in final draft)

5. The silage pit will be constructed of concrete and contain 220 cu. m. and be sufficient to store app. 150 MT dry matter basis of maize silage

6. Fencing is calculate to consist of 4 wires of barbed wire at a cost of 4200 ShSo per role of 400 m. Posts are assumed to cost 100 ShSo each with 200 needed for one km. Labor plus other inputs will put the total cost in the neighborhood of 70,000 ShSo / km.

TABLE 3 (Cont'd)

III. Equipment

1. All equipment costs are calculated with 20% extra for spare parts.

2. Tractors are assumed to be in the 75 to 80 hp. range and four wheel drive.

IV. Labor

1. Labor requirements are low because the farm is adequately mechanized. In practice it may be necessary to substitute extra labor for machinery.

V. Supplies

1. Fuel requirements for the tractors were calculated using the standard formula (fuel = hp.x 66% x .2 liter). Each tractor was assumed to operate for 1000 hrs. each year. Fuel prices assumed to average 30 ShSo/liter. Lubricant costs were arbitrarily set at 20 ShSo/ hour.

2. Irrigation pump fuel requirements were calculated using the formula (fuel = hp x 80% x .2 liter). Lubricant requirements also set at 20 ShSo/hr. The irrigation pump motor is calculated to be 50 hp and the pump able to produce 10000 liters/min. Assuming a 50% ditch loss and an irrigation need of 750 mm of moisture, we arrive at 1250 hr. of pump operation.

3. The pickup truck is calculated at 20,000 km/year with a fuel consumption of 6 km/liter. lubricants and tune ups are set at 20,000 ShSo/yr.

4. Annual maintenance and small spare parts for equipment with engines is calculated at 2% of the value. Maintenance of equipment without engines are calculated at 1% of the value.

5. Figures for seeding costs, fertilizers, herbicides and pesticides were adapted from the Genale Irrigation Rehabilitation Project Feasibility Study.

6. Annual maintenance of facilities was calculated at 1.5% of their costs.

* All costs involving conversion of USD to ShSo. used 140 ShSo per USD.

3.2 Crop Production and Income.

There are no reliable production figures for fodder crops in Somalia. Fodder is not a common crop and very few researchers have had an opportunity to measure yields in any statistically valid way. Therefore assumptions were made based on a small amount of empirical data and upon the experience of the small number of experts working in this field.

3.21 Maize Silage.

Maize and Sorghum were assumed to be the main type of fodder to be raised. In Somalia there is abundant experience in producing these crops In addition, seeds are easily available including a number of varieties that would be suitable for fodder production. Local farmers, both traditional and more modern, are very well versed in the characteristics of these varieties.

Maize would be a preference crop if irrigation water is not a limiting factor. Yields were assumed to reach 10 MT per hectare (dry matter basis) for each growing season. Producing a maize crop for fodder of this magnitude is by no means assured. It would require careful management, sufficient fertilization, and adequate irrigation.

One of the advantages of producing maize as a fodder crop is that the farmer can elect to allow the maize to go to seed if economic and climatic conditions indicate that this would be more profitable. If there was a prolonged rainy season the maize could be harvested and ensiled thereby reducing harvesting risks as the maize would not be in the field for as long a period. The farmer would then be in a position to replant for an additional crop. Maize is a good choice for a fodder crop because it is a safe crop to raise.

3.22 Fodder Sorghum.

By the same token, sorghum is also a safe crop. Sorghum has two advantages over maize. First it is drought resistant. If irrigation water is limited, sorghum would be the crop of choice. This could be the case during the second crop season of the year which would extend into the long "jilal" (January through April) dry season. The second advantage of sorghum is that it will regrow from its roots a number of times if watered after harvesting. In a feeding situation where the fodder is cut fresh every day for the livestock, sorghum would be an attractive alternative to maize. It has two disadvantages, the first being that in the fresh growing state it can be poisonous to livestock. Therefore livestock cannot be allowed to pasture it. Sorghum is safe after it is cut and wilted. The second disadvantage is that the seed heads are subject to bird damage; this makes it a less flexible crop if one might wish to allow it to go to seed. Yields are also assumed to reach 10 MT per hectare (dry matter basis).

3.23 Sudan Grass.

Sudan Grass is also an annual and very important fodder crop. It is of the sorghum family and can also be poisonous if grazed. Sudan Grass's advantage over maize and sorghum is that it can be more easily dried and baled. Like sorghum it can regrow after cutting and is drought resistant. There is experience with Sudan Grass in Somalia and most potential fodder farmers have heard of it. Seeds are available locally but in limited quantities. Yields are also assumed to equal maize yields of 10 MT per hectare per season given proper management, irrigation, and fertilization.

There is in Somalia a local wild variety related to Sudan Grass called "Makadey" (Sorghum Haplochada) which is commonly harvested for the Mogadishu fodder market. One measurement of the yield of this variety by Dr. Mohamed Ben Ali, FAO Forage Agronomist for a first cutting, under semi-farmed conditions, spontaneous growth, no fertilization, and no irrigation was 5.8 MT/ha (DM basis). This is an attractive alternative, especially if it can be maintained in a semi-wild state requiring few farming inputs.

3.24 Perennial Grasses.

There are a large variety of perennial grasses available for fodder production. The advantage to a perennial grass is that farming costs are lower since once planted the crop will be maintained for a number of seasons. Also some common perennials are finer stemmed, thereby being easier to dry or to use as pasture. Under conditions where irrigation and fertilizers are not limiting, many perennials can have tremendous yields if used for pasture. The two disadvantages to continuously grazing an irrigated pasture are that weeds and brush tend to reemerge and the lush moist conditions of the pasture create a favorable environment for the transmission of internal parasites.

Some perennials that can be considered are Bermuda grass (Cynodon sp.), Buffle grass (Cenchrus sp.) or one of the Panicum's or Echinochloa's. All of these species have native varieties common in Somalia. Dr. Mohamed Ben Ali, FAO forage agronomist, measured the yield of Echinochloa Arundinasium, a local wild variety, and found a first cutting to produce 4 MT per hectare (DM basis). The forage harvested was in a rainfed, non-irrigated, semi-farmed stand.

The assumption used in this model fodder farm is that the perennial grasses will have an annual production of 15 MT/ha (DM basis). Careful farming, irrigation, fertilizations, and frequent harvesting could result in higher yields.

3.25 Legumes.

The farm model assumes the possibility of producing a leguminous field crop for fodder. However, at this time, there is no crop that can definitely be recommended. Alfalfa is the one crop that is most often mentioned but experience with alfalfa on the Min. of Livestock, Forestry, and Range's fodder research station (Fodder Production and Conservation Somalia: Progress Report. Mohamed N. Ben Ali, FAO) was not favorable. However, this research effort was limited and it is possible that other varieties would be more suitable.

One consideration concerning the planting of a perennial legume such as alfalfa is that certain wild grass such as Cynodon sp. would rapidly invade the stand. Another consideration is that there is very little appreciation for high protein fodders in the urban fodder markets. Nonetheless it is always possible that if people, particularly milk producers, were to start feeding higher protein fodders, they would rapidly understand its value. There are certain annual legumes that could be raised for fodder, these include cow peas and pigeon peas. There is no local information available to assess the suitability of these crops. A legume fodder crop that could be raised in rotation with annual fodder grasses would be very beneficial. Production assumptions were based on alfalfa and was set at 10 MT per year. It would require continuous irrigation and 7 or 8 cuttings to reach this number of tons per hectare.

3.26 Leucaenia.

The one leguminous crop that is slowly becoming common in Somalia is leucaenia. Any farm expecting to feed animals should plant some leucaenia trees. It is the one simple method to insure high quality protein supplementation for the dry season. The yields are not very high relative to other crops but the establishment and maintenance costs are very low. The best way to harvest the leucaenia is to simply cut down the branches and feed it directly to the animals. Again, there appears to be little appreciation for high protein fodder in the existing market. One farmer harvested and dried leucaenia in order to market the dehydrated leaves as a protein supplement. He met considerable market resistants and gave up on the enterprise. The reasons for this market resistance should be studied as there may be a rational economic or production basis for it. On the other hand it may simply be a matter of habits. It was reported that milk producers felt that feeding leucaenia depressed yields. This is a possible initial reaction to a change in feed and a possible effect of leucaenia, but once the animal is habituated to the new feed it should not be a problem. As far a luecaenia production goes there does not appear to be any real production constraints and this model assume 8 MT harvest per year.

3.27 Income Assumptions.

Table 4 summarizes the production assumptions and hectares devoted to each crop. A price of 5,000 ShSo per ton of fodder is used as a "reference farmgate price". This price was arrived at by numerous inquires concerning fodder actually harvested and sold to supply the livestock export system. Fodder prices are highly sensitive to supply and demand. In the dry season the farmgate price of quality fodder can easily reach 15,000 to 20,000 ShSo per MT. During the 1987 "jilal" (January thru April) even maize stover sold for as much as 10,000 ShSo per MT (farmgate). However, during the wet season fodder becomes unmarketable. 5000 ShSo per MT is a compromise figure that seems to fit the average. Two further assumptions used in calculating the income for this model is that the value of baling the fodder increases the value an additional 2500 ShSo and that the value for a high quality baled leguminous fodder is yet another 2500 ShSo. The assumption is that baled alfalfa hay would then be worth 10,000 ShSo/MT.

Using the assumption given above, the gross income of the model fodder farm is 5,525,000 ShSo per MT or 110,500 ShSo per hectare.

3.30 Results and Discussion.

The economic evaluation of the model farm is tabulated in Table 5. The internal rate of return (IRR) for the model as presented is 0%. Sensitivity analysis shows that increasing the gross revenues by 10% will bring the IRR up to 3%. The model as it is conceived does not prove to be economically feasible until fodder prices are increased 50%, at which point the IRR reaches 14%.

The model is not as sensitive to decreases in investments or in operating costs. A 50% reduction in investments raises the IRR to 11%, while a 50% decrease in operating costs raise the IRR to 7%.

That the economic feasibility of establishing a modern irrigated fodder farm is not very favorable is not a matter of too much concern. The purpose of the model is to test the "upper parameters" or "most expensive" alternative. In fact, it is encouraging that the cost of production of this model and the "reference farmgate price" of 5000 ShSo per MT are nearly identical. This means that fodder production if approached in a careful and economic way can prove to be a profitable enterprise.

3.31 Existing Fodder Production Systems.

Fodder production as it is already practiced in Somalia exploits native grasses. These are low cost operations and have until now been able to satisfy the export needs and the urban dairy production needs. Since the goal is to enhance and expand the fodder industry, it is these farms

TABLE 4

CROP PRODUCTION

	# of ha.	yeild MT/ha	crop per season	value/MT	production per year
1. Maize	7.50	10	2	5000	150
2. Sorghum	7.50	10	2	5000	150
3. Sudan Grass	10	10	2	7500	200
4. Perennial Grass	10	15	1	7500	150
5. Legume	10	10	1	10000	100
6. Leucaena	5	8	1	10000	40
7. total					790
Total Value of Crops			5525000		

61

TABLE 5

ECONOMIC EVALUATION

	year 1	year 2	year 3	year 4	year 5
I. Investments					
1. Land	4737500	0	0	0	0
2. facilities	2730000	0	0	0	0
3. Equipment	18796000	0	0	0	0
4. Working Capital	700000	0	0	0	0
5. Sub-total	26963500	0	0	0	0
II. Operating					
1. Labor	828000	-	-	-	-
2. Supplies etc.	1925500	-	-	-	-
3. Sub-total	2753500	2753500	2753500	2753500	2753500
Total Costs	29717000	2753500	2753500	2753500	2753500
III. Income	3315000	4420000	5525000	5525000	5525000
IV. Net Benefit Before Financing	-26402000	1666500	2771500	2771500	2771500

V. Sensitivity Analysis

Internal Rate of Return

1. greater income	base	110%	120%	130%
	0	.03	.05	.08
2. less investment cost	base	90%	80%	70%
	0	.01	.03	.05
3. less operating costs	base	90%	80%	70%
	0	.01	.03	.04

62

TABLE 5 (Cont'd)

	year 6	year 7	year 8	year 9	year 10 (residual)
I. Investments					
1. Land	0	0	0	0	4737500
2. facilities	0	0	0	0	2730000
3. Equipment	0	18796000	0	0	1.34E+7
4. Working Capital	0	0	0	0	700000
5. Sub-total	0	18796000	0	0	2.16E+7
II. Operating					
1. Labor	-	-	-	-	-
2. Supplies etc.	-	-	-	-	-
3. Sub-total	2753500	2753500	2753500	2753500	2753500
Total Costs	2753500	21549500	2753500	2753500	2753500
III. Income	5525000	5525000	5525000	5525000	5525000
IV. Net Benefit Before Financing	2771500	-16024500	2771500	2771500	2.44E+7

V. Sensitivity Analysis

Internal Rate of Return

1. greater income	140%	150%
	.11	.14
2. less investment	60%	50%
	.08	.11
3. less operating	60%	50%
	.06	.07

that should be encouraged. Cost saving and crop enhancing technologies need to be made available to these farmers. What these cost effective technologies are should be determined by research.

Areas that should be looked at include the best ways to exploit native grasses and the field crops common to Somalia, the role and extent of mechanization including small scale mechanization and hand tools, and how to integrate fodder production with livestock and dairy production. An issue that is easy to overlook is providing farmers with dependable source of necessary inputs. Whether this includes spare parts for machinery, seeds, fertilizers, herbicides, pesticides, tools, fencing materials, fuel, etc., a farm as it increases in technological capability becomes more dependent upon purchased inputs. The existing farm supply system should be studied in order to determine if it can dependably supply fodder farmers with the necessary inputs.

3.32 Fodder Production in Southern Somalia.

Some of the different groups of farmers or businessmen that should be encouraged include small scale suppliers of the urban fodder market, entrepreneurs who supply exporters, owners of existing mechanized farms,and the farmer/exporters supplying the export needs in the north. The people who supply the urban fodder markets already are exploiting the wild grasses that grow abundantly along the rivers and canals. All harvesting is done by hand. The urban fodder needs are quite extensive, for instance at peak demand Mogadishu can consume 125 MT of fodder daily. The one aspect of this fodder production that has not developed is conserving fodder for sale in the dry season. The urban market prefers fresh fodder. When fresh fodder is no longer available the only alternative in the market is fully matured rough grasses and maize stover. No one apparently will cut the grass when it is young and nutritious, dry it, and wait to sell it when the need and presumably the demand is high. One possible explanation for this failure is that the demand is insufficiently predictable. The urban fodder market benefits many people and utilizes a resource that might otherwise be wasted. Small scale dairy producers are the main consumers so any interventions and improvements should focus on enhanced dairy production.

3.33 Fodder Merchants.

There has developed in Southern Somalia a group of fodder merchants who supply exporters with their fodder needs. They represent a link between the exporters and the small farmers located along the rivers. When they have a contract to supply fodder for an exporter they find fields of unharvested grass, purchase it from the owner, cut it by hand, and deliver it to the marshalling yards and port. The quality of this fodder varies with the season. In March and April of 1987, the quality of the available fodder was very low. It is doubtful that the livestock would consume sufficient quantities of this fodder to maintain their body weight. For Somalia to improve the quality of their export animals the quality of the fodder must improve. Fodder should be harvested in an early stage of growth and then dried. The economics of properly preserved

fodder should be demonstrated to exporters so that they will insist on better quality fodder. Besides improving the quality of their product, these fodder merchants could benefit from mechanical harvesting and baling machines. The cost effectiveness of mechanical harvesting would depend upon the cost and availability of labor. It would also depend upon the availability of fields sufficiently flat and free of brush and debris. Baling would most probably be a beneficial practice. If mechanical harvesting was not feasible such that the baler could not be used in the fields, the baler could still be used in a stationary position.

3.34 Fodder Production on Existing Farms.

Although it may not be economically feasible to establish an irrigated farm specifically for the purpose of producing fodder, it is most probably possible for established farms to expand into fodder production. High value crops such as fruits and vegetables are produced on the choice portions of land where they can be most easily irrigated. Fodder would be an excellent "opportunity" crop for those pieces of land that can only be intermittently irrigated or are subject to excessive flooding. The promising yields shown by native species of wild grass that grow naturally along the riverine areas should be exploited. An established farm would only need to invest in a mowing machine, a fodder rake, and a baler in order to enter the fodder production business. The other requirement would be fields that are reasonably free of brush, hillocks, and debris.

3.35 Fodder Production in Northern Somalia.

The fodder production situation in Northern Somalia is very different from fodder production along the Shebelli and Juba rivers. Water harvesting is the key to increased production. There are already in existence many fodder farms in the north that have water diversion and conservation systems established. The wild Cynadon and Cenchrus grasses are encouraged to grow on these farms and if they receive sufficient water these grasses produce 4 to 5 MT per hectare. The grasses are allowed to mature in the field but this practice is probably not as detrimental as it is in the south because the dry climate causes the grass to "cure" before it is fully mature. When the fodder is needed, a crew cuts and bundles the grass by hand and it is transported to Berbera "loose", approximately 2 ton per truck load. The harvesting crew commonly takes one half of the crop for their wages. Depending upon the value of the fodder the harvesting costs are anywhere from 4500 to 9000 ShSo per ton.

The fodder industry in the north could most probably benefit from baling. The value of baled fodder is mostly in the savings incurred in transportation, and most of the fodder produced in the north is transported 150 to 250 km. Given the high cost of harvesting, mowing machines and hay rakes would also benefit many producers. The constraints to investing in any of this equipment includes, of course, producing sufficient fodder to justify the investment, the availability of fuel and

spare parts, and fields sufficiently smooth to allow the machines to function efficiently. Chapter 4 will analyze the conditions that make investing in mowing machines and balers feasible.

3.36 Pasturing Fodder Fields.

The one method of producing and harvesting fodder that should not be overlooked is pasturing it. Allowing the animals to harvest the fodder themselves is certainly cheap and eliminates many technological constraints. There are however management problems that must be dealt with. In the south, along the rivers, maintaining a large concentration of livestock during the rainy season could result in many disease problems: Trypanosomaisis only being one among many. Lush moist pastures are good environments for the transmittal of internal parasites, and cold, wet, and muddy conditions bring on pneumonia and coccidiosis. On the other hand, waiting for the dry season before allowing the animals to graze would result in old mature grasses of lowered nutritive value. One method to circumvent some of the management problems is to mechanically harvest the first cutting and allow the livestock to graze the regrowth when environmental conditions are dryer. Harvesting the fodder mechanically at least once annually solves the other management problem common to irrigated pastures - which is the growth of weeds and brush. This is caused by the livestock's selective eating habits

In the north, the emphasis is different. The drier climate makes disease less of a problem. The important factors are maximizing production and minimizing the growth of weeds and brush. Whether the main enterprise was feeding and supplying animals for export or producing milk and raising young animals would determine what mix of fodder production and livestock pasturing was used. For instance, an exporter would be interested in producing the maximum amount of fodder which he could feed to animals purchased during the dry season when prices are low. He might harvest his fodder twice and only save a limited amount of pasture. His pasture and fodder would maintain the animals until the rains began at which time they could be fattened on the range. A dairy producer would be most interested in having some fodder available for the very end of the dry season with as much pastures as possible reserved for that period of time between the ends of the rains and the worst of the dry season.

3.37 Fodder Production as Key to Improved Livestock Production.

Fodder production is very much the key to the enhancement of the livestock export industry, improvements in livestock productivity and quality, and increases in milk production. The traditional nomadic livestock production system although very efficient in one sense of the word, is also very wasteful. It is efficient in that it is able to extract sustenance from a very harsh unpredictable environment. The nomadic system developed because people could not depend upon the timing, placement, or extent of the rains. Producers, also did not have medications available to control diseases or the means to improve their environment through water catchment or fenced pastures. The system is wasteful because at the end of the rainy season there is more than

sufficient grass available. After the grass matures it loses much of its nutritive value. Insects and decay consume it and by the time the dry season comes, the livestock do not have sufficient feed available and lose weight. This increases the animals susceptibility to disease and limits the number of young born. Fodder production can be looked upon as an act of conservation. The nutritive value of already existing grass is conserved. Water, instead of being allowed to run off to the sea, is harvested and conserved. Ultimately the body weight of the livestock is conserved and not allowed to dissipate for lack of proper nutrition. The net effect would be more production from an already existing resource.

4. ANALYSIS OF THE ECONOMICS OF OWNING AND OPERATING FODDER PRODUCTION MACHINERY.

The introduction of some basic fodder harvesting equipment such as mowing machines, fodder rakes, and baling machines could significantly aid fodder producers. Fodder harvesting in Somalia is done by hand. The crews commonly cut the fodder with a knife or small hand sickle and pile it by hand. Sometimes it is bundled and tied with string, otherwise it is loaded into trucks and compressed by body weight. Hand harvesting is very much dependent upon the labor supply and therefore varies greatly in cost. In the south, it may be easy to hire the necessary labor in the dry season when farm workers do not have other work to do and nearly impossible during critical planting and weeding seasons. It can cost as little as 1000 ShSo per MT in the southern regions where 3 workmen receiving 350 ShSo per day each can cut and bundle a MT of fodder per day. On the other hand, it can cost 4500 ShSo or more per MT in the north where work crews require one half of the fodder in payment.

Mechanizing fodder harvesting with mowing machines and fodder rakes could be very beneficial for some fodder producers. However investing in equipment incurs costs that necessitates the equipment be utilized to its fullest potential. In addition to the cost of the equipment and the cost of operating and maintaining it, there are other costs to be considered. For instance the fields must be smoothed and free of debris and brush otherwise the machines will not be able to function properly and risk being damaged. This chapter will analyze some of the costs and issues concerning investing in mowing machines and fodder rakes. This chapter will also analyze investing in a baling machine. The real value of baling fodder is in the cost savings incurred in transporting that fodder and in the ease in handling that fodder. This analysis will compare the costs of transporting fodder "loose" as compared to baled.

4.10 Description of Analysis

4.11 Tractor.

Any of the fodder harvesting equipment suitable for use in Somalia requires a tractor to power it. Table 6 breaks down the hourly costs of owning and operating a 75 to 80 hp. tractor. The CIF Mogadishu cost as of June of 1987 was approximately $17,000. or 2,380,000 ShSo (140 ShSo per USD). Twenty percent extra is added to the cost to allow for sufficient spare parts to maintain the tractor through its seven year life span. It is assumed that the tractor will be operated 1000 hours per year and that it will operate for 7000 hours. This gives us an hourly depreciation cost of 408 ShSo. Interest, fuel, lubrication, driver, maintenance, and overhead costs result in an hourly cost of 1387 ShSo. This hourly cost will be added to the operating cost of the other equipment analyzed in this chapter.

4.12 Mowing Machine.

The type of mowing machine most suitable for use in Somalia is a rotary disk mower with a 1.5 or 2 meter wide cut. These mowers come with an attachment that will organize the fodder into "windrows" and another attachment that will "condition" the fodder allowing it to dry faster. Determining which of the attachments were needed depends upon the type of fodder being mowed and the climatic conditions. The simplest machine to operate and maintain would be one without the windrowing or conditioning capability. This cost analysis assumes that both attachments are purchased with the mowing machine.

Tables 7 and 8 analyzes the cost of owning and operating a mowing machine at two levels of annual use. The first level of use is 500 MT of fodder harvested annually. This is about the practical upper limit of how much fodder one tractor and one mowing machine can harvest in a year. The other level of use is 100 MT of fodder harvested per year. This is a level where the machine is definitely being underutilized.

The CIF cost of the mowing machine is approximately $7,500. Twenty percent is added to the cost to cover the necessary spare parts. The total operating hours for the life of the machine in Table 7 (Part A) were arrived at by assuming that the mower would cut 500 MT of fodder in a year. Since it was further assumed that it could harvest 60% of an hectare in one hour and that the average yield per hectare is 5 MT, it follows that it would be able to cut 3 MT an hour or 500 MT in 167 hours. It was further assumed that the mower would have a life span of 7 years or 1167 hours (167 hrs. x 7 yrs.).

The hourly cost of owning and operating the mowing machine comes to 1991 ShSo. Since 3 tons of fodder can be cut per hour this results in a cost of 664 ShSo per ton. When the cost of owning and operating the tractor is factored in (see Table 6) the cost per ton to harvest fodder with a mowing machine is 1126 ShSo. When one assumes that the mowing machine is used to harvest only 100 MT of fodder per year (Table 8, Part A), the cost go up dramatically to 3766 ShSo per ton. In this example it was also assumed that the useful life of the machine was 7 years or in this case 233 hours. In practice, if the machine was carefully maintained and sheltered it could have a longer life span thereby somewhat reducing the per ton cost.

4.13 Fodder Rake.

The cost of owning and operating a fodder rake is analyzed in Table 7 and 8. This is assumed to be a simple wheel type side-delivery rake that is powered by the forward motion of the equipment. A 3 meter rake would be sufficient for the conditions incurred in Somalia. The rake would be used to put the fodder in windrows if the windrowing attachment on the rotary mower was not used and for turning windrows so the underside can dry. Table 7, Part B analyzes the rake if used in harvesting 500 MT of fodder per year and part B analyzes the use at 100 MT per year.

The analysis assumes that the rake also has a life span of 7 years. In reality, a rake of this type is such a simple machine that with the replacement of the tines as they break and the replacement of an occasional bearing, they last indefinitely. Fodder rakes operate much faster in the field and in this analysis it is assumed that it can rake 1.5 hec. per hour. This is a reasonable amount for a smooth field and a crop of 4 to 5 tons per hec. Heavier crops would slow the machine down.

The results of the analysis indicate that owning and operating a fodder rake on a farm that produces 500 MT of fodder annually is 450 ShSo per MT. If the farm produces only 100 MT the cost goes up to 1508 ShSo per MT.

4.14 Baling Machine.

The cost of owning and operating a baling machine is developed in Table 9. The baler is assumed to be a twine type bale producing either of the two standard size bales that weigh in the neighborhood of 25 kg. The machine is powered by the PTO (power take off) shaft of a tractor. The analysis follows the same format as that for the mower and rake with part A analyzing for 500 MT of annual use and Part B for 100 MT of annual use. In each case it is assumed that the balers useful life is 7 years. It is also assumed that the baler can cover 60% of a hec. per hour in a field averaging 5 MT of fodder per hec. The only line item that is different in this analysis is that for baler twine. One bale of twine (1 bale consists of 2 spools of twine with 2200 m. of twine each) can produce approximately 400 bales of fodder weighing 25 kg. each. Since it is assumed that the machine can bale 60% of a hectare per hour (which is 3 MT of fodder per hour) the baler would consume 30% of a bale of twine per hour. A bale of twine costs approximately $20 US or 2800 ShSo.

The cost of operating a baler if 500 MT of fodder is baled annually is around 1627 ShSo per MT. If the baler is used for only 100 MT annually the cost would increase to 5147 ShSo per MT.

4.20 Result and Discussion

In practice, if one invests in a mowing machine, one should also invest in a fodder rake. It is possible to collect and pile the fodder by hand after it has been cut by machine and also to turn the windrows by hand. But if labor is expensive and limiting for the cutting, it would also be expensive for the collecting (or raking) phase of fodder harvesting. Whether or not the fodder was raked and turned by hand or by machine, it would still need to be removed from the field. If the fodder was not baled, this process would then be done by hand. Machines called "buckrakes" exist for this removal and stacking phase of fodder production, but to my knowledge, they are no longer manufactured. The rest of this analysis assumes that both the mowing machine and the fodder rake are utilized. The baler is treated separately since it is not necessary to utilize a baler in the mechanical harvesting of fodder. The mowing machine and fodder rake substitutes for hand labor in the actual harvesting process. A baling machine decreases the transportation and

70

handling costs of fodder. If the fodder is not to be transported there is no particular reason to bale it. In fact, fodder properly stacked "loose" keeps better than baled fodder.

4.21 Mower Plus Rake.

The cost of utilizing a mower and rake together to produce 500 MT per year comes to 1576 ShSo per MT. It increases to 5147 ShSo per MT when used for only 100 MT. Graph 1 presents the information for the cost of utilizing a mower and rake for all of the levels of use between 100 MT and 500 MT of annual use. As graph 1 shows, operating costs increase dramatically when less than 200 MT of fodder is being harvested annually.

If a fodder producer wishes to invest in a mower and fodder rake, he should first answer four basic questions. Question 1 is does he produce sufficient fodder to warrant the investment? Annual fodder production in excess of 200 MT would seem to warrant the investment. Question 2 is does the cost and availability of labor warrant the investment? If sufficient cheap labor exists to hand cut and hand collect the fodder for less 1576 ShSo per MT there is no reason to invest. If, however, the labor takes half of the crop as payment, it is definitely worthwhile to invest. Question 3 is are the fields sufficiently smooth to allow the equipment to function? If the fields are not smooth and are full of brush and debris, the producer must determine if it is worth his while to prepare them properly. Question 4 is, can the spare parts be acquired to properly maintain the machine? It was assumed that the machines would be purchased with a supply of spare parts, but it would not be possible to foresee in every case which parts would fail. The company that imported the machine should be required to commit themselves to properly servicing their customers. If the answer to all four questions indicate that it reasonable to invest in this machinery a fodder producer should go ahead and purchase a mower and fodder rake. However if the answer to even one of the questions is negative it would not be wise to invest.

4.22 Transporting Fodder "Loose" vs. Baled.

The cost of owning and operating a baler is presented in Graph 2. As in the case of the mower and rake, Graph 2 indicates that unless 200 MT of fodder is being baled annually, the cost is prohibitive. However, to really analyze the advisability in investing in a baler it is necessary to compare the cost of transporting baled fodder to the cost of transporting "loose" fodder.

Trucking rates in Somalia are officially set at 4.7 ShSo per MT per km. for the lower end of the rate scale. This means that a 6 ton truck can be hired for 28.2 ShSo per km. if roads are good and there are no other complications. Bad roads and difficult loads cost more. The upper limit of the rate scale is approximately double the lowest rate or about 9.4 ShSo per MT per km. It is estimated that a 6 ton truck can carry 2 MT of loose fodder or 5 MT of baled fodder. Graph 3 plots the cost of hauling loose fodder against the cost of hauling baled fodder at the lower

trucking rate of 4.7 ShSo/MT/km. The upper broken line represents the cost if only 100 MT of fodder is baled and transported annually and the lower broken line represents the cost if 500 MT of fodder is baled and transported annually. The area in between the two lines represent the case for intermediate baler utilization. The solid line represents the cost of transporting loose fodder. The slopes of the lines are different because only 2 tons of loose fodder can be transported "loose" whereas 5 tons can be transported baled. This graph indicates that unless the fodder is being transported in excess of 194 km. it is cheaper to produce and transport fodder "loose". If less than 500 MT of fodder is being baled and transported annually it does not become economically feasible unless the fodder is being transported even further.

At the higher trucking rate of 9.4 ShSo/MT/km the economics are very different. Graph 4 represents this case. Again the upper broken line represents the cost of transporting baled fodder if only 100 MT were being produced annually. The lower broken line represents the cost if 500 MT is baled and transported annually. The very steep slope of the solid line indicates that higher trucking rates adversely effects the transportation of "loose" fodder. The solid line ("loose" fodder) crosses the lower broken line at 96 km. In fact even at the low baler use of 100 MT per year it becomes attractive to bale the fodder if it must be transported more than 304 km.

On a practical level the average fodder producer who has a reason to invest in a baling machine will need to bale and transport between 200 MT to 500 MT of fodder annually before he should consider investing. He would also need to transport <u>all</u> of the fodder more than 100 km. on less than ideal roads. For instance, a fodder producer located on the Afgoi - Baidoa highway less than 200 km from Mogadishu should not purchase a baler. However, a producer located at Odweine, between Hargeisa and Burao, should purchase a baler. The potential investor should of course also evaluate whether the machine can be properly maintained and whether spare parts are available. It should be remembered that a baler can also be used effectively as a stationary machine, so the fields do not necessarily have to be smooth nor is it necessary that the fodder be harvested by machine.

72

TABLE 6

HOURLY COST OF OPERATING A TRACTOR

	unit cost	hour cost
100% Utilization of Tractor		
I. Tractor (75 to 80 Hp)	$ 17,000	
1 .cost in ShSo (140 ShSo/$)	2380000	
2 .spare parts (20%)	476000	
3 .total cost	2856000	
4 .total operating hours	7000	
5 .depreciation per hour		408
6 .15% interest (cost/2/1000x.15)		214
7 .fuel (hp x.66 x.2L x 30ShSo)		297
8 .lubrication (20% of fuel)		59
9 .driver (10,000/months,1000 hr./yr)		120
10 .maintence (2% of cost)		57
11 .overhead (20% of 5 thru 10)		231
12 .hourly cost		1387

7

TABLE 7

NORMAL UTILIZATION OF MOWER AND RAKE: 500 MT PER YEAR

A.	Mower (rotary disc)	$ 7,500	
1.	cost is ShSo (140 ShSo/$)	1050000	
2.	spare parts (20%)	210000	
3.	total costs	1260000	
4.	total operating hours	1167	
5.	hourly depreciation		1080
6.	15% interest(cost/2/1000x.15)		567
7.	maintence (1% of cost)		13
8.	overhead (20% of 5 thru 7)		332
9.	hourly cost		1991
11.	capacity per hour(ha./hr.	.60	
12.	cost per ton (5 ton/ha)		664
13.	cost of tractor per ton		462
14.	cost per ton		1126
B.	Hay Rake	$ 3,000	
1.	cost is SoSh (140 ShSo/$)	420000	
2.	spare parts (20%)	84000	
3.	total costs	504000	
4.	total operating hours	465	
5.	hourly depreciation		1084
6.	15% interst(cost/2/1000x.15)		569
7.	maintence (1% of cost)		5
8.	overhead (20% of 5 thru 7)		332
9.	hourly cost		1990
10.	capacity per hour(ha./hr.	1.50	
11.	cost per ton (5 ton/ha)		265
12.	cost of tractor per ton		185
13.	cost per ton		450
C.	Analysis 500 Mt per year (normal utilization)		
1.	cost of mowing per ton		1126
2.	cost of raking per ton		450
3.	total		1576
4.	Cost of baling per ton		1627
5.	Total Cost: 500 MT per year		3203

74

TABLE 8

UNDER UTILIZATION: 100 MT PER YEAR

A.	Mower (rotary disc)	$ 7,500	
1.	cost is ShSo (140 ShSo/$)	1050000	
2.	spare parts (20%)	210000	
3.	total costs	1260000	
4.	total operating hours	233	
5.	hourly depreciation		5408
6.	15% interest(cost/2/1000x.15)		2839
7.	maintence (1% of cost)		13
8.	overhead (20% of 5 thru 7)		1652
9.	hourly cost		9911
11.	capacity per hour(ha./hr.	.60	
12.	cost per ton (5 ton/ha)		3304
13.	cost of tractor per ton		462
14.	cost per ton		3766
B.	Hay Rake	$ 3,000	
1.	cost is ShSo (140 ShSo/$)	420000	
2.	spare parts (20%)	84000	
3.	total costs	504000	
4.	total operating hours	93	
5.	hourly depreciation		5419
6.	15% interest (cost/2/1000x.15)		2845
7.	maintence (1% of cost)		5
8.	overhead (20% of 5 thru 7)		1654
9.	hourly cost		9923
10.	capacity per hour(ha./hr.	1.50	
11.	cost per ton (5 ton/ha)		1323
12.	cost of tractor per ton		185
13.	cost per ton		1508

TABLE 9

A. Normal Utilization of Baler: 500 MT per year.

Baler	$ 10,000	
1. cost in ShSo (140 ShSo/$)	1400000	
2. spare parts (20%)	280000	
3. total costs	1680000	
4. total operating hours	1167	
5. hourly depreciation		1440
6. 15% interest (cost/2/1000x.15)		756
7. maintence (1% of cost)		17
8. overhead (20% of 5 thru 7)		442
9. baler twine(30% of a bale)	2800	840
10. hourly cost		3495
11. capacity per hour(ha./hr.	.60	
12. cost per ton (5 ton/ha)		1165
13. cost of tractor (per ton)		462
14. cost per ton		1627

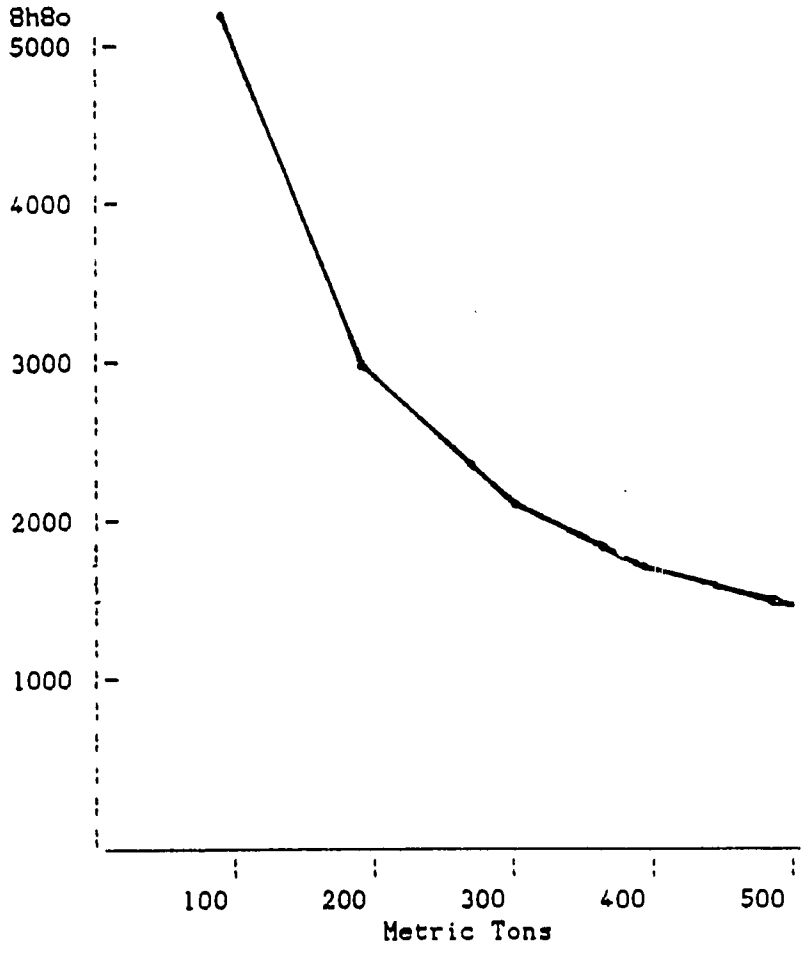
B. Under Utilization of Baler: 100 MT per year.

Baler	$ 10,000	
1. cost is ShSo (140 ShSo/$)	1400000	
2. spare parts (20%)	280000	
3. total costs	1680000	
4. total operating hours	233	
5. hourly depreciation		7210
6. 15% interest (cost/2/1000x.15)		3785
7. maintence (1% of cost)		17
8. overhead (20% of 5 thru 7)		2203
9. baler twine(30% of a bale)	2800	840
10. hourly cost		14055
11. capacity per hour(ha./hr.	.60	
12. cost per ton (5 ton/ha)		4685
13. cost of tractor per ton		462
14 cost per ton		5147

76

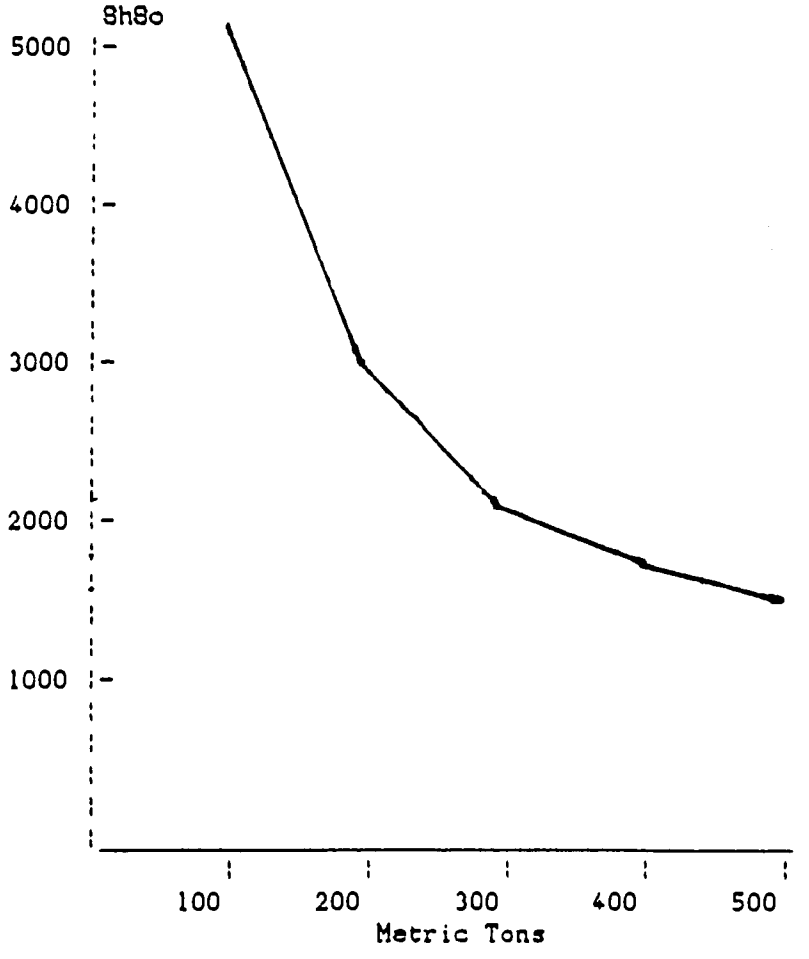
GRAPH 1

COST OF USING A MOWER AND HAY RAKE IN SHSO PER MT.
AT DIFFERENT LEVELS OF ANNUAL USE



GRAPH 2

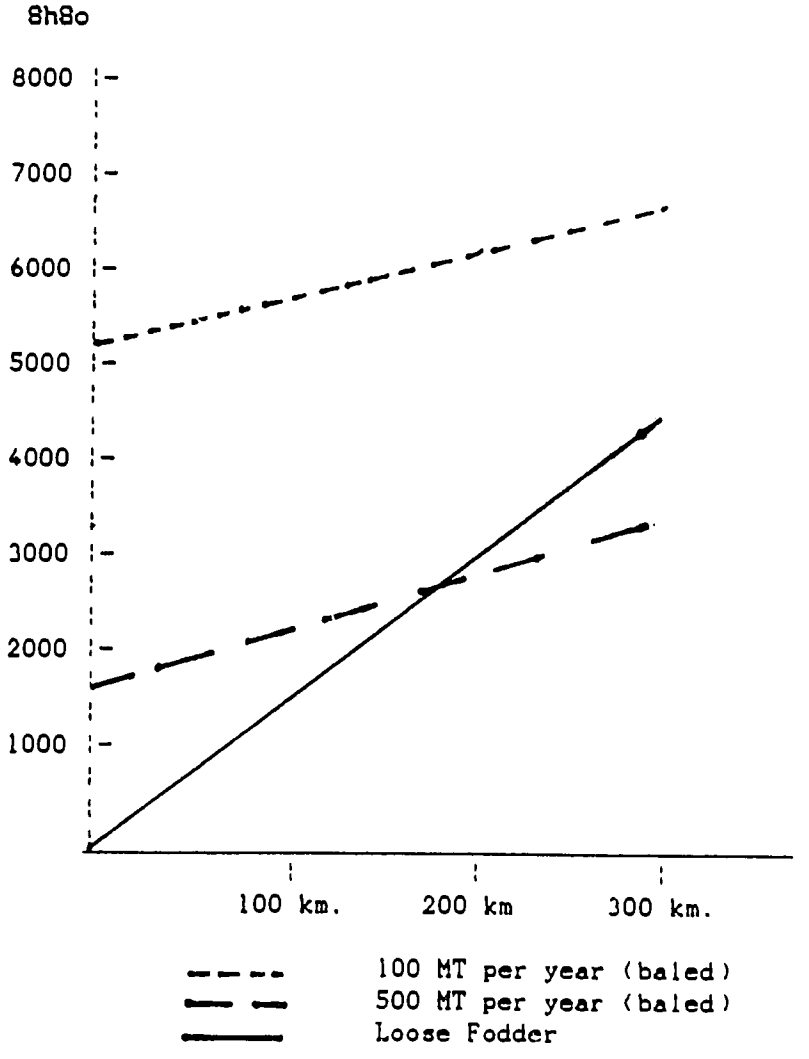
COST OF USING A BALER IN SHSO PER MT.
AT DIFFERENT LEVELS OF ANNUAL USE



76

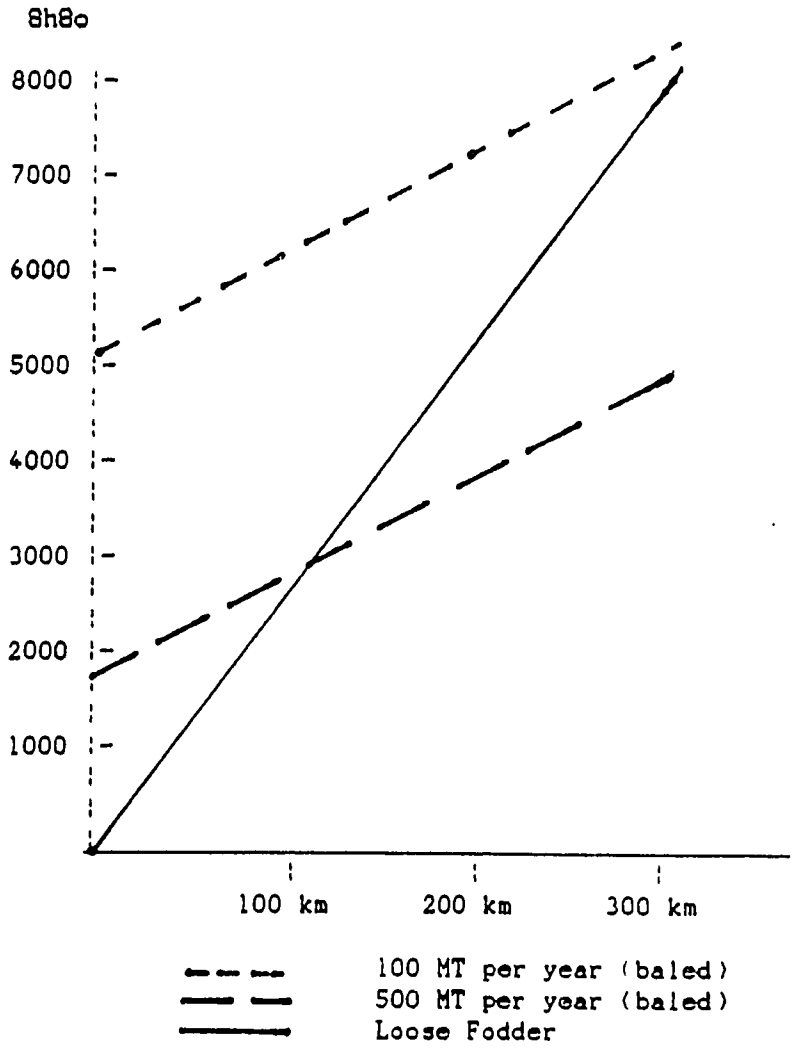
GRAPH 3

COST OF TRANSPORTATION OF FODDER:
LOOSE VS BALED FODDER AT LOW TRUCKING RATE (4.7 SHSO/MT/KM.)



GRAPH 4

COST OF TRANSPORTATION OF FODDER:
LOOSE VS BALED FODDER AT HIGH TRUCKING RATE (9.4 SHSO/MT/KM.)



81

5 DAIRY PRODUCTION

The information presented in this chapter was adapted directly from a feasibility study entitled Balcad Model Dairy Farm written in June 1987 by Klaus Hubl, DVM , (Planning Advisor for the Ministry of Livestock, Forestry , and Range / GTZ); Frank Procella, MS Animal Breeding, (Quarantine Station Advisor, Livestock Marketing and Health Project / USAID); and Gilles Stockton,MS Animal Nutrition, (Private Enterprise Advisor, Livestock Marketing and Health Project / USAID).

The feasibility study was for an irrigated fodder farm with a herd of 100 genetically improved dairy cows (Dawara/Friesian/Sahiwal). The cows were assumed to be raised in a zero-grazing system. Because very few high producing cows can be obtained on the market, the feasibility study allowed for an ambitious breeding program. In this analysis it was assumed that the cows are already genetically improved and capable of producing 11 liters of milk a day during a 270 day lactation. The projected income for non-genetically improved cows is also presented. The information in Table 10 is presented on the basis of a single producing cow. Costs and Incomes are prorated from the feasibility study.

5.10. Operating Costs.

Only direct operating costs are presented in Table 10. Investments in dairy barn facilities and livestock watering systems are not shown. Table 11 presents a list of the assumptions underlying the analysis.

The largest operating expense in this analysis is feed. All feed is assumed to be purchased. The 5000 ShSo per MT (DM) farmgate reference cost for non baled fodder is also used for this analysis. The ration consists of 80% fresh maize or maize silage, and 20% legume. The legume fodder's value is set at 7,500 ShSo per MT (DM). The ration therefore costs 5,500 ShSo / MT.

5.20 Results.

As the results of Table 10 indicates, there is a considerable margin for profit in milking genetically improved cows. This profit could easily be used to invest in proper facilities to house the dairy herd. The cost and sophistication of the necessary facilities depend of course upon the size of the herd. A ten cow herd would not need housing as elaborate as a one hundred cow herd. Providing a source of fresh water for the cows would be a major concern and expense. A dairy cow if she is expected to produce 11 liters of milk per day must not be stressed by lack of water.

If one assumes that the cow is not a crossbred capable of producing 11 liters per day, but has a production of 5.5 liters/day of lactation, then milk income drops to less than half (see Ttable 10). If for conveniences sake one also assumes that the value of offspring and culls drop by half, then profit margins are reduced to 7,100 ShSo. There is an

extensive dairy industry located within the confines of Mogadishu. According to a study by the Min, of Livestock, Forestry and Range and GTZ (Evaluation of Milk Production of Benadir Area), the average yield of these cows is 3.5 liters per day. Purchased feed costs are considerably higher than 5500 ShSo/MT because of the transportation of the fodder from Afgoi and Balcad. Not all feed, however, is purchased, as these cows are grazed in the environs of Mogadishu as much as possible. With the increasing urbanization the grazing areas must be becoming more and more limited requiring more and more purchased feeds. These urban dairies cannot be highly profitable enterprises.

5.30 Discussion.

Based on the information presented here there is a clear indication that fodder production for feeding dairy cattle is a potentially profitable business. The profit is however very dependent upon using dairy cows with a high potential for producing milk. Locating the dairy in the vicinity of Afgoi or Balcad where the fodder is raised would make more sense than locating in Mogadishu. It is cheaper to transport the milk than it is to transport the fodder. It would also be possible to graze the animals on irrigated pastures for a portion of the season reducing the overall feed costs. One strategy would be to have the cows producing during the dry season by feeding them dried or ensiled fodder. Milk prices are highest during the dry season because there is inadequate nutrition available to keep most of the cows producing and the milk supply goes down. One attractive aspect of dairy production and the fodder production necessary to sustain it is that these are enterprises equally available to large and small producers. Any work done to enhance dairy production would therefore have a wide social and economic impact.

TABLE 10

Dairy Production:

Operating Expenses

1. Feed	25,600
2. Labor	9,000
3. Veterinary	1,000
4. Supplies	5,000
5. Interest	3,000
Total	43,600

Income

	Genetically Improved Cows	Indigenous Cows
1. Milk	88,000	39,400
2. Meat	22,600	11,300
Total	110,600	50,700
Net Income	67,000	7,100

TABLE 11

Production Assumptions:

1. Feed

   a. The feeding requirements were calculated as being 2.5% of a Tropical Livestock Unit (TLU).This is 6.25 kg/day or 2.25 MT/year.

   b. For each dairy cow there are a certain number of offspring being maintained in the herd. The growing stock plus the cow amount to 2.07 TLU's. Therefore, the annual fodder needs for the cow and her offspring are 4.66 MT .

   c. The ration consists of 80% maize or sorghum fodder and 20% legume fodder. If the farmgate value of the maize/sorghum fodder is 5000 ShSo and the farmgate value of the legume is 7500 ShSo than the value of the ration is 5500 ShSo/MT.

2. Labor

   Each group of 10 producing cows would need at least one person to do the milking and the cleaning associated with the milking. An additional person would be needed for each group of 20 cows to do the feeding and other chores. The labor needs are therefore 1.5 people for each group of 10 cows. Salaries are 5000 ShSo per month for each person.

3. Veterinary and Supplies

   These costs are arbitrarily set but approximate the actual costs.

4. Interest

   The purchase price for each cow is assumed to be 20,000 ShSo. A 15% annual interest rate would create an interest cost of 3,000 ShSo.

Table 11. cont'd.

5. Milk Production

a. The cow is assumed to be a crossbred Dawara/Friesian/Sahiwal capable of producing 11 liters per day in a 270 day lactation or 2970 liters annually.

b. The calf is allocated 750 liters of milk from the lactation. This leaves 2220 liters for sale.

c. The farmgate price of milk is 40 ShSo per liter.

d. The high producing Indigenous (Dawara) cow is assumed to produce 5.5 liters per day or 1485 liters annually. The calf is allocated 500 liters of the amount, leaving 985 liters for sale.

6. Meat Production

a. The predominate animal produced for sale are two year old crossbred bulls weighing 400 kg. They are assumed to bring 30,000 ShSo each.

b. The culling rate is set at 17% of the dairy cows. The value of each culled crossbred cow is assumed to be 20,000 ShSo.

NOTE: The data for these calculations and the background for the basic "assumptions" were taken from the Balcad Model Dairy Farm, Feasibility Study prepared by Klaus Hubl,DVM, Frank Procella, MS Animal Breeding, and Gilles Stockton, MS Animal Nutrition.

6 LIVESTOCK FEEDING

A major concern for the future of livestock exporting from Somalia is that the quality of the export animal be improved. Somalia's competitors in the market, namely Europe, Turkey, Australia, and New Zealand, are capable of providing consistently high quality young animals. Somalia's export bulls rarely average 300 kg. and can be as old as ten years. The export sheep and goats do not average 25 kg and are over 2 years of age. The consumers in Saudi Arabia, North Yeman, United Arab Emirates, and Egypt are demanding younger, more tender meat. If Somalia wishes to stay in the livestock export trade, the quality of its product must be improved.

The purpose of this analysis is not to determine the "cost" of feeding livestock but to explore some of the principles behind livestock feeding in Somalia. It is not possible to determine the exact cost of feeding because there are too many unknowns; it is only possible to "guess" at the market value of various classes of livestock, the animal's ability to gain weight on the feeds available, or the eventual marketability of the "fed" animals. This analysis makes some very basic "assumptions" about pricing, feeding, and marketing. In practice, an exporter actually feeding some livestock would organize differently than the situation presented here. This analysis only serves as a guide in determining the issues involved in feeding livestock for export.

6.10 Ration Used for Feeding Bull and Sheep.

The first analysis will look at the cost involved in feeding a bull until he is ideal market weight and the second will analyze feeding a buck sheep. The market assumptions underlining these two cases are very different and therefore revealing of the issues involved.

The feed in both cases is assumed to be normal fodder, primarily corn or sorghum fodder with leucania for a protein supplement in the case of the cattle and "domar" (Cynadon and Cenchrus) with a leucaenia supplement for the sheep. Price was a factor in choosing to feed the livestock just on fodder but other factors were also considered. The market for Somali livestock as it now exists is not for "fat" animals but for younger animals carrying more flesh. It is not necessary to put these animals on "finishing rations" with daily gains of more than 1 kg (in the case of beef animals), it is sufficient to simply grow the animals out. Therefore, a high energy ration such an one based on grain is not needed. Since the farmgate value of maize and sorghum grain is around 12 to 15 ShSo per kg. and the farmgate value of fodder is 5 ShSo per kg it is also more economical to feed fodder. Somalia is importing maize for human consumption so feeding fodder also solves the ethical question of using human food to feed animals and in addition saves on foreign exchange. Feeding molasses was also eliminated. Pure molasses cost in the neighborhood of 5 ShSo per kg, but molasses has no protein content. After the molasses ration was balanced with the addition of urea into a molasses meal, it cost in the neighborhood of 12 ShSo per kg. This more or less

86

"artificial" feed when compared to good quality fodder (on a dry matter basis) is not cost effective. The factory producing the molasses also requires payment in "hard" currency, putting molasses out of the reach of most producers.

6.11 Cost of Feeding Bull.

The cost of feeding a bull is presented in Table 12. Part A of Table 12 looks at the situation where a producer purchases a bull, feeds it to an exportable weight, and then sells it to an exporter. Part B assumes that the producer exports the bull himself so the quarantine and exporting costs are added on to the feeding costs.

The live-weight export price (CIF) of bulls to North Yemen in early 1987 is $1000 per MT. The freight charges from Kismayo are $90 per head. Since 3 head of cattle make one MT, the export price of a MT of bulls at the port is $730 or 102,200 ShSo per MT (exchange rate of 140 ShSo per USD). The export value of a bull, FOB Kismayo, is therefore 102.2 ShSo per kg.

The underlying assumption in this analysis is that a young bull weighing 250 kg. is purchased during the dry season (February or March), fed for 6 months, and exported weighing 350 kg. A 350 kg. bull has an export value of 35,770 ShSo. It was arbitrarily assumed that the cost of a 250 kg. bull was one half of this amount, or 17,885 ShSo. This is a purchase price of 71.5 ShSo per kg.

Interest costs were set at 15% and since the animal is owned for 6 months, one half of the annual interest is charged. Death loss is set at 3% which should be a relatively normal death loss. The animal will need a certain amount of vaccinations, it will need to be dipped for ticks, and possibly wormed, thereby incurring a veterinary cost. The labor costs was set by assuming one man could care for 100 bulls and he would be paid 7000 ShSo per month.

The feed offered to the bull was gauged to allow him to gain 600 grams per day. This is approximately the maximum amount of weight that can be produced feeding just fodder. Table 12, Part A assumes 146 days of feeding, which allows for 87.6 kg of gain. The bull would, at the end of the 146 day feeding period weigh 337.6 kg and have an export value of 34,502 ShSo. It would have cost 9685 ShSo to get him to that weight, and his total cost to the farm would be 27,570 ShSo. The theoretical profit to the farm is 6932 ShSo. The cost per kg. of gain is 110.6 ShSo.

6.12 Cost of Exporting Bull.

If the bull was not sold at that point but was put into the export process the "theoretical" profit would be very different. This case is analyzed in Part B. Here it is assumed that the 337.6 kg. animal is put into a quarantine station for an additional 21 days of feeding. At the

end of that feeding period he will weigh 350 kg. Feed costs, however, go up since the fodder must be baled and transported to the quarantine station. It is assumed that the value added by baling the fodder is 2500 ShSo per MT and the cost of transportation is another 2500 ShSo per MT, making the basic value of the fodder 10,000 ShSo per MT.

Quarantine fees are not yet officially determined, but 840 ShSo per animal is the figure that is being considered. Other export related fees and taxes come to 2350 ShSo. A list detailing these costs are presented in Table 13. Other costs relating to the export process are arbitrarily set at 1000 ShSo. This would pay for such items as transportation to the quarantine station and the port. It would also cover the extra labor needs for the transportation and exporting process. The allowance made for feed cost during the export process allows for 10 more days of feeding. This would amount to 3 days in transit and 7 days on the ship. It is not assumed that the bull will gain weight during this 10-day period.

The exporting process costs an additional 6887 ShSo. Together with the purchase price and feeding costs totaling 27,570 ShSo, the final cost of feeding and exporting a bull is 34,457 ShSo. The FOB port value of a 350 kg. bull is 35,770 ShSo. This results in a profit of 1,313 ShSo which is a 3.8% return on the money laid out.

6.13 Cost of Feeding and Exporting Sheep.

The analysis for feeding sheep presented in Table 14 allows for some different basic assumptions. Sheep and goats are exported on a per head basis. The export price for one contract to Saudi Arabia in the early summer of 1987 came to $40 FOB Berbera. This amounts to 5,600 ShSo per head or 187 ShSo per kg if one assumes that the animal weighs 30 kg. The analysis presumes a 20 kg. male sheep is purchased and fed until he reaches 30 kg.

In this analysis it is not assumed that the sheep is purchased during the dry season at a discount price. Instead the 20 kg. sheep is purchased for 187 ShSo per kg which amounts to 3740 ShSo. The total time from purchase until export is 4 months so interest is only charged for one third of a year. The death loss is also assumed to be 3% and the labor and veterinary costs are set at one fifth (20%) of the costs assumed for feeding the bull.

The feeding period is 100 days with an average daily gain of 100 grams per day. The sheep at the end of the 100 day feeding period will weigh 30 kg. and be ready for export. The total cost of feeding is 1099 ShSo or 110 ShSo per kg. of gain. The total value in the sheep is therefore 4839 ShSo. If the sheep is sold to an exporter there would be a profit of 761 ShSo.

If, however, the sheep was exported directly the profit picture would be a little different. Table 14, Part B presents this information. Taxes and fees for exporting sheep through Berbera come to 656 ShSo per head. Transportation and labor costs are approximately 200 ShSo and feed costs for the port and the ship are 40 ShSo. This adds 896 ShSo to the cost of the sheep for a total cost of 5735 ShSo. Since the sheep is worth 5600 ShSo this then results in a net loss of 135 ShSo.

6.20 Result of Feeding and Exporting a Bull.

The basic conclusion is that it is possible to feed cattle and sheep/goats for export. However, as in any other enterprise, it must be done carefully.

Profiting from the feeding of cattle is most difficult. The cost per kg of gain (110 ShSo) exceeds the value of the export animal (102 ShSo per kg). In order to even consider feeding a bull for export one must purchase that bull for considerably less than 102 ShSo per kg. In the analysis (Table 12) it was assumed that the bull was purchased at 71.5 ShSo per kg, but this is a strictly arbitrary purchase price. Market prices in Somalia change constantly, just as in any other country, reflecting changes in supply and demand. One generally constant feature of the Somali livestock market is that the price of livestock declines during the "jilal" dry season. Any successful feeding of cattle in Somalia would have to exploit the lower dry season prices.

It should be noted that in Somalia livestock are not sold by the kilogram. Prices reflect a grade/size determination on the part of the buyer and seller. How this relates to weight is only a guess on everyone's part. This extends even to the final export sale, where cattle are loaded on the ships, never having been weighed.

The development of a livestock feeding industry that purchased young bulls from the primary producers and fed them to export weight, would be very advantageous to Somalia. It would benefit the nomads in that there would be a better more consistent market for livestock during the dry season. Often the nomads are forced to dump cattle on the market or watch them die. A feeding industry would allow the producer to develop a regular marketing strategy where young males could be sold from the herd in the early dry season reducing the number of animals to be maintained on the range. Since it would no longer be necessary to keep the bulls for a number of years until they reach a marketable size, producers could increase the number of females in the herd adding to the overall family food supply and increasing the overall productivity of the cattle production system. For the nation of Somalia the need to increase the productivity of the cattle industry is of course crucial. Cattle exporting is of the most important industries in Somalia and will remain so in the foreseeable future.

87

6.21 Result of Feeding and Exporting a Sheep.

The profitability of feeding sheep is very different. The cost of feeding a sheep is considerably less than its export value (110 ShSo vs. 187). A 77 ShSo profit for each kg of weight put on the sheep is a very attractive profit margin. If this profit margin is not a temporary market anomaly than a sheep and goat feeding industry is a very possible development. This could ultimately result in dramatic changes in the structure of the Somali sheep and goat production system.

The analysis, although finding the feeding of sheep to be profitable, also resulted in a net loss to the exporter. This loss is not an "artifact" of the assumptions used in developing this analysis. The 1987 sheep and goat exporting season (as of June) had every indication as being a loosing year for sheep and goat exporters. Two factors coincided to result in this profit squeeze: high internal prices and a change in the regulations governing foreign exchange. Sheep and goat prices in the first half of 1987 were very high. It was not uncommon to hear of sheep and goats being purchased for 6500 to 7000 ShSo, considerably more than the maximum "official" export price of 5600 ShSo.

That exporters were willing to pay this price would indicate that they had other ways in which to make a profit. Secret deals with the Saudi importer to pay a premium over and above the official $40 price would be one. Another is that the exporters were expecting large profits to made on the consumer goods they would import into Somalia with the hard currency earned from the sheep and goat exports. A June, 1987 change in the foreign exchange regulations requires that all hard currency earned in exporting be exchanged into shillings at the current auction rate. Although the exporter is free to repurchase hard currency through the auction in order to finance his imports, these imports can only come through official channels, making them subject to import regulations and taxes.

In addition to the demand being high, the supply of export quality sheep is probably down. A number of years of semi-drought has probably (in the absence of reliable figures on livestock numbers and trends, it is only possible to speculate on conditions in the bush) depleted the number of export quality sheep and goats. The extended dry season of 1987 certainly took its toll on the overall numbers of animals and the remarkable rains that finally came in May put the producers into a "herd rebuilding" frame of mind.

High livestock prices are a cyclical phenomenon in the rest of the world and there is no reason to assume that conditions would be different in Somalia: numbers down - prices up; numbers up - prices down. There has been some concern on the part of some Somali government officials and some of the larger livestock exporters that the reason for high prices is that there are too many livestock exporters, and that some of these exporters irrationally bid up the prices. The solution, it is felt, is to regulate the exporting industry so that only the largest exporters be allowed to

TABLE 12

CATTLE FEEDING & EXPORTING ANALYSIS

A. Cost of Feeding on Farm	
No. of Livestock Purchased	1
Cost (ShSo)	3740
Interest (15% / 3)	187
Death Loss (3%)	168
Feed Costs (146 days)	560
Vet. Costs	100
Labor	85
Sub-Total	4840
Sale Value If Sold To Exporter	5600
Net Income to Farm	760
B. Cost if Exported Directly	
Cost of Animal after Feeding	4840
Taxes & Fees	656
Cost of Export	200
Feed Costs of Exp.	39
Sub-total	5735
Gross Income from Export	5600
Net Income from Export	-135

TABLE 13

EXPORT TAXES AND FEES FOR CATTLE

1. Customs tax	25% of 1050 ShSo	263
2. Port tax	3% of 1050	32
3. Insurance Premium		
A. War Risk	.05% of Value	10
B. Old Ship Surcharge	.25% of Value	50
C. Reinsurance	2% of Value	400
4. Insurance fee	16% of premium	74
5. Export tax (local)	1% of premium	5
6. Export fee (treas)	2% of premium	9
7. Stamp duty (treas)	2% of premium	9
8. Registration "	3% of premium	14
9. Bank Commision	2% of LC	400
10. Bank Interest	15% of LC advance	45
11. Shiping Agency	5% of freight	630
12. Brokerage	$1.00	140
13. Ship. agency fee	11.5 ShSo/head	12
14. Commission Local	5 ShSo/head	5
15. Port charge	10 ShSo/head	10
16. Export Tax	2 ShSo/head	2
17. Export fee	2 ShSo/head	2
18. Market tax	3% of Market Price	240
TOTAL TAXES AND FEES		2350

TABLE 14

SHEEP & GOAT FEEDING & EXPORTING ANALYSIS

A. Cost of Feeding on Farm	
No. of Livestock Purchased	1
Cost (ShSo)	17885
Interest (15% /2)	1341
Death Loss (3%)	1073
Feed Costs (146 days)	6351
Vet. Costs (500/hd)	500
Labor (420/hd)	420
Sub-Total	27570
Sale Value if Sold to Exporter	34502
Net Income to Farm	6932
B. Cost if Exported Directly	
Cost of Animal After Feeding	27570
Quarantine fees	840
Feed Costs at Quarantine	1827
Taxes & Fees	2350
Cost of Export	1000
Feed Costs of Exporting	870
Sub-total	34457
Gross Income from Export	35770
Net Income from Export	1313

export. This would be a counter productive development. Making livestock exporting a monopoly of just the largest exporters would result in exporting becoming less efficient, not more. It is export inefficiencies that is currently putting the squeeze on Somalia's exports. In addition, it is the small exporter who is the most dynamic innovator. It is these small exporters who are experimenting the changes in the livestock production systems that are so important to Somalia's future. Finally, the nomad is the rock that the whole system stands on. He makes up the biggest portion of the society, he raises the animals, and he purchases the goods that are offered for sale in the markets. Restricting his income through arbitrary regulations would only hinder the overall development of Somalia.

6.30 Discussion and Recommendations

As stated above, Somali livestock are not marketed on a weight basis. This hinders, to some extent, the development of a livestock feeding industry. When profit margins are slim, as in the case of feeding cattle, it becomes important that costs be calculated very carefully. A market system based only on grade and size injects a lot of uncertainty into the calculations. As the markets in the Arabian peninsula become more sophisticated, they will probably insist on purchasing on a weight basis. When this happens, Somali exporters will be forced to buy on a weight basis. Livestock feeding can then become more of a possibility.

The export related fees and taxes (see Table 13) adversely effect the livestock export industry and therefore will also hinder the development of a livestock feeding industry. Although the fees and taxes only amount to around 6.5% of the export value of a bull, it is almost double the profit projected in this analysis. In the case of the sheep export analysis it is more than double. The fees and taxes may represent actual costs of operating the export related bureaucracy but some of the services rendered are suspicious. In some instances it is not the actual fee that is burdensome, but the process of paying the fee and collecting the proper stamp. By some accounts, as many as 9 agencies and branches of government must be visited for final authorization to export livestock.

Livestock feeding, when and if it develops, would be an important improvement to Somalia's livestock production system. As stated above, livestock feeding is not so much the development of "new" production as it is the conservation of the existing production. Grass and soil are currently being wasted. There is abundant grass in the wet season, and not enough in the dry. Consequently range lands are over-grazed in the dry season and made subject to wind and water erosion. The animals lose weight and that weight must be regained before that animal can be productive again. The solution is to take some of the wet season grass and conserve it to feed the livestock in the dry season. Since the animals would not lose weight, they would immediately be able to use the fresh "wet season" grass for productive purposes. The same amount of grass would therefore support more production and result in greater food security for the producer, and a better product for the export industry.

The most important factor determining the development of a livestock feeding industry is economics. If there is a profit to be made, people will attempt it. The role of the government in this case will be crucial. In order to invest in the necessary infrastructure people must feel secure in the knowledge that their investment is warranted and protected. A stable financial environment is the major prerequisite. Access to credit and the availability of technical expertise are also needed to encourage the development of a livestock feeding industry.

A system to improve the quality of the livestock destined for export is evolving. It is primarily a "range" operation that collects export quality animals and maintains them in the bush. The purpose is to improve their condition before export and to profit from price increases. As the animals begin to concentrate near the ports, range enclosures and fodder become important in maintaining these animals. This system as it is developing is "low tech." and "low cost". Research is needed in order to understand the organization and the economics of this system before specific recommendations can be made on how to improve and encourage its development.

7. CONCLUSION

Fodder production is a necessary addition to the Somali livestock production system. With the addition of fodder production it will be possible to promote improvements in livestock productivity and quality. It is also important to any positive changes in the range management system. However, fodder production, at least in this initial stage, is not a highly profitable endeavor. It is, nonetheless, possible to successfully engage in fodder production. The fodder producers supplying the Berbera export market gives evidence of this. As with any other agricultural enterprise, to be successful, fodder production must be approached in a careful and considered manner.

Fodder production in the Somali context can be looked upon as a method of conservation. In the wet season there is more than sufficient grass to nourish the livestock. However, the grass that is not immediately consumed matures into a lower nutritive state and is subject to depredations due to insects and the normal oxidative processes. Consequently during the dry season there is insufficient grass to nourish the livestock. The animals loose a considerable amount of weight which must be regained before the animals can again be considered fully productive. It is this endless cycle of feast and famine that prevents improvements in the livestock quality and productivity.

The consequences of this lack of improvement includes an export market which is being lost to countries who can supply a high quality animal, and deterioration of the range lands. New technologies, such as veterinary medicine and borehole drilling, shift the balance between livestock numbers and range carrying capacity. Other technological changes, such as fodder production, become necessary simply to counteract the negative effects.

7.10 Fodder Production.

The results of the model for the irrigated fodder farm show that production costs are too high to make this a sustainable enterprise at current fodder prices. Producing fodder on land suitable for fruit and vegetable production would probably not be wise anyway. What the model represents is the high cost end of the various ways to produce fodder. That the cost of production for this model roughly equals the actual market cost of fodder is encouraging. This means that any fodder production systems that can produce fodder cheaper than the "model farm" has a chance of being successful.

The best method to promote the development of the fodder industry is to support the people and the methods that are already engaged in fodder production. The people engaged in fodder production include the small farmers and workers living along the rivers who supply the Mogadishu fodder market, the small exporters who supply the export fodder needs in Berbera, and the fodder merchants who supply the exporters in Mogadishu and Kismayo. All of these various groups harvest wild grasses and crop residues.

What is needed to help these producers expand their industry is research, expertise, and credit. First, research is needed to understand how this nascent industry is organized, what are the production constraints, and what are the economics of fodder production/harvesting. Second some clear recommendations are needed on how production can be improved. This would require basic research into the various aspects of the industry. Finally, credit is needed to promote the adoption of fodder production enhancing activities.

7.20 Mechanization.

The results of the analysis of using fodder harvesting machinery show that under a certain minimum annual production, it is not economically feasible to invest in machinery. The approximate point where the cost of owning the machines exceed the cost of hand harvesting is about 200 MT of fodder produced annually. This is true for both the mowing machine and fodder rake combination and for the baling machine. In the case of the baling machine there is a further stipulation concerning transportation. A baling machine is not economically feasible unless the 200 (plus) Mt of fodder is transported in excess of 100 kilometers on less than ideal roads and 200 km. if the roads are good.

There are other variables to consider before purchasing fodder harvesting machinery. The cost and availability of the labor to do the work by hand can vary considerably from one area to another. These local variations must be taken into consideration. These machines, in order to function must have fields that are relatively smooth and free of brush and debris. Spare parts and fuel is another consideration. Any of these machines can be disabled by the failure of any number of components. Although the analysis assumed that a supply of spare parts were purchased with the machine, it would not be feasible to purchase every part that could possibly fail. The integrity of the dealership selling the machinery must be considered carefully. The availability of fuel is of course an "on again-off again" proposition affecting most business related decisions.

Fodder production machinery does have a place in the Somali fodder industry. However, it is not a technology suitable for all producers. A fodder producer needs to have the information about the economics of the equipment, made available to him, before he decides to invest. The suitability of smaller scale machinery and hand tools were not considered in this report. Hopefully, future fodder production research would study the feasibility of using such machines and tools.

7.30 Dairy Production.

Fodder production for the purpose of feeding dairy cows shows surprisingly positive economic return. This economic return, however, i dependent upon using high quality cows capable of producing 11 liters o milk per day. When one assumes a milk production of 5.5 liters per day which is good production for a high producing indigenous "Dawara" cow, th economic return is not so favorable.

A policy promoting the adoption of improved dairy stock coupled wit fodder production should be instituted. With Mogadishu being in a mil deficient situation, local production meets only 25% of the demand, an increase in production will be of great benefit. Improved dairy productio can occur in any size operation, therefore any work done to promote th growth of this industry would benefit the full range of producers.

7.40 Livestock Feeding.

The cost of feeding a bull exceeds the export value of that bull (11 ShSo per kg. vs 102 ShSo per kg). Profiting from feeding bulls i therefore highly dependent upon the initial purchase price of the bulls In the world of livestock feeding this is not an abnormal situation. I simply means that one must purchase a low "quality" animal and transfor it into a higher "quality" animal. In Somalia this would mean that bull would have to be purchased in the dry season when the animals "condition' and the price were at their lowest.

The situation for feeding sheep was very different. The cost per kg. of gain was 110 ShSo and the export value of the sheep was 187 ShSo pe kg. Under these conditions it would be easy to profit from feeding shee and goats. In practice, however, as a feeding industry develops, the purchase price of the small sheep or goat would increase. The profit margin would shrink from the 76 ShSo projected here to some lower level.

The sheep feeding analysis resulted in a net loss to the exporter even though the result of the feeding was positive. There was every indication, as of June 1987, that the sheep and goat exports would result in losses. The 1986 export season also resulted in losses, at least on paper. High prices to the producers probably result from low livestock numbers, the effect of many years of drought and semi-drought. Exporters have been willing to pay premium prices because they have been anxious to earn foreign exchange with which to finance the importing of consumer goods. Recent changes in the currency regulations have probably resulted in a less favorable situation for livestock exporters who count on importing consumer goods for their profit margins.

Livestock in Somalia are not marketed on a weight basis. Instead they are bought and sold in a grade/size system. Until the ultimate purchaser, the livestock importer in Arabian Peninsula, insists on buying on a weight basis livestock feeding as presented in this analysis will probably not develop. Livestock feeding as it is currently developing is a kind of low

key speculative operation. Export type livestock are purchased and grouped into herds. These animals are kept on the range much as any other nomadic herd until they can be sold for export. This system is modifying with the addition of range enclosures and fodder farms but can not really be expected to develop into intensive feeding operations as long as the export market does not purchase animals on a weight basis. Any promotion of livestock feeding will have to take into account that livestock feeding (or livestock "conditioning") will be primarily range operations. Range enclosures where grass has been reserved for these animals will be an important feature of this feeding system as will low intensity fodder production.

7.5 Long Term Benefits.

The development of a more modern fodder industry along with dairy production and livestock "conditioning" is potentially very beneficial for Somalia. As matters are currently organized, livestock in Somalia go through an annual feast - famine cycle. This cycle seriously effects the productivity of the livestock which naturally effects the nutritive and economic well being of the people. Conserving grass when it is young and nutritious and making it available to the animals during the dry season is the obvious way of breaking this cycle. Promoting these developments in socially and economically acceptable ways is the goal. The end result is that Somalia can produce a higher quality animal to meet the changing consumer demands in the Arabian Peninsula. It can produce more animals that are more productive. Damage to the rangelands can be reduced and ultimately eliminated, and the population can be better off.

All of the above benefits are possible, but these changes will not come quickly or easily. It will be a long process. One of the first steps is to support the development of the livestock export industry. Livestock Exporters are currently the most dynamic sector of the livestock industry. They are the ones who are experimenting with methods to improve their product and their business methods.

The above report is not intended to be the final word on any of the subjects discussed. Without concrete field data it is not possible to calculate operating costs and be confident that the results are accurate. The purpose of the report is to explore some of the issues involved and highlight the areas that seem most promising.

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