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NUTRITION IMPACTS OF LIVESTOCK DEVELOPMENT  
SCHEMES AMONG PASTORAL PEOPLES

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## EXECUTIVE SUMMARY

Livestock development and range management projects in developing countries are shown in this paper to have inherent problems leading to implementation failure due to the marked changes they impose on local herding populations' patterns of food acquisition, distribution and consumption. The aim of this report is to examine AID and other donor livestock projects in arid regions of the world to determine the human nutrition impacts of various schemes and to identify project approaches that offer more realistic likelihood of success. Then guidelines are proposed for consideration by AID to design nutritionally sound livestock/range projects which simultaneously achieve development goals of increased sustained ruminant animal production by pastoralists themselves.

The report focuses on a nutritional double bind caused by attempts to sharply raise the meat offtake of range livestock while upgrading soil and vegetation through environmental conservation measures, and assuming no adverse effect on the well being of herder peoples. National government and international donor agricultural policies concerning food production, especially for red meat, have been superimposed on the existing dietary ecology of graziers without careful attention to the nutritional basic needs of these producers. The report draws upon secondary data sources such as AID and World Bank documents, regional nutrition surveys and socio-demographic and anthropological field studies as well as on the up-to-date literature on nomadic societies and human nutritional needs. The report is organized in seven chapters, beginning with a description

of the food sources and way of life of pastoralists in developing areas, their nutritional conditions and dietaries and then focussing on the known impacts of livestock projects and potential effects of such activities, using case studies from AID. The final chapter of the report deals with guidelines and recommended policy orientations as well as project design and management procedures to achieve nutritional benefits for pastoralists as part-and-parcel of the development process.

The approach is to point out the predominance of subsistence production of cereal foods, especially coarse grains, among pastoralists as well as their reliance on ruminant milks from the herds, and occasional use of livestock for meat consumption as a means of hunger alleviation. Semi-nomads are found to cluster in agro-herding systems, with fewer groups in more arid areas specializing in extensive migratory nomadism. The diets of these groups vary in the quantity of milk used in the food supply, but grain consumption remains critical especially for intake of caloric energy, total protein and a variety of vitamins and minerals considered essential to health. In fact, the mixed preparation and consumption of plant and animal origin foods creates complementarity in the essential amino acid array; this has a synergistic effect in raising the biological value of protein needed for human growth and tissue maintenance. In addition, milk contributes minerals such as calcium to the diet and if drunk regularly may provide immunological properties against various types of diseases. Pastoral peoples have adapted both culturally and genetically to living with livestock and consuming ruminant milk in quantity over many generations. This combination of nutritional impacts, along with other multi-purposes uses of livestock byproducts, show an imperative need to consider the nutristructure of pastoralism in making changes for development and meat production purposes.

The potential effects of range and livestock development inputs on herding peoples are viewed in terms of a series of questions to be asked of the design for development as to specific impacts and interactions, food supply and availability, price, distribution and timing. An historical overview of post-independence livestock development projects shows those involved with pastoralism have occurred in Africa and the Middle East. The project types initiated in the early 1960's are described as primarily animal health and breeding oriented; those of the late 1960's and early 1970's are aimed at the stratified production of meat for urban consumption from the range areas through the use of range management techniques borrowed from Western countries, especially the United States. These output strategies were not sensitive to the seasonal hunger periods and human ecology of pastoralism.

During the 1970's the lengthy period of cyclical drought in Africa has altered livestock policies by giving additional priority to rangeland conservation practices through limitation on stocking rates and fenced off grass growing perimeters or anti-bush fire control measures. However, the expected increase in the offtake of meat, especially beef in sub-Saharan Africa and mutton in the Near East, did not materialize during the entire 1970's period. Livestock/range management projects were delayed in the implementation stages and met with pastoralist resistance or avoidance in many cases. This led to serious reductions of donor agency investment in the livestock sub-sector by the end of the decade. With the effects of revised development policies by international agencies in favor of basic human needs, the stage was set for the introduction of social and nutritional soundness criteria into livestock development design. Meanwhile, livestock were made part of regional integrated development of rural systems linked to river basin control and irrigation strategies on a larger scale than before as the 1980's began.

Two major case studies of livestock development schemes were traced from the late 1960's through the 1970's, one in the Sahel and the other in North Africa. Both projects and their sequelae represent attempts to increase meat production by semi-nomadic pastoralists on inland ranges for shipment to coastal city consumers, while conserving the range soils and vegetation against erosion and over-grazing. In neither case were the food and nutritional conditions of the impacted livestock raisers effectively considered by the project designers to the point of implementation. The potential loss of milk, manure, wool or hides, meat and other economic and social values that pastoralists draw from their herds, as well as loss of control over herd movements and the land led to piecemeal revision of each project by AID. The changes made during the 1970's were not appropriate to achieving nutritional improvements. By the beginning of the 1980's both projects were slated for regional development schemes as part of entire river basin development efforts; these too took little account of local herdsman's needs nutritionally or otherwise. At present no serious adverse impacts of project development could be measured due to lack of adequate implementation, but few if any benefits had been realised by pastoralists or others. Redesign efforts including nutrition guidelines and socio-economic impacts are in order. The report cites examples of newer nutrition-oriented AID livestock projects also.

Nutrition guidelines recommended include consideration of the basic subsistence availability of essential food supplies including grains, milk, wild and cultivated vegetables and fruits as well as hunting and some trade foods, mainly grains. The emphasis should be placed on determining the advantages of a semi-nomadic ecological setting rather than trying to force settlement of nomads or assume they live in fixed locations. Herds need to be viewed in terms of mixed species of large and small ruminants with graziers

retaining control over the movements of their beasts and their marketing rather than government agency or parastatal managerial takeover of the herding functions. Conservation efforts are important, but need not cause a radical destocking of the range or limitation of grazing to small blocks of land. The more successful inputs such as veterinary health measures, and improvement of underground water resources for livestock should be complemented with human health interventions and improvements in water availability and sanitation for human use.

An internal rate of return analysis does not show the progressive effects of a nutritionally sound approach, but errors in the calculations and over-estimates of return on investments are part of the implied problem in current livestock development strategies. Careful attention to a set of nutrition impact development questions shows that subsistence use of livestock can be encouraged rather than discouraged, thereby avoiding intense constraints on pastoralist food supply and preventing malnutrition and hunger as well as socio-economic disintegration of herder family and society. Only by assuring grazier families of a mix of food resources and livestock accessibility for milk, manure, meat and sale or gift-exchange can the nutristructure of their society be maintained or ameliorated across various seasons of the year and through cycles of drought and precipitation. The development of livestock on a managed transhumant basis as an adjunct to the growth of irrigated cropping is an appropriate use of the rainfed lands. Designs that are more realistic and longer range may be required to integrate pastoralism into the wider production and exchange relationships of economic development in low income, low technology parts of the world.

Title: NUTRITION IMPACTS OF LIVESTOCK DEVELOPMENT SCHEMES AMONG  
PASTORAL PEOPLES

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## FOREWORD

It has become an easy thing to criticize project implementation in livestock development among pastoralist populations of Less Developed Countries. Recent field evaluations and 'expert' consultant reports<sup>1</sup> point clearly to a recurrent pattern of unmet goals, inadequately achieved objectives and slippage in schedules. These AID reports also reveal unusually high levels of misunderstanding, cultural shock, work frustrations and interpersonal conflict associated with rapid turnover among project personnel. Concerns have also been expressed about unintended adverse effects on the food supply and way of life of nomadic peoples and their livestock and land resources.

A recent conference on pastoral and rangeland issues in livestock development (sponsored by AID) thoroughly questioned the rationales, assumptions and methods used by donor agencies and host governments in attempting to transform traditional pastoral systems into commercial livestock production agro-industries. The conference report<sup>2</sup> throws doubt on the otherwise high priority given to ecological protection of range vegetation and soils in the arid and semi-arid regions where most pastoralists live. Other writings by development social scientists have called for a major shake-up in the livestock/range management sub-sector of agricultural development in order to fulfill the survival needs of pastoralists and fit their cultural and

socio-economic conditions. Meanwhile, some new approaches are underway in the livestock/pastoralist field that try to incorporate nutritionally-sound alternatives discussed in this paper.

The purpose of this policy paper is, accordingly, to research documentation on a variety of livestock projects over time and space among pastoral peoples; to sift through the literature for techniques applicable to improving nutrition impacts of livestock development for pastoralists; to analyse current policies and approaches in terms of nutrition impacts; to suggest appropriate nutrition-related guidelines for consideration by AID in future livestock programming and development projects.

This is clearly an inter-sectoral set of issues. Human nutrition is usually seen as a consumer or food distribution and income equity problem, with many health and population linkages in developing countries. Livestock improvement, on the other hand, is part of the agriculture and rural development 'productive' sector in donor agencies and host government ministries. In reality, both sets of issues impinge on pastoral populations involved in livestock and range development projects. Such projects affect cultural practices, socio-economic conditions and diet of the target groups. Social soundness and economic cost-benefit analysis are generally recognized as critical to project design. However, as we shall see, the nutritional well-being of pastoral communities is also influenced by the rural and urban policies of host governments and their planning for regional environmental protection in project areas.

One may picture the development process in pastoralist society as a three-legged stool, composed of a food and fiber production leg from ruminant herds, an environmental management leg focussed on land and water resources, and a human basic needs leg which includes the food supply and nutrition of the pastoralists themselves. If one leg, such as animal production, grows at the expense of others it may destabilize the stool. If a leg gets wobbly or is fractured, e.g., the land resources supporting the herd, the burden of development pressures may tilt the stool and cause stresses. If the entire burden of a project falls on one leg, such as the traditional food system, the whole effort may collapse. Nutrition impact analysis involves a sharpened focus on factors that strengthen or weaken pastoralist dietary balance. Balanced growth of all legs, including grazer food acquisition and consumption, tends to facilitate development aims through the achievement of successful livestock improvement projects that meet needs of the pastoralists.

The author has become acquainted with donor-assisted livestock and range development efforts in various parts of Africa and the Near East through his own field research, work on livestock project design efforts for AID, and professional work as a nutrition planner. This field experience is utilized here in providing in-depth analysis of two livestock development case-studies in Senegal and Morocco. The interpretations are those of

the author, informed by careful perusal of project documentation and evaluations from the AID files and those of other donors such as the World Bank, and by discussions with a number of people active in livestock/range development.\*

\* A special note of appreciation is owed Dr. Patrick Fleuret, AID/PPC. He conceived this nutrition impact analysis of development efforts; he has thoroughly reviewed this paper and assisted in fine-tuning its focus during preparation and writing while giving the author complete freedom of research expression.

## 1.0 FOOD PRODUCTION AND HUNGER ALLEVIATION - ANIMAL HUSBANDRY

The AID Agricultural Development Policy Paper of 1978 advocated increased food production to raise incomes in poor rural areas and to achieve national self-sufficiency in food. It built upon the 1975 Amendment to the Foreign Assistance Act of 1961, which stated in Section 103, that its purpose was to "alleviate starvation, hunger and malnutrition and to provide basic services to poor people, enhancing their capacity for self-help." The Policy Paper's view of livestock raisers is:<sup>1</sup>

Activities in animal husbandry can directly supplement the diets of low income rural households as well as provide cash income from marketing destined for higher income groups or export.... Raising livestock in many low income countries is very labor intensive, provides income and nutritional supplements to low income producers and warrants AID support.

Based on the New Directions Mandate, the AID Nutrition Office issued a Circular to the Missions for Fiscal Year 1979 which stated its concerns about the gap between the food production sectors and the nutrition goals of the Agency, citing,<sup>2</sup>

the lack of sufficient understanding of the nutritional effects of development programs, particularly those in the agricultural production sector... Understanding of nutrition factors could go a long way toward an integration of the thinking and planning which takes place in the agriculture and rural development and nutrition and health of communities.

This circular expressed a concern that various forms of agricultural production had developed without providing nutritional

improvements among the rural producers themselves. The President's Commission Report on World Hunger asserted this viewpoint forcefully in 1980,<sup>3</sup>

AID's official priority is still agricultural development rather than alleviation of hunger and malnutrition. The Commission believes that AID's rural development program could do even more to alleviate hunger - without sacrificing the needed production and income gains - if they were more consistently formulated with specific consumption and nutritional goals in mind.

The priority to 'hunger alleviation' was presented in its strongest form by the Director of the AID Nutrition Office, Dr. Forman in his Paper, AID and the Hunger Issue,<sup>4</sup> in April of 1980, as follows:

The basic philosophy [is] that hunger alleviation [improved food consumption] no longer be thought of as, at best, a side-benefit of agriculture and rural development projects, but that we begin with hunger alleviation as the primary objective, and food consumption by the poor, rather than productivity as the ultimate effectiveness criterion.... When agricultural inputs are geared to the production of a particular food item....what effects will this have on the reduction of hunger and malnutrition among those in need ...if consumption of that food is restricted economically and culturally to the middle and upper classes?

It is with these questions in mind that we turn to an analysis of the nutrition impact of livestock development among pastoral populations, most of whom are poor, rural and relatively isolated in the development policy and provision of resources by low-income countries.

### 1.1 Food Sources and Dietary Staples of Pastoral Peoples.

To determine the specific nutrition factors impinging on pastoralists, it is necessary first to trace their way of life in a general sense, and bring out the nutrition impact issues involved in changing traditional livestock practices later. The Club des Amis du Sahel has portrayed the pastoral way of life broadly. The following summarizes much of the Club des Amis description and additional components from the literature:<sup>5</sup>

Most pastoral groups live on marginal land areas, usually locked into interior regions of large countries within wide continental zones. Many pastoralists fall into the category of "rural poor" today. They exist in small groups on rainfed, semi-arid to arid expanses of rangeland, bush and forests, gathering together in larger groupings or settlements during certain times of the year. Pastoralist households raise domesticated ruminant animal herds by nomadic or semi-nomadic movements. They are subject to many vagaries of rainfall and seasonal temperature change, which affect grazing resources and water supplies for ruminants and people. The pastoral group adapts to the mobility needs of the herd by moving people with animals. They regularly cross from one ecological zone to another in search of sustenance for the beasts. They also require access to permanently settled areas, usually near river valleys, where they exchange food production and consumption resources with sedentary groups.

Pastoralists raise meat, milk and fiber-bearing animals; but they extract only some of their food energy needs directly from the herds. Most pastoral peoples regularly consume carbohydrate sources of food, usually in the form of cereals, sugars and starchy tubers. They raise crops by subsistence methods on or near grazing lands. But these temporary cultivations are not usually sufficient to supply enough plant foods for consumption; the difference is made up by exchange of herd products and provision of labor to settled peoples in return for crop food items. Between harvest seasons pastoralists often suffer caloric deficits; this is especially true in the 'hunger season', a period of months when stored food is running out and new cultivated crops and animal products are not yet plentiful.

Nomadic and semi-nomadic populations usually have only limited and infrequent access to the wider variety of vegetable, fruit and small animal foods found in more settled communities. They consume low or irregular amounts of plant oils and poultry. This severely restricts their food choices for supply of essential nutrients in the diet. Pastoralists are quite dependent on milk-based foods from their herds, as well as some wild plant and animal foods. Yet most pastoralists eat only small amounts of meat from their herds. Up to 75% or more of the diet usually comes from cereals, especially coarse grains such as millets, barleys, maize, sorghum, etc., as well as from food crops of wheat or rice obtained from settled farmers in most cases.

There is recurrent demand for trade foods, but few items other than staples are usually purchased from agricultural markets. These are mainly foods which are easily stored and transported - dry cereals, dried fruits, sugar, tea, salt, condiments, etc. Although pastoralists trade their livestock, milk, animal fibers and manure by-products of herding for food staples or for cash, they do not usually engage in specialized commercial livestock production as an industry. The multipurpose exploitation of family herds of mixed species is the essence of their way of life.

Nutritional conditions among pastoralists vary with the growth and structure of their herds, and with the climatic conditions. Generally, pastoral peoples are lean and active with adequate caloric intakes under normal circumstances. As with other rural peoples, there is a strong tendency for the nutritionally at-risk members of pastoral populations to be the pregnant and lactating women, their young children and the elderly, who may consume lower-energy diets.<sup>6</sup>

Pastoral women usually breastfeed their infants for prolonged periods of time, up to three years, before weaning them onto coarse cereal roughages and milk foods which are sometimes bacterially contaminated. The highest malnutrition rates appear among weanlings exposed to diarrhea and subject to malabsorption of adult foods, contributing to dehydration, nutrient deficiencies and death. Living in isolated and changing surroundings, the

environmental conditions perpetuate a vicious cycle of malnutrition-infection syndrome associated with near absence of preventive health services, lack of health care, and scarce, often polluted water supplies. Malnutrition-related morbidity is prevalent among younger children, with increased incidence noted during the 'hunger season' and especially during drought years when herds and crops are less productive. Child growth may be retarded by lack of proper foods, and by endemic infection with human and animal parasites, sometimes transmitted by contact with the herds, or by insects and other vectors.<sup>7</sup>

The demographic profile of a pastoral society generally displays slow transition from a structure with relatively low fertility rates and high mortality rates, toward reduced mortality in modern times. However, fertility may increase with improvements in preventive medicine. Most pastoral populations would double in density in three to four generations if livestock pressure on grazing and water resources did not keep household groups dispersed over the landscape. Droughts and epidemics of livestock diseases tend to maintain the land-animal balance over longer time periods; although some pastoralists settle out or become sedentarized over time, they do not usually join the urban-oriented exodus from rural areas as do more settled farming peoples.<sup>8</sup>

Land tenure in pastoral societies is usually collective, sometimes tribal in nature. Land rights are based on customary law, and there are often ambiguous quasi-legal arrangements with

nation-states in which pastoralists live. There is little or no private land-holding on inalienable grazing areas; the wider pastoral society organizes land-use and provides culturally defined access to its members for grazing and watering livestock, tilling land, hunting and gathering, habitations and travel. Today, pastoral lands are increasingly encroached upon by settled cultivators and sedentarizing nomads; economic development projects of governments, conservation efforts to protect soil and vegetation, and easements frequently turn the rangeland into private or government property. Central governments often attempt livestock production projects to increase meat and fiber offtake from pastoral areas in the form of saleable products from the herd. Governments may also wish to sedentarize nomads, create privately-held land values and conserve rangelands, while imposing taxation and administrative structures on pastoralist lands, livestock, dwellings and commerce.

Market demand pressures on pastoralists come mainly from urban areas of developing countries where cash economies and burgeoning post-independence populations raise the price for limited supplies of meat, wool and hides. Pastoralists usually sell mature animals on the hoof for transport to cities or for local slaughter. They also sell surplus milk production as well as wool, hair and hides. Graziers use manure for fertilizer, household needs (such as fuel and building material) as well as in exchange for animal feed and water rights. Meat is not usually

bought or sold, since a live beast is a form of capital; and animals are not often slaughtered except for ceremonial human consumption purposes.<sup>9</sup>

## 1.2 Nutrition Impact Questions for Livestock Development

Development issues in pastoral areas seem similar to development issues in general. Therefore nutritional considerations of rural development in agriculture may be an appropriate starting point. P. Pinstруп-Andersen of the International Food Policy Research Institute has developed a list of thirteen inter-related questions to be asked by project planners in designing programs.\* This list focuses on nutrition impacts as mediated by economic considerations and the trade-offs required between costs and intended benefits. With some modifications, the list may be applicable to livestock projects:<sup>10</sup>

1) What is the nutritional problem of the population and its strata? i.e., which members of the population (stratified by economic level) and which members of households are malnourished and why?

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\* The World Bank is preparing four projects in developing countries to utilize Pinstруп-Anderson's nutrition impact paradigm. None are livestock projects. The only suggested comparison is Operation Flood, a World Bank financed milk-production project in India among dairy farmers. An evaluation shows that this project, originally intended to increase the milk consumption of the rural population, has had the "unintended" effect of raising dairymen's incomes through marketing of milk production to urban consumers. It thus indirectly improved the food purchasing power of the producers. The original intent to raise nutrition levels by increased supplies of milk in rural areas was not achieved.<sup>11</sup>

- 2) How does the project affect the output of each individual food commodity available in the project area? What are the direct effects on output? What are the substitution effects? What are the effects of complementary measures?
- 3) What proportions of project output are expected to influence food availability in the project area? Is there a beneficial, negative or neutral effect on home consumption of subsistence foods, especially by malnourished segments of the population? Is there a significant impact on the market supply of these products?
- 4) Is the project expected to change the seasonal availability of food?
- 5) \* Are expected changes in market supplies likely to have an effect on the price of each commodity? How can this price change be quantified in terms of consumption by malnourished population groups?
- 6) \* Is the project likely to have a direct price effect on its principal product?
- 7) \* How are incomes and costs from the project expected to be allocated among the component members of the population, especially the malnourished groups?
- 8) \* What are the income and price elasticities for each of the principal food commodities for each population group involved?
- 9) \* What is the net effect of change in the supply and demand for food on commodity prices?

- 10) What is the net effect of change in income, price and home consumption on food eaten by the malnourished?
- 11) Does the project alter existing intra-household distribution of income budget control and food supply? If yes, how so?
- 12) Is the project expected to affect health, labor (work effort and skill) and time required in work, especially for malnourished groups?
- 13)\* Are there any obvious important second round nutrition effects to consider?

The utility of Pinstrup-Anderson's questions for determining the nutrition impacts of livestock projects tend to be limited to those which focus on the subsistence production and consumption aspects, and on the nutritionally at-risk members of pastoralist households. Many of the more quantitative economic questions are less relevant, due in part to the lack of an adequate data base and to the low levels of animal production derived from livestock projects thus far.

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\* Questions 5, 6, 7, 8, 9, 10 and 13 require economic analysis of local and national market phenomena based on quantitative micro-economics such as the dynamics of supply and demand trends for food commodities from herds. As we shall see in the case studies, AID livestock projects have not advanced to the stage where measureable reallocation of local resources, etc. have occurred in pastoral areas to produce these effects. Instruments to measure these effects are not part of project development and the monetary resources to do so seem absent.

Since this list of questions is illustrative rather than definitive and has not as yet been applied to real projects, AID should be particularly concerned with those of the questions (nos. 1, 2, 3, 4, 6, 11 and 12) which can be more easily addressed in the context of a pastoral-livestock development plan. The results of this paper are intended to shed light on some of these questions, mainly through intensive scrutiny of case studies of actual livestock projects.

## 2.0 PASTORALIST DIETARIES

Having looked at the food system and living circumstances of pastoral societies in general, we now closely examine the nutritional value of their diet and its relationship to livestock keeping.

### 2.1 The Nutristructure of Pastoral Diets.

The nutristructure of a human group is defined as a set of interlocked food resources, dietary behaviors, and social-economic organization in an environmental setting which together form an adaptive configuration. It is a society's basic food system which provides the nutrient intakes necessary to support the members of the group, alleviate hunger and control malnutrition. Partial or total disruption of the nutristructure through changes in agriculture or consumption can easily disrupt the balance of nutrient intake and exacerbate problems of malnutrition.<sup>1</sup>

A recent survey of the food staples of a large number of developing nations by the Food and Agriculture Organization<sup>2</sup> includes information on staple foods and preferred or avoided foods among pastoral groups within those countries. 23% of 111 developing nations surveyed contained significant numbers of pastoralists. These countries were located in the semi-arid to arid parts of Africa, the Near East and Asia. The majority

(17 of 26) were in Sub-Saharan Africa.\* A tabulation of the foods used as staples and those preferred by pastoralist groups demonstrates the underlying nutritive structure of their diets in contrast to that of settled farming populations.

The FAO food survey shows clearly that pastoralists are mainly subsistence users of foods they produce and gather. Some are heavily engaged in trade for food with adjacent sedentary societies, but many are relatively independent due to their pastoral production system. They depend heavily on cereal foods and milk products, and consume relatively little meat products.

#### 2.1.1 Milk

Milk consumption is an integral part of the diet. In addition to fresh or fermented milk, most pastoralists use butter and other milk by-products, such as cheeses, whey, etc. They also sell milk products surplus to home consumption. The size and composition of a pastoralist herd is related to the milk consumption demands of the herding household. Large ruminants are the major producers of milk in most pastoralist societies, but small ruminants may be critical to milk herds.

\* As we shall see in succeeding chapters most AID livestock development projects are found in these parts of Africa and the Near East. World Bank projects are located in similar regions. Four-fifths of the FAO-identified countries have received donor assistance in range and livestock development during the past two decades. The major goals of development have been to increase meat production and offtake and development of grazing areas plant cover (grass) resources.

### 2.1.2 Meat

Only 40% of pastoral groups in the FAO survey showed meat as a dietary preference; half of these had meat listed as a staple food. The most frequently consumed meat is that of small ruminants, especially goats, although the majority of pastoral societies surveyed raise large ruminant animals such as cattle or camels as well as sheep and goats. Many pastoralists also hunt wild game for meat consumption during certain seasons of the year. All but a very few groups maintain ritual or customary avoidance of pigs and pork products (domestic and wild). The majority (70%) are Islamic, for whom pork is forbidden as food and pigs are a loathed animal. In 60% of the groups there is a distaste expressed for fish as food.

### 2.1.3 Cereals

A breakdown of the cereals eaten as staples by pastoralists shows that coarse grains are used by most societies, ranked in the following order of frequency: millets (60%), sorghums (45%), maize and barley (35%). Wheat is the other cereal cited often (40%). In fact, most pastoral peoples consume two or more types of cereal foods which they grow by subsistence means and/or obtain in trade of animal products. Some pastoral societies bake bread from grains while others eat it in the form of a porridge or vapor-steamed dish.

#### 2.1.4 Other Plant Foods

Vegetables eaten are mainly in cooked dishes such as legumes and starchy tubers. Fresh fruits and vegetables are generally absent, but dried items such as dates, onions, and beans are obtained in trade for consumption. The FAO study also revealed that certain kinds of processed foods are acceptable dietary substitutes for primary staples among some pastoral groups.

These include vegetable oils in place of butter and animal fats; instead of whole grains, wheat and corn meals and fortified flours; dried milk powder is a temporary milk substitute when reconstituted with water for cooking purposes. Processed sugar has become a trade good widely appreciated by pastoral groups and often consumed with tea or other sweetened beverages.<sup>2</sup>

Although consumption patterns vary, it is possible to provide acceptable nutritionally adequate dietary substitutes for indigenous foods during hunger months (or in the course of development projects that may temporarily reduce local food supplies).

## 2.2 The Nutritional Rationale for Pastoralist Diets:

### Energy Nutrition.

There is a scientifically based nutritional rationale underlying characteristic pastoralist dietary patterns. For a given weight of edible food, different products provide very distinct caloric values. Thus, fats and oils provide a little more than twice the energy of equal weights of carbohydrates or

proteins (the ratio is 9:4:4). However, the moisture content of foods is usually higher than their fat content. Milk contains approximately 85-90% water; meats range from 60-70% in water content; the moisture in cereals (at approximately 10%) is the lowest. Cereals are by far the highest in carbohydrate content (75%), but are usually lowest in fat content. The energy value of 100 grams of cereal food varies between 330 and 360 Kilocalories.\* Meats which are highest in fat content, 17-20%, provide 165-267 Kilocalories per 100 grams depending on fatness, moisture content and indigestible fiber. Milks vary in energy from 63-100 Kilocalories per 100 grams due to varying fat content of different ruminant species and the condition of the lactating animal.<sup>4</sup>

In short, cereals provide the most energy, followed by meats, with milks offering the least amount of food energy per unit weight. If equal weights of these foods were consumed the energy contribution ratio of cereal:meat:milk would be approximately 4:3:1. However, as shown in Table I, meats usually provide less than 3% of pastoralist dietary energy due to the small quantities consumed. Since other carbohydrate plant foods provide energy levels similar to cereals, the ratio between cereal and milk Kilocalories per unit weight is approximately 4:1.

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\* A kilocalorie is a unit of heat energy able to raise the temperature of a litre of water 1 degree Centigrade. The daily adult requirement for populations such as pastoralists is between 2200 and 3000 kilocalories on average. Thus 1 Kilogram of cereal food provides more than the daily adult energy requirements recommended by FAO.<sup>3</sup>

Table I Averaged Food Energy Sources of Typical Nomadic and Agro-Pastoralists.\* N=6

<u>FOODS</u>	<u>Percent Energy in the Diet</u>	<u>Herding Exploitation Systems</u>
	Nomadic Pastoralists (80% + herding activity)	Agro-Pastoralists (40-60% herding activity)
	<u>Dietary Energy Sources</u>	
MILK	53.0%	26.0%
MEAT	2.5%	1.0%
GRAIN	37.5%	62.0%
DATES	<u>7.0%</u>	<u>11.0%</u>
	100.0%	100.0%

b.

<u>Herding System</u>	<u>Ratio of Energy in Diet</u>			
	<u>MILK</u>	<u>MEAT</u>	<u>GRAIN</u>	<u>DATES</u>
Pastoral Nomads	2	2	1	1
	..	..	..	..
Agro-Pastoralists	1	1	2	2

\* Swift<sup>5</sup> has calculated the food energy contribution to pastoralist diets by various staple foods. Based on several examples from the West African literature, herding peoples were divided into those (the more nomadic) which engaged primarily in extensive livestock raising, and those which combined cultivation of cereals with semi-nomadic herding (the agro-pastoralists). Table I illustrates the percentages and ratios of food energy contributed by primary foods for these two types of pastoralists.

As shown in Table I, the diet of a nomadic pastoralist may contain more than 50% of energy intake in the form of milk from the herd. This means that the relative quantities of foods consumed can easily exceed four parts milk to one part cereal or other plant food. By contrast, an agro-pastoralist diet derives approximately 25% of food energy from milk and 75% from cereals and dried plant foods. In this case the ratio of the two food-stuffs is one part milk to one part cereal. Considering the relative scarcity of milk compared to cereal food, the diet containing less milk is easier to maintain with a smaller herd of livestock.\*

In pastoral society the terms of trade for milk and cereal grains are approximately equal, with variations by season and supply/demand conditions. Thus it is advantageous for pastoralists to consume cereal foods for energy needs, and supplement with milk food rather than depend too heavily on milk as a source of energy.

\* Were an adult diet among nomadic pastoralists to contain only milk and cereal with 50% of food energy derived from milk, an adult daily intake would consist of approximately 1600 grams of milk and 400 grams of cereal (2600 Kilocalories total).

For an adult diet containing 25% food energy from milk, 75% from cereal, the diet would contain 600 grams of milk and 600 grams of cereal.

### 2.3 Nutritional Rationale for Pastoralist Diets:

#### Quantitative Protein Nutrition

Where energy intake is adequate overall, either of the food staple ratios reviewed in Table I (and variations in between) are sufficient to furnish a dietary balance for total proteins, macro-minerals and some major vitamins. The total protein content of various cereals and milks differs significantly. Cereal foods range from a low of 7.4% to 14.8% protein (lowest in some millets and highest in wheat); total protein in ruminant milks ranges from a low of 2% in camel milk to a high of 6% in sheep milk; cow milk averages about 4%. Meats have the highest quantity of protein, between 17 and 20%.<sup>6</sup>

Since most pastoralists consume only small and infrequent amounts of meat, its average contribution to total protein intake is much reduced.\* Among agro-pastoralists, the contribution of cereal food to total protein intake is greatest, i.e. three-fourths of the protein is supplied in this way (a ratio of 3:1 with milk protein). However, among nomadic pastoralists where milk supplies up to 50% or more of dietary energy, cereals still provide over half the total proteins (a ratio of 5:4 with proteins from milk).

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\* The contribution of meat, offals (and blood in a few pastoralist groups) should not go unnoted in terms of beneficial nutrient content of this food. Meats contain iron and fat-soluble vitamins A and D (especially in organ meats such as the liver) as well as B-complex vitamins. Fresh meat also contains Vitamin C.

### 2.3.1 Cereal Nutrients

In short, regardless of the type of pastoralism practiced (and the associated dietary staple pattern) cereals remain the most important providers of total protein. The contribution of plant foods to protein nutrition is decreased when starchy tubers, sugars or other carbohydrate foods very low in protein are substituted for cereals in the diet of some agro-pastoralists. Cereals also offer much of the dietary fiber, as there is no fiber in milk. Cereals are high in phosphorus and macro-minerals including iron, which is practically absent in milk. Cereals are rich in B-complex vitamins, but contain little fat-soluble vitamins or Vitamin C.

### 2.3.2 Nutrients in Milk

On the basis of nutrient content alone ruminant milks do not provide a balanced diet for human consumption, especially for adults and growing children. Cow's milk is low in energy (65 Kilocalories per 100 grams). It contains only 3.3% protein (but this protein is of good quality), 3.4% fat (of which two-thirds of the fatty acids are saturated) and 15 milligrams/100 grams of cholesterol (contributing to increased risk of arteriovascular degeneration). Milk is rich in calcium at 120 milligrams/100 grams but is relatively low in magnesium and zinc; milk has no fiber and is very low in iron and copper content, while rather

high in sodium. This results in some mineral deficiencies unless supplemented. In terms of vitamin levels, milk is adequate for Vitamin A, but low in Vitamins D, E and K, low for thiamine, niacin, and folic acid and has traces of Vitamin C. Milks of various ruminants vary somewhat from this pattern; nutrient levels alter with change of season and state of lactation, especially protein, fat and vitamin levels, but are generally similar when compared to human or other non-ruminant milks. Only for infants is milk considered a good approximation to adequate nutrition, since babies have some stored vitamins and minerals in their bodies at birth which make up for the deficiencies in milk.<sup>7</sup>

#### 2.4 Complementary Protein Nutriture in the Pastoralist Diet

Proteins are the structural components in muscle tissue cells and various organs of the body. All proteins are composed of building blocks of molecules called amino acids which have a nitrogen atom, unlike non-nitrogenous fats and carbohydrates. Specific arrays of amino acid chains characterize the proteins of each species of plant and animal. Proteins of animal origin are more similar to human proteins in the amino acid array than those of most plant proteins. The human body cannot synthesize all the amino acids it needs to construct body proteins, and hence must obtain about 11 specific amino acids, termed essential Amino acids, in the diet. Those foods which contain the right combinations of amino acids to suit human nutritional needs are called

high quality protein foods, i.e. high biological value proteins. Mixtures of foods containing various proportions of essential amino acids can provide the qualitative balance needed for building human body proteins for growth, maintenance and reproduction, and resistance to disease or injury through response of the immunologic and tissue repair systems of the body.

As stated in the FAO publication, 'Kwashiorkor in Africa'<sup>8</sup>

Of all natural foods, milk is probably regarded as being of the most outstanding nutritive value. It is not only a good source of protein of excellent quality....[but its] incorporation in cereal diets is highly desirable as [milk] is rich in essential amino acids, lysine, tryptophan and methionine.

These amino acids are among the essential amino acids without which protein utilization is limited; hence when one of them is lacking in the diet it is called the limiting essential amino acid. A method for comparison of the proteins in foods that uses the most limiting essential amino acid as its criterion is the 'Chemical Score' indicator; whole egg protein is the reference standard valued at 100, i.e. a nearly perfect protein for human nutritional needs. Various ruminant milks score well at between 69 and 71 by this method, while the Chemical Scores of various cereals vary widely from 31 to 53 due to their low content of limiting essential amino acids. On the other hand, the limiting amino acids in milk foods are the sulfur-containing ones, found abundantly in most cereals. In sum, cereals and milk mix well in terms of qualitative protein nutriture and are considered complementary to one another.<sup>9</sup>

There is good evidence from experimental studies that foods which have complementary amino acids are synergistic in their Chemical Scores, together providing a much higher capacity for synthesis of body proteins than either food protein alone. Complementary protein foods must be consumed at nearly the same time and in proper proportions to raise their combined score closer to that of the reference whole egg protein. It is significant to note that among pastoralists cereals are typically consumed in combination with milk products in adequate proportions to achieve this complementary effect and provide for qualitative protein nutriture. In short, the lower protein score of starchy cereal total protein is enhanced considerably by ingestion of relatively smaller quantities of milk protein. For pastoralists this means that regular milk consumption mixed with cereal is critical to maintenance of health and prevention of malnutrition conditions such as Kwashiorkor. In fact, the forms of Protein-Energy Malnutrition found among settled peoples such as Kwashiorkor are rare among those milk-drinking pastoralists whose diets contain ample milk as well as cereal and other plant foods.<sup>10</sup>

#### 2.4.1 Protein Planning and Pastoralists

Planners are unaware of the differences between protein nutriture quantitatively and qualitatively concerning ruminant milks. A misleading "high" protein point of view has tended to

dominate discussions of the role of milk (and meat) in the nutrition of pastoralists.<sup>11</sup> Given the facts that relatively little meat is consumed by pastoral household groups, there is a tendency to over-rate milk as the main staple food without considering plant foods, especially cereals. Only in extremely extensive nomadic pastoral systems with very large herds does milk play a primary part in caloric and total protein intake; even among nomads this has a highly seasonal character that varies with lactation rates of dams. In the agro-pastoral groups milk is consumed regularly but in lesser quantities, yet remains essential to the diet.

For example, authors Dahl and Hjort in a recent treatise on pastoral nomads, Having Herds,<sup>12</sup> assume a mainly milk diet for the human groups. They proceed to calculate the purely quantitative nutrient intakes of proteins and calories needed to sustain life. They maintain that milk is a "high protein" food, not taking into account the fact that ruminant milks score well in protein quality but are low in total protein vis-a-vis cereals or meats. They state:

After fulfilling the basic protein demand (with milk) the remaining calories can be equally provided from other sources, such as carbohydrates. Thus if the herd can provide a sufficient supply of milk in terms of protein and the majority of calorie demands, exchanging grain or meal for meat does not imply a poorer diet.

However, as we have seen, cereal foods usually fulfill most of the energy and total protein demand; milk performs a complementary function of raising protein quality of the diet and a

supplementary role in the provision of calories and other nutrients (macro-minerals and vitamins) in most pastoral societies. Development planners should take note of this complex of nutritional factors in designing livestock/pastoral projects.

## 2.5 Disease-Resistance Factors in Pastoralist Milk-Drinking

Ruminant milk is utilized by the human body in a variety of subtle ways conducive to improved human health and growth. Some of these functions have been discovered only recently in relation to the immunological and disease-prevention value of milk in the diet. In a paper recently prepared for publication, Murray and Murray find that,<sup>13</sup>

Unusual resistance to disease has been noted among some African tribal societies that consume milk of cows, goats, sheep or camels as a major source of food ... Milk contains a complex array of defense mechanisms which have evolved favoring survival of the species by protecting the suckling offspring against infection ... Living intimately with their environment, being exposed to the same diseases as their animals, and consuming animal milk for thousands of years as nomads have done, may have permitted them to adapt favorably to and take advantage of the biological defense mechanisms of their animal milk.

The authors go on to suggest that milk-using pastoralists seem to be better protected against prevalent infectious diseases, some degenerative conditions and malignancies than non-dairying peoples. Colostrum in human and animal milk provides passive immunological protection against infectious diseases to infants until their own immune systems mature. Other characteristics of milk foods also seem to be protective: 1) Malaria vectors are

common in pastoral area. Malarial parasites require high levels of iron and PABA (paramino benzoic acid) in the bloodstream in order to reproduce activity. Malaria is suppressed when a diet high in milk and relatively low in iron-containing foods such as meat and blood and some cereals or vegetables is eaten. 2) A variety of viral infections and intestinal parasites are rare among milk-consuming pastoralists, but appear in epidemic proportions when, as during starvation periods due to drought, relief foods high in iron and PABA replace the milk diet completely. In this regard perhaps it is significant that few pastoralist societies consume ruminant blood although it is rich in iron and many nutrients, but all of these societies use milk from their herds.

As noted above, ruminant milks are high in saturated fat, sodium and cholesterol, yet there is evidence that pastoral populations do not suffer from degenerative heart disease or hypertension; gall stones are rare and there is little diverticulosis among nomads. Cancers are unusual in members of pastoral societies of developing countries, especially liver cancer which is frequent among more sedentary groups. Liver cancer is caused by a carcinogenic fungus, aflatoxin, found in poorly-stored grain and legumes, the principal dietary staples of farming peoples. Nomadic herds graze on natural forages that are not contaminated with aflatoxin, hence their milks are free of this toxic substance; and grain foods of pastoralists are not usually stored

for long periods of time. In short, the pastoralist diet has a characteristic set of advantages associated with regular milk consumption in the prevention of endemic diseases.<sup>14</sup>

## 2.6 Pastoralist Adaption to Ruminant Milks

There is also an apparent genetic adaption of pastoralists to the consumption of fresh milk from the herds. Milk contains a carbohydrate, lactose sugar, in small quantities (5%) which requires the presence of the enzyme lactase in the gastro-intestinal tract for proper digestion. Lactase is present in all mammalian infants including humans, but disappears with development after the age of weaning and is widely deficient in sedentary adult population. A human geography of the distribution of primary lactase-deficiency shows that only milk-drinking pastoral populations and their direct descendants retain the capacity to secrete lactase as adults, a genetic adaption that appears to have taken place over thousands of generations. By contrast, lactose-intolerant (lactase-deficient) youth and adults suffer gas pains and diarrhea from consuming doses of milk in quantities less than that regularly eaten by pastoralists; many such individuals learn to avoid milk in their diet as a result. Therefore, development policies oriented toward pastoralists should take into account their special adaptation to milk-drinking which enables them to consume beneficial quantities of milk throughout life.<sup>15</sup>

As noted earlier there is evidence of lower fertility rates among pastoralists compared to sedentary populations. In non-herding societies of developing countries, young child malnutrition is exacerbated by early weaning and provision of a high carbohydrate low quality protein diet, lacking the advantage of ruminant milks. Milk consumption in pastoralist society is usually arranged to favor vulnerable segments of the population such as pregnant and lactating women and their post-weanling children, providing a variety of nutritional and health benefits. Improved and long lactation periods permit infants to breastfeed for up to three years or more in pastoralist societies. This, and the recently discovered hormonal interaction between lactation and suppression of ovulation in breastfeeding women, suggests that the wider birth intervals found in pastoral societies permit better adaption to adult diets once weaning occurs.<sup>16</sup> Development planners are taking increasing interest in population control implications of projects. Reduced fertility rates tend to prevent rapid population growth in pastoral society, thus decreasing population pressures on food resources from the herd; in short, milks help maintain a balance in the man-land relationship.<sup>17</sup>

However, it is clear that biologically contaminated milk products from the herds often cause diseases among nomads, and transmit zoonoses from the livestock to their human keepers. The most vulnerable members of pastoral populations are weanling

infants and young children exposed to these infections and intoxications, as well as pregnant women and breast-feeding mothers. Weanling mortality and child morbidity is high among pastoralists who generally have few means of preventive health care available from their governments. After this period, chances of survival improve and rates of malnutrition and disease are reduced as long as the herding families consume regular quantities of milk along with other staple dietary foods.<sup>18</sup>

## 2.7 Pastoralist Nutristructure: Conclusions

Ruminant milk and cereal foods provide the major nutrient resources among most pastoralist groups. Cereals and milk fit into the pastoralist dietary like pieces that nearly complete a human nutritional jigsaw puzzle. Milks are the primary herd product used directly by pastoralists for food. Meat and offals are eaten but less frequently and irregularly. Herd animal blood is consumed by only a fraction of the herding peoples, since it is taboo in many societies. Other meat animals such as pigs are also forbidden to Muslim pastoralists who form the majority of the herding societies in developing countries. Since pastoralists do not consume many fresh vegetables, poultry, fish or other protective foods, they must maintain a careful balance in their consumption of milk and grain supplemented by wild plants, animals, and trade foods at times.

Some substitution of traditional pastoral food resources is possible and acceptable, especially for fats and oils, cereal products, and (temporarily) powdered milk in place of fresh milk. However, planning of livestock development projects that emphasize meat production and reductions in herd size should take into account the multi-purpose uses made of livestock products by herding groups. For example, herd byproducts such as manure and urine are used as fertilizer to increase the yields of cereal grain crops on the meager soils of marginal pastoral lands. In some societies, draught animals from the herds are used in tillage and as beasts of burden to transport food supplies. Development projects that deny pastoralists access to these livestock products adversely impact on their nutritional well-being. The overall synergistic value of these livestock resources may be diminished by programs that aim single-mindedly to increase meat offtake from herds, to destock ranges, or to limit the variety of ruminant species on the land mainly for soil conservation. These linkages show that there are good reasons for evaluating development policies and range improvement practices from the nutrition impact perspective in planning and implementing livestock projects.

### 3.0 LIVESTOCK AND RANGE DEVELOPMENT: IMPACTS ON PASTORALIST NUTRISTRUCTURE

The literature on pastoralist economics make clear that livestock constitute a multi-faceted resource which provides both offtake and renewable resource investment for herding peoples. This contrasts with the Western view that rangeland is the basic resource, and meat a cash-crop to be reaped through linear input-output management of livestock on a sustained-yield basis through exploitation of soil and vegetation. Typically, pastoralists raise livestock on lands that are inefficient and marginal producers of domesticated plant crops due to their relative aridity, meager soils and difficult access. Milk, fibers, and meat produced in this way, as well as other herding byproducts such as manure, do not compete with more productive uses on these kinds of lands. Pastoralism has, in fact, evolved as the best available technology for the extensive low-energy utilization of marginal land-areas.

Contary to the belief that pastoral nomads were predecessors of sedentary farmers in pre-history, the archeological record indicates that the domestication of livestock, especially ruminant herding animals, followed the domestication of the major cereal crops. Thus pastoral nomadism emerged as an offshoot of settled agriculture on lands previously given over to hunting of wild ungulates and unsuitable or unavailable for cultivation.<sup>1</sup>

As suggested earlier there are several positive feedback effects on the nutrition of pastoralists associated with raising livestock. As stated by Quimby,<sup>2</sup>

The way that pastoral people have of storing food is in the form of live animals....Where consumption of dairy products for human use is given priority, larger herds with a higher proportion of milking animals are needed."

Also needed are mixed herds with various species of animals producing adequate supplies of milk across the seasons. Young ruminants compete with humans for consumption of the milk. This has led to the separation of the milk herd by livestock raisers in order to provide a regular supply for human use as well as to raise young animals. In livestock development aimed at meat production, the growth of young animals is given priority, and human consumption of milk reduced or eliminated. Sale or slaughter of animals for meat is seen as a form of disinvestment by pastoralists; in contrast livestock developers wish to increase offtake and/or destock rangelands. The by-products of herds such as manure and urine are also lost to use as fertilizer or fuel when livestock are kept on controlled grazing areas away from areas of human cultivation and habitation.

### 3.1 Nutritional Effects of Range Development Interventions

No matter what social strategies and economic exploitations of livestock are followed, the human nutristructure remains delicately balanced upon utilization of herds for

subsistence and for exchange of herd products for other kinds of food or income. Any new innovation, such as a livestock development project, will impact upon existing nutritional resources, tending to reduce their subsistence use when products of the herd are diverted to other purposes or land is taken out of grazing for conservation or improvement.

Accentuating meat production for offtake can mean a trade-off reduction of milk supply for pastoralists. This may cripple the dietary pattern of a herding population, unintentionally lowering the nutritional intake of the so-called 'beneficiary' population. Since such changes do not occur in a vacuum, it is important to point out the economic, social, ecological, political and policy issues related to nutrition impacts as shown in various analyses of the problem of livestock/range management development efforts.

AID anthropologist Allen Hoben has written on the 'Lessons Learned' from livestock projects in Africa as follows:<sup>3</sup>

- a) the attempt of livestock/range projects to limit stocking levels to avoid overgrazing and not exceed the carrying capacity of rangelands has generally been unsuccessful; it can deplete food resources temporarily.
- b) the range management objective of restricting herd movements to specific locations has tended to deprive herding communities of access to their land-base. In some cases fencing for range or ranch development has triggered a transformation of land tenure from collective to individual, overriding indigenous customary law and introducing cultivation in place of grazing.

- c) the forced sedentarization of pastoralists has often caused them great hardship, created degraded human living conditions and produced hunger and malnutrition effects associated with impoverishment.
- d) livestock projects tend to focus on one breed of species of livestock, usually cattle in Sub-Saharan Africa, to the exclusion of sheep or goats. The output product has invariably been meat for sale, rather than dairy products, hides or fibers.

In the Near East sheep for meat have been the cash crop product; camels, goats and mixed herds used for food security by pastoralists have been ignored by mono-husbandry projects, reducing both subsistence food supplies and trade in herd animal renewable products such as wool, hides, etc.

### 3.2 Grazier Survival Strategies: Direct and Interactive Effects of Livestock Projects.

The impact of subsistence food production for home consumption is critical. With herds kept relatively large as insurance against losses and for provision of food and other products to support the household group year-round, pastoralists engage in a number of diversification strategies which development projects may undermine.

- 1) Livestock holdings are spread out across a number of graziers by a complex of customary gift-giving, marriage exchanges, inheritance of animals and ritual and social network

obligations.\* The survival function of this dispersion of livestock resources is to prevent an overwhelming impact due to loss of a single herd in a specific micro-environment from drought, epizootic disease or some other calamity. Livestock exchange and dispersion of holdings across wide areas is a social form of livestock insurance among pastoralists. In time of need, a herder can 'call in' animals from his associates to reconstitute his own herd. Development projects attempt to restrict the herds to specific 'rightful' owners; this prevents subsidiary holders of a variety of usufructory and interactional obligations from spreading their claims to beasts across a number of herds. In effect it narrows the range of their portfolio of livestock and increases food insecurity and risk over time.

\* A factor pointed out by anthropologists is the cultural attachment to specific breeds or species of livestock, such as the 'Cattle-Complex' in some African pastoralist societies, camel-complex among desert nomads and preference for sheep among Near Eastern Islamic pastoralists. These beasts and their progeny become part of the social reciprocity system of prestations, sacrifice and inter-personal and group debt relations. Their presence creates a marker of socio-economic hierarchies of esteem, privilege and power by which influential men control the loyalty and labor of others in traditional tribal political systems. These issues of sentimental and ideological identification of humans with ruminants are beyond the scope of this paper except as they may impinge on the willingness of pastoralists to market their livestock, or to raise one species on the range in place of another.<sup>4</sup>

2) Pastoralists mix species of animals in the same herd, and often own a combination of large ruminants and small ruminants, in ratios depending on the ecology of the region. As pointed out by Konczacki,<sup>5</sup>

Dietary needs differ between various species of animals. At one extreme, cattle subsist mainly on grasses and require frequent watering. At the other extreme, camels need to browse and seldom graze; (they are) watered at less frequent intervals. Sheep and goats live on both grass and leafage of trees and bushes...and require frequent watering. The factors are responsible for the way herds are split into groups according to the type of animal.

Development aimed at mono-husbandry of a single cash-crop species such as cattle, or sheep, denies pastoralists the advantages of mixed species herds and limits the human consumption opportunities. In fact, livestock projects concentrate mainly on the monoculture of a specific breed of animal. The consequences can be of immediate adverse impact on the herding household dietary intake.

a) Goats, the major source of small ruminant meat for pastoralists in many societies, also produce impressive quantities of milk. However, goats are usually ignored or eliminated from livestock development projects. In some parts of Africa goat eradication campaigns by governments have been launched on the theory that this particular animal species maurouds forests, contributing to ecological destruction and desertification. However,

goats are a hardy and rustic type of ruminant, capable of surviving on vegetation that cows and sheep would starve on. Goats also drop their young in off-seasons, thus fill the "milk gap" when other ruminants such as cows have gone dry. Particularly important from the nutrition and health perspective, is the use of goat-skins as bladders for transportation and storage of human drinking water on pastoral drylands. Goathair is also used in weaving nomadic tents. Therefore, any livestock development project amongst pastoralists who traditionally raise goats should include this species in food production as part of the plan to maintain or raise levels of milk consumption and health of the pastoralist beneficiaries.<sup>6</sup>

- b) As noted earlier, sheep have a different grazing/browsing pattern than cattle or goats. Sheep exploit a different micro-level of plants on the same land surface, increasing the ruminant production capacity of the plant cover. Sheep also eat leafy forages cut by herders in seasons when grasses and forbs are inadequate. Contrary to the general impression of development planners, sheep are also milked for human consumption. Sheep milk is lower in quantity than cow or goat milk, but is much higher in

fat and protein content; hence it is an important nutritional resource especially in pastoral societies where sheep predominate. Wool sheep produce a valued annual shearing used for a variety of purposes in the form of clothing and bedding; sheepskins with wool are used as floor covers also. Wool is sold for cash raw, or in the form of labor-intensive woven rugs, blankets and clothing that provides additional cash income for pastoralist women. Among some pastoralist groups this income is used to obtain improved food for children, as well as other health-related goods and services; it serves as a form of savings which can be transformed into cash when needed. Sheep production livestock projects often understate the uses of milk and wool by pastoralists. Although mutton is eaten only rarely by herders, its importance as a ritual food is especially significant in Islamic societies, creating special demands on pastoralists that may run counter to seasonal lamb offtake production systems devised by project planners.

- c) Cattle and camels may be left out of livestock projects which concentrate on sheep meat production, even though the larger ruminants provide both milk and serve as draught animals and sources of manure in pastoralist society. Similarly, equids used as draught animals may

be neglected thus reducing the plowing and crop production capacity of the population. However, the more important aspect of cattle-oriented livestock projects that affect human diets is the de-emphasis on milk production for human consumption through insistence on the exclusive suckling of young beef calves to promote maximum growth. Attention to development and maintenance of dairy herds among pastoralists is a major nutrition factor; it requires careful planning and adaptation, as the dairy animals must be kept near human dwellings for milking - a task usually performed by women in pastoral societies.

3) Elimination of herd mobility across the rangelands. Livestock projects are often associated with government attempts to sedentarize pastoralists. Even if not explicitly part of a range management plan, limitations on herd movements due to the introduction of controlled grazing areas and suppression of transhumance and nomadic treks obliges pastoralists to remain in a single location for all seasons of the year. This in itself brings on sedentarization without the needed infrastructure such as adequate housing, water supply environmental sanitation or health and education services. Due to concentrated recycling of human and animal wastes, the disease burden of a recently

settled population of pastoralists increases exponentially compared to that of a mobile group that can leave its human and livestock pollution behind when it moves to a fallow site. Sedentarized nomads have increased intestinal parasite loads, which consume ingested nutrients: vector-borne and filth-spread infectious diseases increase in incidence among sedentarized pastoralists due to the 'closing circle' impacts of reduced mobility of man and beast. <sup>8</sup>

Basic pastoralist food supplies are threatened by permanent settlement. The limitations on seasonal movement prevents pastoralists from foraging for wild plants and animals across broad spaces and over time. During periods of food scarcity from herds and crops edible wild foods near settled areas are rapidly exhausted. During dry months various fruits, seeds, roots and leaves become unavailable, depleting the supplementary gathering resource upon which pastoralist societies often depend. Hunting of animals may be similarly depleted. Hunting of various land animals and birds tends to control incursions of predators on domesticated animals and crops and reduce the population of pest species. However, livestock projects may ban burning of grasses by pastoralists, making hunting more difficult and encouraging predator or pest wildlife to prey on livestock and crops. This diminishes food resources for humans in more than one way.

One of the major effects of longer-range limitation on herd mobility is to expose livestock herds to decimation during drought periods. Ability to move animals to different micro-environments in response to patchy rainfall and seasonal variations in forage and water availability is a key element in the pastoral adaptation of extensive herd management. The herder is the decision-maker, able to interpret the needs of his herd based on his knowledge of a variety of environmental niches. Restriction to one controlled grazing niche managed by project planners rather than the herding population may work well for a period of time or respond to easily controlled environmental, climatic and breed inputs. However, in the capricious conditions of range areas in developing countries there are too many variables to be able to control all of them simultaneously. Sudden changes, such as epidemics of infectious livestock disease, can decimate herds which are not mobile or immunized.<sup>9</sup> Similarly floods, snowstorms (in mountainous areas) or drought may call for quick reaction by herders to move their livestock away from danger zones and into more favorable range conditions.<sup>10</sup>

Therefore, attempts to fence-off areas of rangeland to promote deferred grazing or to restrict entry to limited numbers and types of livestock can be self-defeating, leading to major losses of herd numbers and structure, with the herders

reduced to a posture of helplessness. Controlled ranges limit pastoralist households access to their beasts and thus create human deprivation in food supply.

Similarly, attempts to destock rangelands in order to adjust animal numbers to the theoretical carrying capacity of the land or to cull diseased and aging stock, place management of the herds beyond the reach of the pastoralists. These types of projects have been strongly resisted in many pastoral societies, yet remain at issue in current project planning. The Western planner's notion of replacing 'quantity' of livestock with 'quality' stock for meat production and range conservation does not jibe well with the rational, well-adapted multi-faceted exploitation of herds and frequently causes outright resistance to livestock development efforts by the intended beneficiaries.

4) Project impacts on Herd Products Used for Exchange with Non-Pastoralists.

Many pastoralist groups depend upon access to river, lake and underground water resources during the dry season on lands occupied by settled farming peoples. Livestock manure is often bartered for access to water and crop residues on cultivated lands; pastoralists also gain access to human living space, village water, and other resources during dry seasons when their herds are moved into settled communities. They may barter or sell milk in exchange for grain foods. Typically,

milk and grains are exchanged on a weight for weight basis, providing the additional caloric and other nutrients pastoralists need.

Household income earned by pastoralist women usually derives from the sale of milk and milk products and small ruminants from the herd, as well as wool products among sheep raisers. If livestock development projects reduce the milk supply, this may eliminate the saleable surplus; prevention of transhumance to settled areas may make sale of milk to non-pastoralists impractical. This also tends to lower the status of women in pastoral groups as it endangers their economic activity.

In sheepraising societies where wool is the major cash crop exploited by pastoralist women, any project-related reduction in wool due to limitations on flock size or change in fleeces may have an adverse effect on the role of women and their earning power. This can impact on maternal and young child diets, since the income earned by pastoralist women from milk, wool or other sales is often used to improve the distribution of intra-household resources, including food, in favor of these nutritionally at-risk members. In pastoralist societies where divorce or widowhood is common, women may act as household heads and depend upon herd resources to provide for their children and their own food supply and well-being. Thus,

the social conditions of marriage and household organization must be considered in the implementation of livestock projects. Too often, only male livestock raisers are considered as the beneficiaries through raising offtake and income from the sale of meat; however, a variety of livestock products may benefit other household members as well.

#### 4.0 BRIEF HISTORY OF LIVESTOCK DEVELOPMENT AND RANGE MANAGEMENT SCHEMES; AID PROJECT MODELS

Using published and internal documents and interviews with key officials at AID and other donor and technical assistance agencies, we can trace the phases of AID livestock development from the 1960's to the present-day in relation to nutrition-based effects on pastoral peoples.

##### 4.1 The 1960's Period, Project Types

Development of livestock production had little if any overt nutritional purpose in U.S. foreign assistance through the 1960's. The growth of the P.L. 480 Program as a means of disposing of large quantities of U.S. farm surplus foods (began in 1954) was a more direct way to provide developing countries with livestock products such as dried milk for protein and mineral needs; also, cereals and vegetable oils were the main sources of caloric-based foreign food assistance during this period. By the end of the decade, as supplies of U.S. milk powder became expensive, soya-based formulated cereal foods were used to replace dried milk as a high biological value protein and caloric source for nutrition intervention programs in developing countries. However, the use of milk products from pastoral herds within developing countries was not a priority for development during this period.<sup>1</sup>

On the other hand, beef and mutton production in developing countries was encouraged. Initially, interest focussed on improving livestock health through veterinary technology and breeding of animals to raise meat-production capacity through importation of temperate-climate or exotic males and through artificial insemination. The main emphasis was initially on cattle production. The first wave of cattle ranching schemes was introduced during the 1960's in Africa, and the Near East and Latin America (even though the latter had no pastoralist tradition). In Asia there were no livestock projects in pastoral areas; but breeding of water buffalo for improved production was encouraged.

Action programs in the 1960's were typically carried out in controlled or experimental grazing areas, where production effects of improved veterinary services, breeding and ranching schemes could be proven through centralized culling of herds, destocking to suit carrying capacity of lands, and regulated forms of grazing. These projects were carried out in areas from which pastoralists were removed or non-existent, hence the human nutrition impacts on herding populations received no attention.

Previously, colonial governments had attempted to destock and conserve portions of tribal grazing areas in Africa and the Near East, as well as to dig borehole wells and improve

the quality of livestock through control of disease and by cross-breeding. They also had attempted (unsuccessfully) to sedentarize some nomadic populations. Thus in the initial years after independence, mainly during the 1960's, newly emergent host governments in developing nations of Africa and the Near East showed little interest in culling pastoralist herds or limiting their rangeland nomadism, due in part to lively opposition to these practices by pastoralist groups. Instead, governments allowed the establishment of a few Western-style ranches but focused on disease control and animal health improvement programs. They encouraged research into animal breeding and soil science and vegetation studies of the rangelands. The decade of the 1960's was, incidentally, a period of good rainfall in most of the semi-arid and arid zones of Africa and the Near East. Animal numbers and off-take rose, but the demand for meat from the expanding urban areas of new nations exceeded the pastoralist-based supply projections.<sup>2</sup>

By the end of the 1960's research on soils and vegetation in pastoral zones suggested that the meat production potential of these areas was underdeveloped, and that off-takes could be improved through introduction of range management technologies. Meanwhile, independent governments had begun to consolidate their authority and strengthen administrative control over tribal areas and more remote geographic zones inhabited by pastoralists. Governments and donor agencies recognized range

areas as lagging in economic growth potential for supply of meat and hides to rapidly growing cities and for export. Policies toward pastoral areas changed dramatically as the 1960's period ended.

#### 4.2 Livestock Grazing Schemes: Late 1960's and early 1970's.

In most new nations with significant numbers of pastoral peoples, the exploitation of pastoral lands for meat production was incorporated into development policies of the agriculture sector. A variety of Western United States models of production technology were applied to pastoralist areas. Simultaneously, developing country governments initiated programs to sedentarize their nomadic populations in villages or resettlement areas. Often enough, technological and social policies were intertwined in this phase of Livestock Production/Range Management schemes.

Technically the projects were of four primary types:<sup>3</sup>

- 1) Controlled Access Natural Ranges: regeneration of natural vegetation.
- 2) Rotational Grazing on Fenced or Demarcated Pastures
- 3) Replanting and deferred Grazing of denuded range areas.
- 4) Ranching schemes which included provision of fenced grazing water wells and livestock forages, veterinary services, breeding, etc.

In some areas the development of livestock marketing systems was also introduced to encourage the commercialization of meat animals. Various combinations of the above technical approaches were also attempted.

The most elaborate of these livestock schemes is the systematic zonal approach to meat production based on the Western concept of technologically advanced horizontal "stratification". As described by Ferguson,<sup>4</sup> this strategy was regional or national in scope. It consisted of,

- a) Stratification of the process of meat production into separate layers or states - breeding, cow/calf herds, growing out, fattening, processing - with each stage located geographically to take advantage of the comparative advantage of each eco-climatic zone.
- b) Stratification of land use and management systems or patterns - extensive grazing, intensive crop production, intensive fodder/pasture production, intensive crop production, mixed farming, conservation and forestry-sited and planned to make the best use of all scarce resources (except the most limiting resource- the human pastoralists) and the land use potential of specific site locations.

As described earlier, livestock production programs based on sustained yield of young animals from the rangelands runs roughshod over the multipurpose uses of livestock and land by pastoralists and may easily endanger their nutritional well-being. The major goal of such projects is to produce more and sell more meat animals for consumption by non-pastoralist populations in the wider economy, or for export. The main intended benefit expected to accrue to the pastoralist is a future rise

in income from animal sales once the project objectives have been achieved. These deferred benefits are assumed to have the effect of raising living standards and thus improving the dietary conditions among pastoralists. Meat production is justified as an economic necessity for the urban consumption market and as a source of 'high protein' food for the entire country. However, the nutritional needs of urban consumers are not analysed in this vague rationale; nor are the nutritional needs of rural producers.

#### 4.3 Drought and the Rise of Range Management

Vagaries of nature at the turn of the decade of the 1970's added a new priority to livestock project policy - conservation of natural land resources in the semi-arid and arid zones. This came about in part as a result of the growing influence of the environmentalist movement with donor agencies such as AID, and in part as a response to the overwhelming impact of the multi-year drought in the Sahel of Africa and Saharan areas raising fears of famine and rapid desertification. Relief efforts to feed pastoralist refugees from drought-stricken areas added to these concerns.

Thus the early 1970's witnessed the massive introduction of U.S. range management technology and strategies to pastoralist peoples. Within AID it was widely espoused as a solution

to both the drought-induced ecological problem and the perceived need for increased meat offtake. As stated in the 1974 publication Range Management and Development in Africa,<sup>5</sup>

Range management is the science and art of planning and directing range use to obtain maximum livestock production consistent with the conservation of the range resource. The definition implies a sustained yield of livestock over a long period of time. It infers the production of the correct kind of meat, wool, hides, etc. to satisfy economic demand... it can be obtained only by conservation of the vegetation necessary for grazing animals.

In this approach both production and conservation objectives are integrated through adoption of a systems method. In tandem with AID's "New Directions" policies of the early 1970's, the pastoralists involved in range management projects were designated the "human constituents" of the development design, a new and untried part of the technology transfer model employed. Abercrombie stated it as follows,<sup>6</sup>

The inhabitants and users of the land resource base in proposed integrated range/livestock programs are assumed to be the chief beneficiaries... The human element must be taken into account to assure that the land use plan includes a production system and form of land tenure that is consistent with the expectations and expressed needs of the population for survival and stewardship of these resources for future generations.... Knowledge of the human constituents is also fundamental to mid-course project evaluation and impact analysis over time. Recognition of this concept in project design is of recent vintage in the range management/livestock field and is less than fully understood by most such development planners.

While this formulation expressed apparent concern about the basic human needs and desires of pastoral populations, there

remained many institutional constraints to fully using the "knowledge of the human constituents" in the design and implementation of livestock/range management projects. Part of this was due to the lack of understanding on the part of development planners. However, the concept of pastoralist as project "constituents" rather than as human capital or as viable constituencies reveals fundamental bias in the orientation of the production-conservation policies and plans. No human nutrition planners, for instance, were ordinarily involved in project design. Even the required social science contribution to the range management development approach was often an addendum tacked onto the basic strategy. Its aim - to convince pastoralists that it was in their interest to cooperate with livestock/range management development project operations. This has been expressed by an AID rural sociologist who worked closely with the livestock sub-sector during the 1970's,<sup>7</sup> in the Sahel:

We are operating under the hypothesis that this situation [soil deterioration due to overgrazing] can be arrested and reversed through rational range management which will accommodate economic animal management and that such a combined program will result in the optimal output and at the same time conserve the land....We assume that the present grazers [i.e. pastoralists] would submit themselves to mutual self limitations in the use of the land in exchange for a trusting promise of increased outputs and exclusive rights to the range site.

#### 4.4 Range Management Project Performance through the 1970's.

The model for pastoralist participation in range management projects was derived from rural sociological change agent theory derived from experience in the United States and other developed countries with colonial livestock raising populations such as Australia and Argentina. Herders are offered a 'package deal' of deferred benefits in return for their compliance with extension rules and technological methods of improved management.<sup>8</sup> However, the decade of the 1970's ended with little evidence that such approaches were rewarding. Many range interventions were resisted early on by the pastoralists, preventing implementation. Few projects received adequate host government support by the Livestock divisions of Agricultural Ministries in staff or budget; government promises to proclaim changes in land tenure for exclusive use of ranges by stockmen involved in projects did not materialize or were done in law but not in practice. Evaluations of project after project in terms of their initial objectives of meat production and range improvement revealed them to be overly ambitious, poorly planned and lacking in the data-base on land and animal resources needed to judge project performance. Expected increases in meat production for urban areas evaporated.<sup>9</sup>

As shown in Table II, some range projects were phased out early, and others were downgraded into demonstration or

experimental 'pilot' projects rather than, as originally intended, large-scale implementation programs to meet national policy goals for livestock. The institutional capacity of host government agencies to administer range management in pastoral areas was called into question by AID. Project operations by AID contractors were also judged deficient. Increased resources were put into training and centralized research on livestock issues rather than in country implementation projects during the mid-1970's. Between 1975 and 1980, for instance, the proportion of Africa Bureau funds for rural food production invested in the Range/Livestock sub-sector declined from 16% to 8%.<sup>10</sup>

Table II. AID LIVESTOCK DEVELOPMENT PROJECTS INVOLVING PASTORALISTS: A CHRONOLOGICAL TYPOLOGY\*

Type of Project	Time Period (Date of Project Contract Initiation)				Total
	1960's	1970-73	1974-77	1978-80	
Central Research Projects	0	4	6	1	11
Livestock Improvement Only	3	0	0	0	3
Livestock and Range Management Projects	5+	8	6	2	21
Integrated Rural Development and Livestock Projects	0	1	2	2!	5
Totals	8	13	14	5	40

+ Begun in late 1960's

! Basic Needs Orientation

\* The World Bank and other donor agencies have carried out livestock and range projects similar to those of AID in many of the same countries of Africa and the Near East since the 1970's (with similarly inadequate rates of return or improvement). Bank sources indicate that livestock projects accounted for about 20% of rural food production investments at the beginning of the 1970's decade and have declined to only 3% by 1980. Integrated rural development including livestock has increased and now accounts for 23% of Bank investments in agricultural food production. Although the World Bank also embraces a Basic Human Needs philosophy toward development, it has yet to employ this approach in its projects among pastoralist peoples. There are no nutrition impact evaluation guidelines currently applied to livestock development. AID has taken the lead among international donors in re-evaluating its policies with regard to livestock development and pastoralism.

Data for this table were drawn from a computerized request to the AID project abstracting service of DIU with the assistance of AID Librarian Helen Davidson. The most recent integrated projects focus mainly on research into livestock raising conditions by pastoralists and on the delivery of consumer services including nutrition. Note the switch from Livestock only to Range Management projects that occurred from the late 1960's into the 1970's. The number of Range Management projects subsequently declined in the latter half of the 1970's, as the agency reduced its numbers of implementation efforts and gave increased attention to centralized livestock and rangeland research.

In many cases, project failures were attributed to non-cooperative pastoralists. As we shall see, there is reason to conclude that many of the implementation difficulties came about not because pastoralists were uncooperative, hostile or too conservative as has been suggested by range management technicians. Rather, the problems may have arisen because in large part livestock/range management project designs contradicted the existing subsistence food systems of the herders and threatened to undermine the nutristructure of the pastoral populations without developing effective alternatives.

#### 4.5 Pastoralist Project Approaches and Basic Needs

The Basic Needs philosophy was adopted by AID in 1972/3. The subsequent creation of units and positions within the donor agency concerned with social soundness of project designs led to the hiring of pastoral anthropologists and other social scientists directly concerned with the impacts of range projects on the well being of pastoral peoples.<sup>11</sup>

Toward the end of the 1970's a confrontation within the Agency emerged between the agriculturist-range model of development on the one hand and the basic needs-social scientist viewpoint on the other. The dialogue took place between two distinct scientific schools of thought with differing assumptions and methodologies. On one side were what may be characterized as the "red" (meat production-oriented) range managers and livestock scientists. On the other side were the "white" (milk consumption by pastoralist-oriented) anthropologists and Basic Human Needs planners.

A leading exponent of the latter school of thought was the AID senior anthropologist, Allen Hoben, who stated,<sup>12</sup>

AID classifies all of its pastoral zone projects in the livestock sub-sector of agriculture...Livestock production and land use management rather than the nutrition, health, security or income of pastoralists become project objectives. In the words of one senior AID official, 'Cattle rather than people are treated as the target population'.

Despite recent improvement, AID and other major donors approaches still have a narrow technology import orientation that does not take account of pre-project systems of production and distribution....What is particularly

discouraging about the tech-fix syndrome is that it has been recognized as a general problem for at least two decades, yet little has been done about it.

In some cases soil or grass became the targets for project improvement, with meat per hectare seen as the output; pastoralists and their herding systems were ignored or considered impediments to development.

However, since 1978/79 new types of pastoral development projects reflecting such criticism have been designed and begun. These projects emerged from a new strategy that includes baseline research on existing pastoral systems, participation in decision-making by pastoral beneficiaries and attempts to integrate Basic Human Needs components that modify development project objectives and procedures to fit the existing pastoral framework. This contrasts with the earlier approaches based on rapid introduction of radical technical change.

The nutritional perspective has also become a higher priority in these newer projects. However, there is little or no guidance available on how to successfully achieve human nutrition objectives in a pastoral development setting. In doing so, we must take into account the momentum of existing models of range and livestock development as well as the new pastoral/livestock integration designs.

There is no doubt that a variety of approaches to livestock, new and old, will continue to be applied for some time to come. All of these 'models' require analysis in terms of their human nutrition impact potential. It is the purpose of this paper to take some initial steps in accomplishing this demanding inter-sectoral planning and evaluation task.

## 5.0 CASE STUDIES OF LIVESTOCK DEVELOPMENT PROJECTS AMONG PASTORALISTS

Ideally, it would be possible through the analysis of case studies to illustrate in detail the linkages between livestock development design, implementation, output and pastoralist nutrition impacts. However, as the brief history of AID livestock projects shows (Chapter 4), success in meat production and range management types of projects is rare, and many projects have not been in operation long enough to demonstrate substantial effects. In addition, data-bases on project populations and interactions between pastoralist diets and development efforts are lacking. Indeed, project-associated collection of baseline data on pastoralist nutrition conditions and livestock economy has been done in only one or two projects recently initiated. Therefore, the usefulness of project case-studies in answering the nutrition impact questions posed by Pinstrup-Anderson (See Chapter 2) is limited, especially the economic cost-benefit and price effects. Only the immediate effects of project activities on pastoralists and a comparison of the intended outcomes and potential unintended impacts can be addressed with some precision.

A careful examination was made of a series of AID livestock project documents from Project Identification Documents to Project Papers and subsequent Project Evaluations. Also,

AID cable traffic on project progress reveals a fascinating set of signposts for future project design and implementation procedures with regard to nutrition and related aspects in pastoral areas. Realistic interpretations of the existing and potential nutrition-related impacts of two such projects are presented here. In addition, new project designs aimed at these same pastoralist areas are presented to provide future options for livestock development in relation to nutrition impact analysis.

#### 5.1 The Setting of Moroccan Livestock Projects.

Moroccan pastoralism is almost totally given over to the herding of small ruminants, principally wool sheep and goat husbandry. Mixed flocks are tended on expanses of arid eastern steppelands and desertic areas (where camels are also raised). Cattle-keeping is primarily a small-scale sedentary mixed farming activity. Sheep and goats dominate among pastoralists of Morocco's semi-arid high plains and the mountains, valleys and foothills of the Atlas ranges.

The Upper Moulouya River Valley is the location of the livestock development projects in this case study; it is an upland area between the High Atlas range to the South and the Middle Atlas chain to the North and West. The Moulouya River originates in the angle formed by these two mountain ranges and flows north-eastward into lowland steppes before emptying into



the Mediterranean Sea. These mountain chains form a continental divide that separates this Central Moroccan watershed from the Atlantic plains and coastal regions with their highly urbanized and settled farming populations.

The valley of the Upper Moulouya is nearly three thousand feet high. A ribcage of water channels descends from the Atlas foothills to form its tributaries. The climate in the valley plain is harsh, with wide temperature variations. Freezing is common in winter, but snowfall at this elevation is unusual although the mountains are snowcapped. Mean annual rainfall of 200-300 mm. decreases with altitude from West to East. Periodic rainfalls occur in spring and late autumn; winters are often rainless and summers are warm and dry with low humidity.<sup>1</sup>

Several nomadic and semi-nomadic Berber Islamic tribes, originally from the Saharan region south of the High Atlas, migrated into the Upper Moulouya watershed during the 14th to 17th centuries. They continue to herd sheep and goats on the plains and in the mountains using a variety of seasonal pastoral strategies. Today many tribal fractions also farm the irrigated banks of stream beds and sow adjacent drylands with cereal crops. During the past two generations since French occupation of Morocco, the population of this region has become largely sedentarized farmer-graziers; they maintain small flocks of

sheep and goats on their tribal collective rangelands, and raise a few cattle, horses and donkeys near their mud-walled village settlements.

Sheep form up to four-fifths of the herds; goats make up the remainder. Sheep do better on the winter-spring ranges of valley grasses and forbs while goats are better browsers on mountain foliage in summer and autumn. The transhumant flocks alternate between these two major seasonal resources. Ruminant grazing involves flocks of up to one hundred small ruminants per nomadic household of tent-dwellers. Semi-nomadic pastoralists keep between twenty-five and fifty animals in a flock, and sedentary groups maintain less than twenty beasts per household. Village-based cattle herds composed of one or more cows per household are kept near permanent settlements as dairy and calf producers. Horses, mules and donkeys are also raised as beasts of burden along with a few camels. Large ruminants and equids are supplemented with fodder crops and grains from farming.<sup>2</sup>

## 5.2 Pastoral History of the Atlas Region

Although French colonialism began in 1912 in Morocco, the Upper Moulouya Berber tribal federations were not conquered until the 1930's and colonial demarcation of collective ranges took place in 1949 after the Second World War occupation ended. Since the 1950's tribal lands have been 'frozen' into stratified

collective range areas which divide the valley from the foothills and the mountains. With the opening of paved roads to the coastal cities during the post-war period, a highly monetized market economy in sheep-raising emerged on the rangelands of various tribal fractions of the Upper Moulouya region.

Morocco obtained its independence from France in 1956. During the past two decades the land use and social economy of the Inter-Atlas region have been transformed as large stock-owners and private landowners circumvented indigenous tribal controls on range land grazing to increase their offtake of sheep for sale to urban consumers. Local Berber herdsmen hold grazing rights on their tribal collective lands; they contract with outsiders to raise increased numbers of sheep, receiving usufructory rights over the by-products and ownership of one-fourth of the lambfall each year. Thus sheep are continuously added to the rangelands through outside intervention.

Since independence in 1956, some portions of the Upper Moulouya collective lands have been declared off-limits to grazing as part of the national policy to protect mountain forests and valley esparto grass areas as natural domains, harvested for their wood and fibers by government leases. Together, these conservation measures reduced the range surface area of the Upper Moulouya plain and mountains by about one-fourth, even as the number of sheep grazed in the region were

increasing. Today, range experts estimate that the carrying capacity of the land is exceeded at least twice by the number of sheep.<sup>3</sup>

### 5.3 Socio-Economic Conditions in the Upper Moulouya Area<sup>4</sup>

The human population of the Upper Moulouya has also increased since independence, doubling in about thirty years despite a low birth rate. In-migration of poor herders from drought-stricken Saharan regions across the High Atlas adds to the pastoral population of the region. However, many of the inhabitants have settled out and become subsistence farmers or agricultural laborers, as cultivations have increased in the drylands and irrigated areas. Administrative towns and market villages have grown rapidly since independence, and traditional social and political cohesion within the segmentary tribal fraction of the Berber pastoralists and farmers has given way to class divisions of increasing inequality.

A 1971 socio-economic survey of the users of a collective rangeland was carried out for the first AID range/livestock project in the Upper Moulouya. This study showed that the majority (75%) of the Berber population had become sedentary; 20% engaged in semi-nomadism and only 5% remained nomadic. In this survey of 62 communities with over four thousand inhabitants (See Table III), large stockowners and landholders

constituted only 12% of the population but controlled nearly half the livestock (sheep) and half the irrigated river bottom land. This stratum was also the major user of the rangelands for shifting cultivation of cereal crops. Another 12 % of the population was landless and dependent for survival on labor as herders and agricultural workers. They possessed only 1% of the sheep; many were recent in-migrants from desertic regions south of the High Atlas mountains. Nearly a quarter of the households were small farmers who owned less than 15% of the livestock. Grazier-cultivators (including semi-nomads) owned one third of the livestock. Nomads, only five percent of the population, owned 10% of the sheep on the range and maintained additional numbers on contract with outsiders, as did some of the semi-nomads. The more nomadic herds contained more goats.

The principal food supply of this population is derived from winter crops of cereal grains cultivated with animal-drawn plows on the drylands; the crops include barley, hard and soft wheat, and rye. Spring plantings of irrigated parcels provide a maize crop as well as starchy roots and tubers including turnips, carrots, potatoes, onions and some vegetable legumes. The most reliable cereal grain is barley and it is also the staple food crop. Barley produces straw for use as animal fodder and ample crop residues grazed by the flocks during the post-harvest season. Although most grains are used for human

consumption, barley is also in demand for animal feed during the dry season and in winter for sheep and large ruminants.<sup>5</sup>

#### 5.4 Rural Moroccan Nutrition, Dietary Conditions and Social Problems

The major nutrition problems in rural Morocco are found among the landless and under-employed portions of the population who do not have pastoral herds. Typical diets of these low income families provide barely sufficient caloric intake from cereals and starchy root crops. Their diet is deficient in protein, fats and major nutrients such as calcium, iron, and vitamins. Poor mothers have a monotonous diet of bread and cereal stews, and wean their children onto bread and sweetened tea. Families eat meat less than once a month and consume no milk.<sup>6</sup>

However, in the pastoral areas such as the Upper Moulouya, livestock provide an opportunity for pastoralist and farmers to obtain milk products and additional supplies of small ruminant meat and fat as well as cereal and root crops. Proportions of children of low weight for age or height are historically less in this region than in non-pastoral regions of the country. However, the trend toward sedentarization of pastoralists has made their dietary more like that of poor farmers, creating increased rates of child malnutrition, mor-

bidity and mortality. Rates of child malnutrition have also increased as pre-Saharan seasonal agricultural workers and laborers have come to settle in the Upper Moulouya.

Although fertility rates of the pastoralists of this region are historically the lowest in Morocco, birth rates are increasing with sedentarization. Child-spacing is wider in the Upper Moulouya than elsewhere in Morocco, allowing for lengthier periods of breastfeeding. This is due to the Moroccan Berber custom of abrupt weaning when a mother becomes pregnant with a second child; this 'suckling taboo' causes excessive rates of 'weanling diarrhea' and protein-energy malnutrition in young children.<sup>8</sup> However, as we shall see, low fertility is also associated with excessive sterility due to a major nutrition-related social problem associated with the transformation of pastoralists into poor sedentary farmers in the Upper Moulouya.

#### 5.5.1 Sterility, Social Pathology and malnutrition

An important social factor in exacerbating child malnutrition is the high divorce rate linked to rural prostitution, a dilemma that has characterized the Upper Moulouya since colonial times. Out-of-wedlock births are not uncommon; many children without fathers are neglected or orphaned. A few Christian missionary groups have taken on the function of caring for parentless children and providing health care and nutrition

rehabilitation services to women and infants. However, venereal disease is prevalent; it is the major cause of high rates of female sterility. In this patrilineal society sterility is often sufficient cause for divorce. Divorce is traditionally easier among Inter-Atlas Berbers than among other ethnic-linguistic groups in Morocco. Berber women are accorded a more independent status and are expected to work to provide resources and income to maintain their households in addition to that provided by a husband. Some women serve as heads of households for their children and for aged kin.

One-third to two-fifths of marriages in the Upper Moulouya end in divorce, usually within two years of marriage. The concentration of military barracks in the villages since the French occupation of the region in the 1930's has encouraged young divorcees from poor rural households to migrate to market and administrative towns and practice commercial prostitution. Prostitutes build on the traditional function of Berber women as dancing girls and courtesans for government officials of the Moroccan monarchy. The explosive growth in the cash economy of the region since independence has exacerbated this practice.<sup>9</sup>

Some of the proceeds of prostitution, which after livestock is the main outside income producer for the region, are reinvested in livestock contracted to pastoralists on tribal collective lands. In short, the decline of pastoralism as the

population became more sedentary is associated with increasing social pathologies and class divisions: divorce, prostitution and child neglect that contribute to malnutrition and disease.<sup>10</sup>

#### 5.5 Background of the First AID Range/Livestock Project in Morocco

Nutrition impacts of livestock development will be reviewed as part of Moroccan range project history. In 1968 the Moroccan Ministry of Agriculture and USAID agreed to convert a section of the Upper Moulouya into a range perimeter for grazing sheep to achieve greater output of mutton for urban consumption. The project site was one of twelve perimeters (demarcated deferred grazing areas) throughout Central Morocco chosen for government intervention. As stated in the Project Paper.<sup>11</sup>

The project addresses the problem of over-grazing and the low/level of production of Morocco's collective grazing lands (5.3 million hectares) which constitute the large part of grazing resources in the country. Over the longer term, the project is also intended to assist Morocco to overcome a widening shortage of animal proteins to meet adequate nutritional standards and assist in the social and economic development of the pastoral people

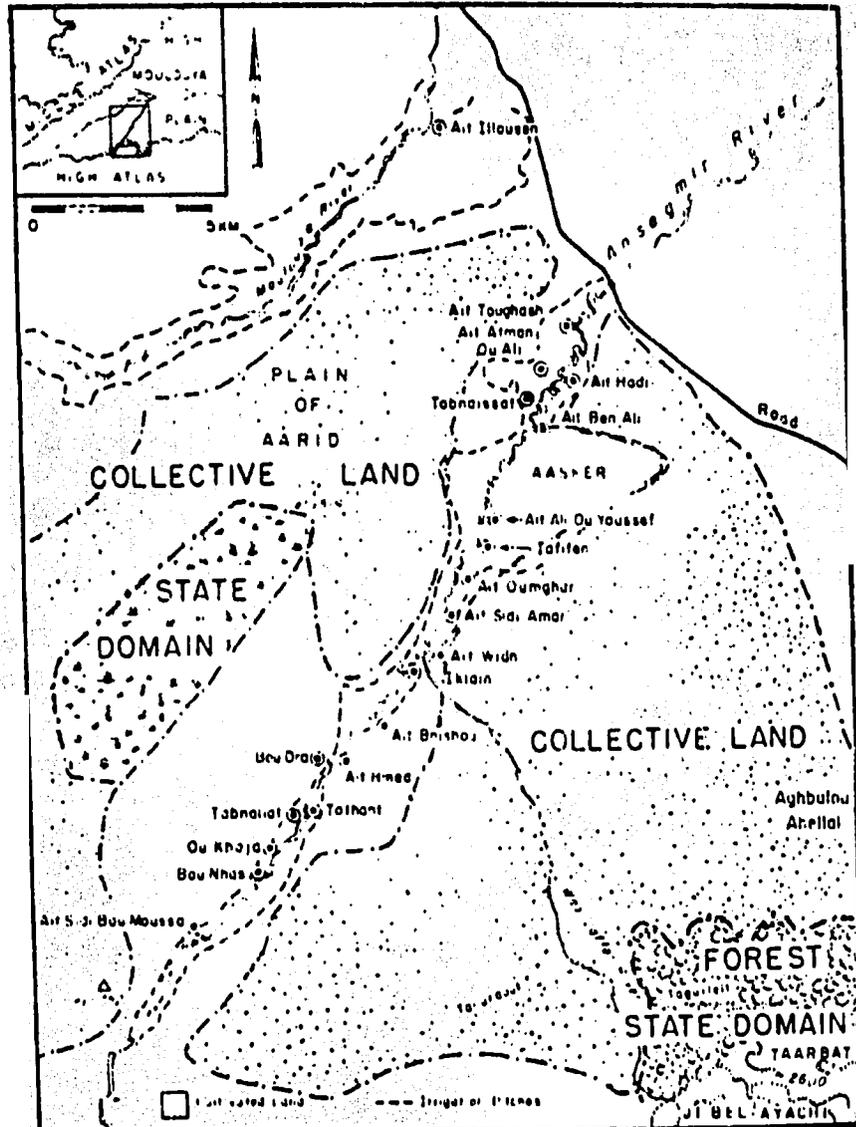
Although the longer term intention of the project appears to offer a nutrition-oriented rationale, the real beneficiaries of this animal protein nutriture (for sale) are Morocco's urban

consumers rather than the pastoralists of the Upper Moulouya and other rangeland locations. The basic aims of the project are production of meat through vegetative regeneration of the grasses using scientific range management principles. Little attention is devoted to the livestock raisers, the pastoral people, except in terms of the by-now-familiar expectation that they will have greater cash incomes from the project and this will assist their development.

However, the context in which the AID project was initiated was far from benign. Previous AID efforts in Morocco had concentrated on cattle production. During the early 1960's U.S. assistance was directed at improving breeds of cattle and controlling cattle diseases through veterinary interventions. An AID-supported project also focussed on spreading the use of alfalfa forage crops from irrigated land for cattle fodder in rural areas among small farmers. In the mid-1960's, a ranch, Adarouch, was established in the Middle Atlas region to promote capital-intensive production of beef cattle. The ranch was created by Moroccan government fiat on the lands of a Berber pastoralist tribe; the transhumant nomads were evicted.

In association with private investors and the American King Ranch Corporation, the Moroccan government developed the infrastructure and fenced in the land for grazing by imported breeds of beef cattle. Although the ranch was eventually able

104 THE AIT AYASH OF THE HIGH MOLOUYA PLAIN



Map 9. Map of the collective land of the Ait Ayash

Source: Midelt Archives, April 1951.

to raise beef animals, it was fiscally mismanaged by expatriates and the American investors later withdrew. Due to the persistence of infectious zoonoses in Moroccan cattle, this beef operation did not penetrate the lucrative European market for which it was originally intended. Instead, meat produced on the ranch was used to supply a burgeoning demand for beef in the urban coastal cities where government and business elites, foreign assistance missions, and large-scale foreign tourist industries developed after independence. The ex-pastoralists were 'resettled' as sedentary farmers in the plains and became the net losers in land, wealth and diet.

The lesson learned by pastoralists throughout the Atlas area was that government intervention led to elimination of traditional transhumance and alienation of pastoral lands. The Berber tribes of the Atlas mountains and valleys depend for their claim to collective tribal rangelands on a 'perpetual oath of fealty to the monarchy renewed each year on the King's birthday. They resist government attempts to appropriate these lands, assert their customary claims and see government programs as threats to their rights and their survival. The Adarouch beef ranch exacerbated these suspicions toward any government interventions on the collective ranges.<sup>12</sup>

5.6 Phase I: Implementation of the AID Project on the Aridh Plain, 1969-1974

From its inception this livestock project had problems overcoming pastoralist opposition. The initial AID-sponsored range project was begun in 1969; it used the approach of regeneration of natural vegetation through deferred grazing on fenced perimeters. Twelve perimeters across three regions of Central Morocco were expected to improve some three hundred thousand hectares of collective grazing lands. During the start-up period, an American anthropologist studying one of the tribes in the Upper Moulouya region adjacent to the Aridh Plain described the context as follows:<sup>13</sup>

My socio-economic data collection was limited to one village of the Ait Ayash Tribe, due to the wariness of the people about questions of property, exacerbated because at this time a pilot project of range management was initiated on the collective lands of the Ait Ayash by the International Voluntary Service under contract of U.S.AID...The project failed in its early stages and had little impact except for the fears it raised about its purposes and the connection between my work and theirs. The purposes of the project were never properly explained to the local people.

Several of the project sites were sabotaged by pastoralists and had to be abandoned. The AID contractor withdrew from the project in late 1969. The project was relaunched on the Aridh Plain by an AID range management expert as a demonstration effort in 1970. On the Aridh Plain perimeter of the Upper Moulouya region it was to cover an area of 35,000 hectares. The revised approach used reseeding of a fenced range area as the technology rather than natural vegetation regeneration. In

addition, it included improvements in water resources, veterinary health measures and socio-economic surveys that went far beyond the original range development and extension objectives. However, most of the other perimeter sites were removed from the project. As stated in the April, 1970 Airgram from AID/Morocco to AID/Washington:<sup>14</sup>

The basic purpose of the project has not changed... However, the scope has been substantially changed to broaden and intensify research elements and to concentrate on less hectarage than was originally conceived... The magnitude is reduced from twelve management areas covering 325,000 hectares to two areas of Range Improvement Perimeter covering 70,000 hectares by the end of FY 1970.\*

This reduction in scale was attributed to:

- 1) Lack of an adequate Government of Morocco administrative input
- 2) Reluctance of the pastoral people to support programs which infringe on their traditional use of the collective lands.
- 3) Lack of an adequate research, demonstration and information program to convince pastoral people of the value of rangeland and livestock management techniques.
- 4) Too short a time-frame in the original project for "drasitcally changing operational patterns and decreasing the number of animals grazing the land".

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\* In fact, the project reseeded some 3000 hectares on the Aridh Plain site by the time it was terminated in 1974.

The redesigned project now consisted of:

- 1) Production of forage and pasture crops in specific areas on the Aridh Plain; pastoralists were expected to increase their participation in the project by planting imported forage grasses with their animal-drawn plows.
- 2) Water development based on borehole wells with pumps on the rangeland; construction of forage centers and animal shelters for year-round occupation of the rangeland.
- 3) Veterinary attention to livestock health problems since "an aggressive animal health program was considered essential to the success of the project".
- 4) Deferred grazing on the fenced area of planted grasses, followed by rotational grazing of a selected number of sheep from participating project cooperators, chosen among the pastoralists of the surrounding tribes.

The legal basis for this new perimeter range-livestock scheme was the promulgation in July, 1969, of a Moroccan government edict (Dahir) setting aside designated range management perimeter lands on the collective ranges for government development purposes.

However, concerns about the responses of pastoralists to the revised project objectives and methods continued. As stated in a Airgram from AID/Washington to AID/Morocco in May, 1970.<sup>15</sup>

a) We note that the revised PROP...is more realistic than the previously planned project (which) was not initiated on any of the proposed management areas due primarily to resistance of pastoral people to grazing restrictions and to intervention on traditional tribal lands. Obviously this resistance will not be easily overcome and will not be eliminated by a decree of the government....It is difficult to understand how this project can move forward until the Government of Morocco secures the willing cooperation of the pastoral people. Demonstration and research on rangeland improvement alone likely will not materially change the attitudes of the local people.

AID/Morocco replied in June, stating that:<sup>16</sup>

.. Willingness of pastoral people to cooperate...is extremely difficult...[as they] are extremely suspicious of government of Morocco intervention on what they consider to be their lands due to the history of expropriation without compensation...or dual use.

In November 1970 an AID Project Appraisal Report (PAR) evaluation of the Aridh project suggested that the land tenure conditions of the tribal populations surrounding the Aridh Plain be surveyed, "to accurately determine who is grazing livestock and to what extent the use is seasonal and transitory in nature." The PAR also added a major new sub-objective to the project, as follows:<sup>17</sup>

To assist in the social and economic development of the people using the collective grazing lands...the social aspects must be given high priority and the programs must take into account customs, desires, etc. of the people involved.

In light of these exchanges it is useful to note that real concerns were expressed and actions recommended to respond to perceived needs of the pastoralist in the project area. However, for various reasons, the project implementation was unable to achieve the broader social goals of research and development among the human constituents of the project area.

The revised pilot project on the Aridh Plain begun in 1970-71 fenced off a grazing area of three thousand hectares experimentally seeded with imported grass species. Due to lack of appropriate animal-drawn plowing equipment, a tractor-drawn mechanical seed drill was used to sow the grass seed. After a grazing deferral period of more than one year, several wealthier livestock owners were recruited as cooperators who together placed approximately one thousand sheep on the reseeded range. The project created a research station to compare sheep on reseeded grasses to a control group of sheep on natural vegetation, and to use the reseeded perimeter as a visible demonstration area to convince surrounding herders to emulate its approach. The objectives of the project were stated in the following terms by the new Project Paper:<sup>1</sup>

- 1) to reduce nomadism through more intensive use of the grazing resource.
- 2) to increase crop returns and soil fertility from reduced grazing on cultivated lands normally grazed on a seasonal basis under existing practices.
- 3) to reduce water and soil runoff from grazing areas and thus make for less silting downstream at dams and irrigation sites

In response to the PAR evaluation, a survey of grazer rights and usage of the Aridh Plain collective lands was carried out by an AID local-hire Moroccan, who also performed the extension information role of contacting tribes people to explain the purposes of the project. AID/Morocco described his activity in a January, 1971 airgram to Washington, as follows:<sup>19</sup>

Range-use sociological studies and information programs: Working through local officials more than one hundred scheduled meetings were held to explain the project and collect data... More than six hundred local people were

contacted in a period of a few weeks. Representatives of each administrative sub-division (douar) were accompanied on tours of their areas to obtain their views as to the need for additional water supplies and other improvements. The sites for twenty wells have been tentatively located by these groups. As a result of the above efforts the attitude of the people towards the project has substantially changed for the better from what it was a year ago...This is a pilot project and one of its major objectives is to train people to appreciate and recognize the economic benefits of range and livestock improvements.

However, the range livestock project did not include monetary resources or plans to provide the wells requested by the pastoralist communities. The socio-economic survey carried out in 1970-71 was not analysed or fed back into the project operations due to lack of skilled social scientists to carry out this function. (The only known use of the raw data was that made by a research anthropologist carrying out field studies in the Upper Moulouya area in 1971-72. See Teitelbaum, 1976).

By 1971 the technical inputs of livestock improvement and range reseeding on the demonstration area had been implemented and sheep were shown to improve in weight gain and offtake as a result.<sup>20</sup> However, the extension aspects of the project remained minimal and only a few large stockowners were cooperating with the project implementation. A 1971 AID Audit report described the project as follows:<sup>21</sup> "The most serious hindrance was not having the 'willing cooperation' of the pastoral people expected to benefit." AID and the GOM agreed to terminate the project in 1973-74. An end of tour report by the I.V.S. technician who ended his work that year stated,<sup>22</sup>

The project's primary problem was failure to obtain understanding, consensus and participation of local livestock producers and their leaders at the provincial level...Because their needs were ignored, herders failed to perceive the benefits which could be expected to accrue from the project .

In fact, the project precipitated adverse impacts on the land base around the fenced perimeter. Large and small cultivators plowed up the land for cereal grain production. Opposed to the governmental diversion of collective rangelands as controlled grazing areas, and fearing that more land would be expropriated, farmers rapidly carried out de facto takeovers of the collective lands by tillage. Some of these users sought documents to press their claims to private ownership before these areas could be used for range development. In short, the initiation of the range project generated strong and rapid counter-productive responses on the part of the surrounding population. The nutrition impact results of these responses will be discussed.

#### 5.7 Phase II: Design of the Second AID Range Management Scheme for Morocco.

Data on sheep weights from the first pilot project in the Aridh Plain in 1974 showed that under controlled conditions the offtake of mutton from the rangelands could be doubled by limiting the number of sheep on reseeded fenced areas. The Moroccan Ministry of Agriculture gradually increased the perimeter in the Upper Moulouya to cover some ten thousand hectares by 1980. The pilot project became a showplace visited by

government officials and various agricultural agencies and foreign dignitaries (including the King of Saudia Arabia) during the 1970's. The first project had provided training at U.S. Universities for several Moroccan agricultural technicians in range management, one of whom continued to supervise the Aridh perimeter activities.<sup>23</sup>

It is not suprising that a second generation AID live-stock range management project planned for the early 1980's is attempting to build on the base of the first one. Ideally, the new project design would learn lessons from the successes and from the failures of the previous project. The new Project Paper issued in February, 1980 was entitled, 'Morocco: Range Management Improvement'. It is instructive to state the objectives of the new project design:<sup>24</sup>

The prime concern of this project is the improvement of range vegetation conditions in Eastern Morocco...This is not a comprehensive livestock sector project involving breeding, animal health, intensive feeding, etc. The program will actually operate on five range perimeters totalling 1000,000 hectares - designated areas of communal grazing land...set aside for improvement and utilized by grazing associations.

The goal of this project...is to increase incomes of the poor herders of Eastern Morocco. It should be pointed out, however, that the greatest long range benefit to Morocco will be the reversal of its range deterioration and the restoration and conservation of its natural resource base in the project areas.

As described, the new project plan differs little from the orginal range management and extension program planned before the revision of the first project into a pilot effort. There are basically two new elements in the Phase II design:

- 1) to allow access on range perimeters only to legally constitute pastoral grazing associations; and
- 2) to strengthen the Feed and Livestock Division of the Moroccan Ministry of Agriculture in order to enable this unit to manage the range projects.

However, the major goals of rangeland conservation, stock reduction and sheep production remain the same, with pastoralists expected to benefit economically from sale of the offtake:<sup>25</sup>

The goal is to increase income of poor farmers and herders on arid rangelands...in terms of saleable meat and wool from fewer animals. More important a decrease in stocking rates and improvement of range conditions will slow down the destruction of plant cover, arrest undue erosion, and provide protection to watersheds.

The new project is slated for implementation on several of the designated perimeters in the Royal decree (of 1969). This includes the Aridh Plain which is to be expanded to over thirty thousand hectares. The project assumes that the major impediment to success will be pastoralist resistance to range land improvement and their non-participation. This is to be dealt with by means of grazing associations, range extension demonstration efforts, improved knowledge of pastoralist current practices and cultural-social conditions and sensitization of the implementing agency officials about these concerns.

The problem of pastoralist resistance to range management intervention was highlighted, as we have seen, in evaluations of the first project. In response to these concerns, the new

project design includes a component of concurrent social studies of the pastoral population,<sup>26</sup>

A specialist in the anthropology of pastoralist peoples is assigned to the project...to insure that the project implementation takes adequate account of the social and cultural practices of the inhabitants of the project areas...to provide continuing social and ecological analysis of the herders...and to sensitise U.S. and GOM staff to the realities of the semi-pastoralist economy. It is essential that the social needs of both herders and farmers be well understood by the Livestock Service if its range management improvement program is to benefit the poor livestock raisers.

The U.S. anthropologist's functions are to be multiple: to make periodic reports on the equitability of perimeter grazing assignments, on the impact of grazing deferrment, on transhumant exchange relationships among herders, on contract grazing, on the relationship between pastoralists and non-pastoralists, and the economic role of women in livestock production. His role is to identify socially sensitive approaches to accomplish project objectives.

The main caveats expressed on pastoralist reaction to the project concern potential inequalities in the allocation of grazing rights by the Moroccan officials, and pastoralist abuse of the range perimeter areas by ignoring their grazing association rules and increasing stocking rates. "This underlies the importance of the pastoral anthropologists work in studying the economic incentives of livestock producers to sell their sheep."

In short, the second project has goals similar to those of the first project. While it expresses concerns as to the social reaction of pastoralists to the development technology,

it does not include baseline studies of land tenure, dietary conditions or pastoralist organization; yet it attempts to meld these factors into project implementation after-the-fact through employment of a social scientist expert. In terms of nutrition impact potential little has been learned from the first project, as we shall see.

#### 5.8 Anticipated Nutrition-Related Impacts of AID Livestock Development Projects in Morocco.

The development planners who designed the second AID livestock project did not realise that the failure of the previous project was due in large part to fundamental conflicts between range management approaches and pastoralist production/consumption needs and practices. As a careful analysis of the Project Paper shows, the costs and benefits of the design document do not take into account the spillover effects on diet and household economy of the pastoralists in the project area. The following analysis is organized in terms of nutrition impact issues raised in Chapter 2.

The Project Paper<sup>27</sup> calculates a financial return of 18.4% after three years of deferred grazing for the range re-seeding method, and 19.4% for rotational grazing on naturally regenerated pastures after a deferral period of five years. It includes mainly natural rangeland management as the prime technique due to lower investment costs and greater rate of return. Increased offtake is calculated at 9 Kilograms of meat and 0.5

Kilograms of wool per hectare for the natural range. When totalled across the various range perimeters the increase in live weight meat offtake after the deferral period is estimated at over 125%. Wool production is also expected to nearly double. The only intended impact on the pastoral user population is that of increased income from sales of sheep; the distribution of this income and its relative purchasing power are not discussed.

#### 5.8.1 Milk Yields and Uses

There is no mention of cows in the project plan, although household cattle are important dairy producers in the pastoral economy. Goats are mentioned in passing by the Project Paper which states that there is no expectation of increased production of goat milk or meat due to lack of a firm data base. The planners state that goat production is likely to decline as a result of the project implementation because,<sup>28</sup>

Recent studies indicate that goats are poor grazers and do not excel in rate of growth on improved ranges compared to sheep...As sheep raising is more profitable it is likely that most operators who raise goats will raise more sheep instead in improving areas.

Compare this statement to the (admittedly sketchy) description by the social analyst who visited Morocco as part of the project design team,<sup>29</sup>

Women are generally in charge of providing milk from goats for family consumption and cash sales at local souks (markets). Proceeds from the sale of goat's milk as well as wool products such as rugs belong exclusively

to women...It is possible that under the proposed project goat milk yields can be increased from their extremely low level of 30 liters per year, thereby increasing women's cash incomes.

It is clear from Chapter 2 that goat milk and meat products can be of crucial nutritional significance to pastoralists. Goats come into milk during the off-season for cows, and their meat is more often eaten than that of the more prized sheep or cattle. Goat milk and meat provide high biological value proteins and some minerals that complement the cereal and starchy tuber diet of the Berber pastoralists in the Upper Moulouya.

A development project which places emphasis on the commercial production of sheep at the expense of goat-raising creates conditions for nutritional loss among the pastoralists on a seasonal basis and in terms of complementarity between foods of plant and animal origin. The project design also does not take into account the customary practice of milking sheep among Berber pastoralists. The range management approach prevents access by the pastoral household to ewes for milking purposes. Thus two sources of household milk supply, goat and sheep, are likely to be depleted by project impacts. The net impact is dietary losses of two seasonally essential sources of milk: high protein and fat content ewe's milk in the spring-summer season, and dry season supplies of goat's milk. The result may be an increase in protein-energy malnutrition, especially among young children.

### 5.8.2 Cereal Food Crops

As shown above, interference in traditional grazing and herding patterns equals interference with pastoralist consumption patterns. By fencing off range perimeters on collective lands and eliminating access of herds to cultivation areas, the project may also lower the yields of crops formerly fertilized with animal droppings. In addition, by preventing dryland cultivation of cereal crops on the range area of the Aridh Plain, it reduces the total cereal grain supply upon which the semi-nomads depend for their staple food, and denies crop residues to their livestock during the dry season. It seems clear that the initial impacts of this project design will constrain the ability of the pastoralist beneficiaries to obtain a cereal food subsistence supply. However, it does include the existing Moroccan government element of offering a supply of animal feed grains to compensate stockowners for deferral of grazing on managed range areas. These feed grains may be used for human consumption in case of scarcity since there is no plan in the project to compensate pastoralists for grain losses due to the project impacts. In short, the effect of the changed system of livestock raising may be to reduce total caloric intake, total protein, and complementary proteins and other nutrients found in cereal food staples consumed by pastoralists; and create deficiency conditions during the deferral period of up to five years.

### 5.8.3 Wool Yields and Pastoralist Women's Incomes

The basis for the calculation of wool yields in the project is from an analysis performed in the 1960's by an AID range expert,<sup>30</sup> and from the results of experimental trials on the reseeded perimeter of the Aridh Plain in the early 1970's. The level of wool production is currently low, at one Kilogram of raw wool (in grease) per sheep each year; the increase expected from the project per animal is between 50% and 100%. However, the project inputs call for a sharp reduction in the stocking of controlled rangelands. As a result net total wool production per hectare will actually decrease, if the projected figures are correct, by approximately 16.5%.<sup>31</sup>

The deferral of grazing on the managed rangelands will automatically lower wool yields per hectare for up to five years unless the sheep are grazed elsewhere. This loss of a livestock product impacts directly on women pastoralists and indirectly on nutrition among poorer segments of the Upper Moulouya society. As described by the social analyst of the livestock project design team,<sup>32</sup> (among semi-nomads)

In...herding operations women rarely accompany men when stock is trekked to more favorable grazing areas in the dry summer months. During this period women manufacture traditional items from wool....Proceeds from the sale of....wool products such as rugs belong exclusively to women.

Thus a sharp decline in wool shearings due to project limitations on sheep numbers and deferred grazing combined to deprive

pastoral woman of their current supply of wool, and may drive up the price of raw wool. Many women in the Upper Moulouya, especially those from poorer rural families not only weave garments and bedding for their families from sheep wool, but also handweave woollen rugs, cloth and other items of traditional Berber design that serves as ready source of cash income. The net loss of wool due to project changes in stockraising may not only lower income, but also tip the distribution of intra-household income against women. This can create nutritional losses, since women in this region are important contributors to household budgets, especially for young child nutrition and health. Increasing destitution of women is associated with higher rates of divorce, prostitution and venereal disease. These social pathologies are also implicated in increased rates of child neglect, illegitimacy and malnutrition.

#### 5.9 The World Bank - FAO Integrated Livestock/Watershed Scheme in the Moroccan Atlas.

Even as the AID second generation range/livestock project is being initiated, a World Bank/FAO project is being designed for the entire Upper Moulouya Watershed area from the Middle Atlas to the High Atlas mountain ranges, entitled: Middle Atlas Integrated Agriculture-Livestock Project.<sup>33</sup> The project will cover four sub-zones including the Aridh Plain and surrounds, with a major effort in livestock raising, reseeding of denuded

ranges, fertilization of natural ranges, planting of shrubs and forest improvements in the mountains. The project calls for construction of livestock stables for sheep breeding and veterinary health improvements, shelters, forage centers, fattening areas, market facilities and rural slaughterhouses with cold storage compartments. Also included are infrastructural investments such as two hundred kilometers of pastoral area roads, provision of human health services, construction of schools, and supply of 9000 head of sheep and compensatory food grains for the inhabitants. Also housing for project staff with running water and electricity will be financed. The Bank intends to reach 28,000 farmer-grazier households and increase their average income by 150% by organizing them into sedentary grazing associations with exclusive rights on the managed rangelands.

The objectives of the project are defined by the ecology of the watershed at different altitudes. It will eliminate pastoral use of the forested areas for conservation of trees and soils; this is a major long range objective. On the valley floor irrigated and dryland agriculture will be developed to produce mainly forage crops. Sheep are the livestock to be grazed on the improved range areas between the valley's rivers and the mountain forests. The project is to be vertically integrated: all meat production functions will be developed in the project location from animal reproduction, to sheep raising

on ranges, fattening for offtake, slaughter and cold storage as well as marketing and transportation.

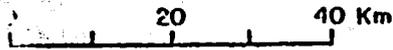
As stated in the FAO design document,<sup>2</sup>

Since the three complementary objectives (forestry conservation, range management livestock grazing, and improved cultivation) focus on the three territories exploited by grazier-cultivators, development of these lands is expected to affect all activities which produce income. Therefore, farmer-graziers will be closely associated with the proposed development, which will not be allowed to begin until their cooperation is offered through traditional organizations and local governments. [translation from French]

The major problems to be resolved during detailed design missions to Morocco by World Bank planners are the organization and leadership of the livestock raiser associations and "measures to be taken by the Moroccan government to stop illegal appropriation of collective lands, and to recover the 10,000 hectares of plowed land on the Aridh perimeter."

The Bank project concentrates exclusively on sheep production activities, but also expects to show benefits from improvements in other ruminant offtakes. Compared to the AID project calculations of a 19% return on investment, the Bank expects an 11% return overall. It expects sheep and goat meat production to increase by 110% and cattle production to go up by 50% after a three year deferral of grazing. Within a ten year period, milk production is expected to rise 600% for goats and 150% for cows. No description is given concerning the techniques to be used for improving goat and cattle production.

MAROC — PROJET MOYEN ATLAS  
ZONES DU PROJET

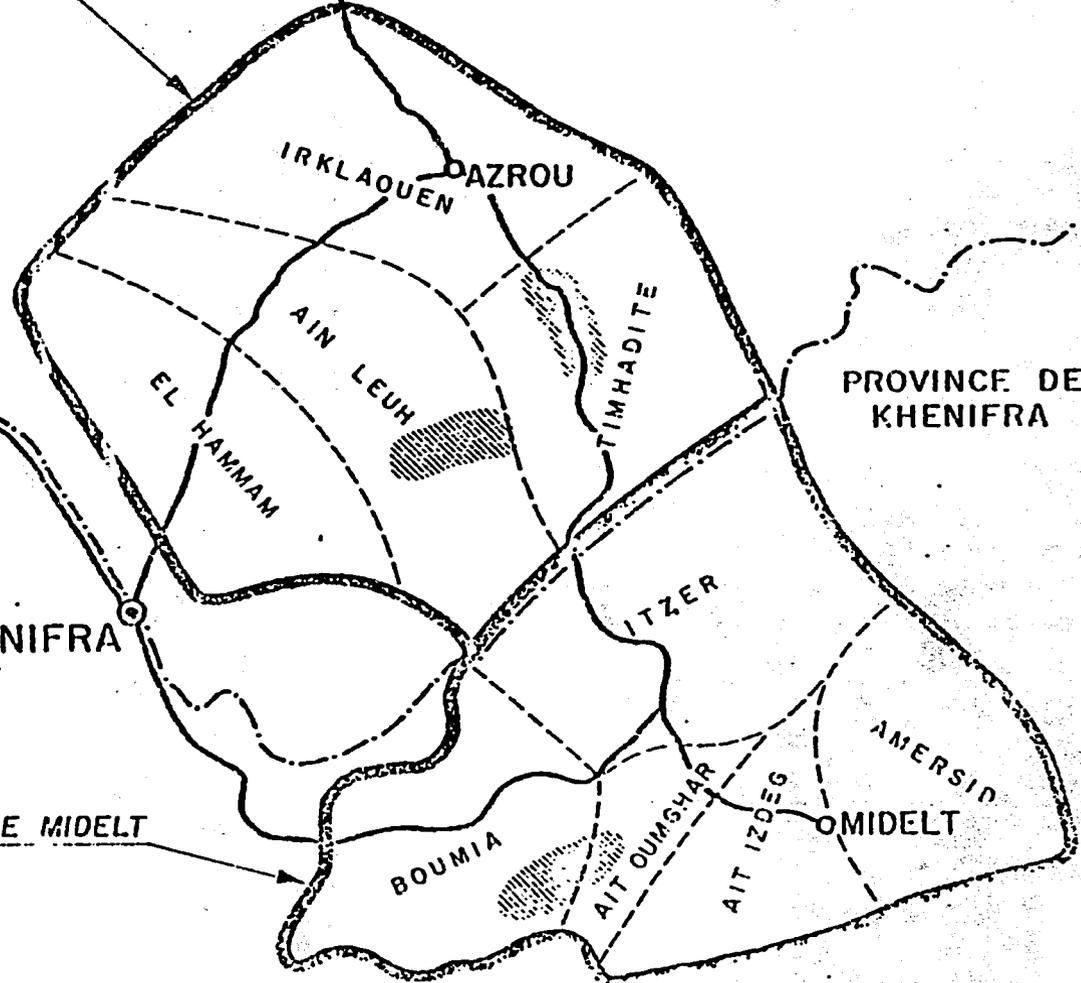


MEKNES

PROVINCE DE MEKNES

CERCLE AZROU

ORD



PROVINCE DE KHENIFRA

KHENIFRA

CERCLE MIDELT

LEGENDE

- LIMITE DE PROVINCE
- - - LIMITE DE COMMUNE RURALE
- ▬▬▬ LIMITE DE CERCLE
- LIMITE PRINCIPALE
- ⊙ CHEF-LIEU DE PROVINCE
- CHEF-LIEU DE CERCLE
- ▨ ZONE D'AMELIORATION PASTORALE

6°

5°

However, the Bank project expects significant increases in agricultural yields of cereals and irrigated crops, especially animal forages after reconstruction of the river irrigation areas.

#### 5.9.1 Nutrition Impact Critique of these Projects

As planned, the World Bank/FAO project pays little attention to pastoralist nutrition needs or production/consumption behavior. It makes the same assumptions as the AID project, that improved sale of livestock products will result in a higher incomes and hence better living standards for the resident population; it attempts to persuade them to cooperate with project methods. The sheer size, an entire watershed basin, of the World Bank project includes the AID project area on the Aridh Plain. This makes possible a regionally integrated socio-economic and nutrition-oriented development process; but it does not incorporate pastoralism into the planning process.

The orientation is firmly rooted in the same controlled perimeter range management as AID projects in Morocco. However, the Bank intends to radically change the complete land-use pattern of the Upper Moulouya, to transform its economy and alter the entire human social and administrative organization. Therefore, the risks of severe nutritional loss to a large number of pastoralist and farmers in the region are greater should the project implementation fail to produce desired results

rapidly. Since it cannot improve food production and consumption locally during the first three years of construction and deferred grazing, the Bank project counts on importing food grains for distribution to the beneficiary population in lieu of their existing mode of food acquisition. This too is a risky 'relief' activity, as it alters pastoral nutristructure. Since the Bank project also enforces sedentarization of nomadic or transhumant groups, it must deal with problems associated with nutritional loss in addition to the reduction of milk, meat and cereal food and wool availability from the herds and the lands.

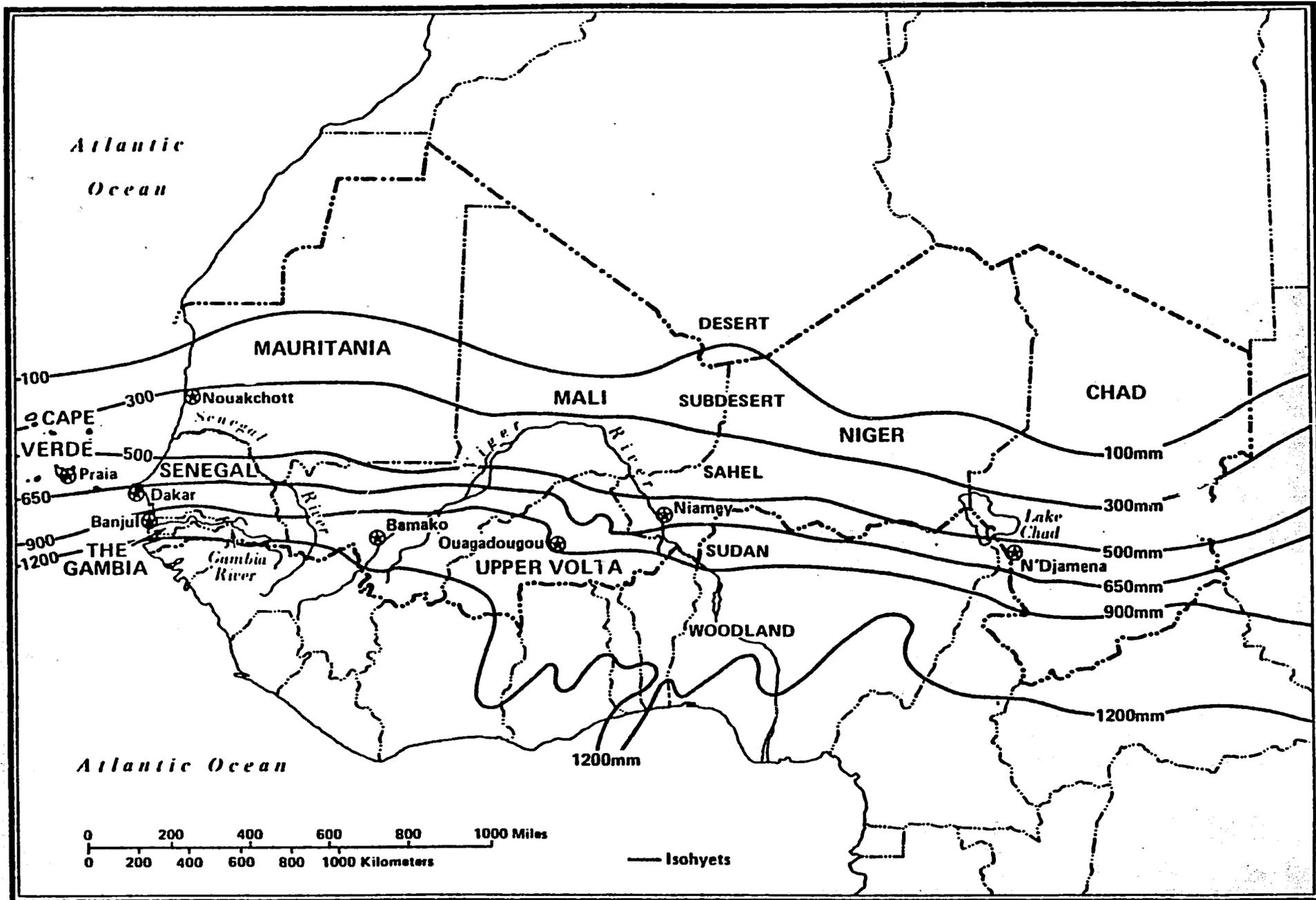
In the chapter on nutritionally sound alternatives these issues will be addressed from a nutrition impact perspective on project design.

6.0 CASE STUDIES CONTINUED, THE SAHEL:

The Impact of Drought on Human Nutrition among Sahelian Pastoralists

Recent reports on the impact of the 1968-74 Sahelian drought period highlight losses of one-third to one-half of the food supply of that African region as a major problem. The foods consumed by Sahelian pastoralists are those most affected by drought - milk, cereals and wild foods. As livestock numbers diminish due to death and sale for slaughter, this affects the human use of livestock as food in a variety of ways. Cows with inadequate grazing resources reproduce fewer calves, as do she-goats and other ruminants. This decreases the seasonal milk supply; starved cows also produce lower amounts of milk each day, and pastoralists must share this declining food substance with the young animals until they are weaned.<sup>1</sup>

Grain shortages of shifting cultivation crops also are exacerbated on dryland areas during drought periods. Wild plant foods decline due to lack of water, and game is reduced in numbers in drought-stricken areas. In addition, the adverse terms of trade created by economic losses of income tend to draw cereal foods away from drought-ridden areas toward regions of better climate and higher effective demand. Ironically pastoralists are obliged to sell off livestock at low prices for export to prevent starvation death losses; this tends to raise



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the meat supply in urban areas temporarily, while engendering disinvestment and long term decline in herds among pastoralists. Together these adverse conditions lead to a famine-prone situation. Donated cereal food relief efforts were used to supply adequate energy intakes to Sahelian peoples during the worst of the drought years, but could not approximate pastoral nutri-structure. <sup>2</sup>

Even after the return of the rains, it takes a number of years to rebuild the nutristructure of a pastoral system. As stated by Dahl and Hjort in a report on Livestock drought interactions in the Sahel, <sup>3</sup>

During the drought itself milk production is reduced owing to scarcity of fodder. Then when the rains return, milk production does not start until after the calves are born. The period of gestation varies from one species to another, being roughly five months for sheep and goats, nine for cattle and twelve for camels. Hence, a drought induces a transient pattern of milk production initially resembling that obtained in areas with one rainy season....The consequences of drought for livestock production tend to upset pastoral household economy for a long time after the return of the rains... Pastoralists will struggle with scarcity for a long time, having too little milk and too few animals...both the daily supply of food and continued access to primary means of production.

Hence, the imbalance between milk and grain supplies may continue to create malnutrition in pastoral systems for years after the end of a drought period. As the authors also point out, drought tends to accelerate a trend toward settling out of nomads, i.e. involuntary sedentarization due to loss of the herd. This increases the numbers of poor small farmers or

landless agricultural workers whose diets are permanently lacking in milk foods and resources other than planted crops. This causes increased risks of malnutrition especially among the vulnerable members of household groups, the pregnant and lactating women, infants and young children and the elderly. As stated by Kates, for the Sahelian drought,<sup>4</sup>

Overall, surveys suggest that the already high rates of acute malnutrition among young children (5%) doubled during the worst years of drought in severely affected areas.

Toward the end of the 1968-74 drought years AID and other donor relief efforts to provide food assistance directly to pastoralists groups were judged adequate to save many lives, but insufficient to re-establish a viable pastoral economy in the region. Livestock projects on improved rangelands become policy instruments aimed at replenishing the Sahel with sustained-yield livestock that could become relatively drought-proof. The following case study deals with an AID project of this sort.

### 6.1 Senegalese Livestock Development Policies

In Senegal little was done to implement livestock schemes for years after this West African country gained independence in 1960 with the breakup of the former French colonial system. The eastern region of Senegal is in the Sahel along the Upper Senegal River basin; the river borders Mauretania on the east

bank. Previously livestock (primarily cattle) were raised on both sides of the river and trekked to the Senegalese Atlantic coast capital city of Dakar for slaughter. However, with the coming of the Sahelian drought, this region received both foreign humanitarian assistance and donor offers to develop livestock/range projects for the future.

By the early 1970's Senegal's national policy toward livestock could be described thusly,<sup>5</sup>

An integrated stratified Northern [and eastern] geographical zone to serve as a breeding zone for a cow-calf operation. This area would provide yearlings for growing out areas located in the cash crop and farming regions of the peanut growing area. At a later stage, these animals would be transferred to the Cap Verde [coastal area near Dakar] for finishing, using agro-industrial byproducts.

AID's first project design in the Bakel area of Eastern Senegal began in 1973. A Scope of Work for the project design stated,<sup>6</sup>

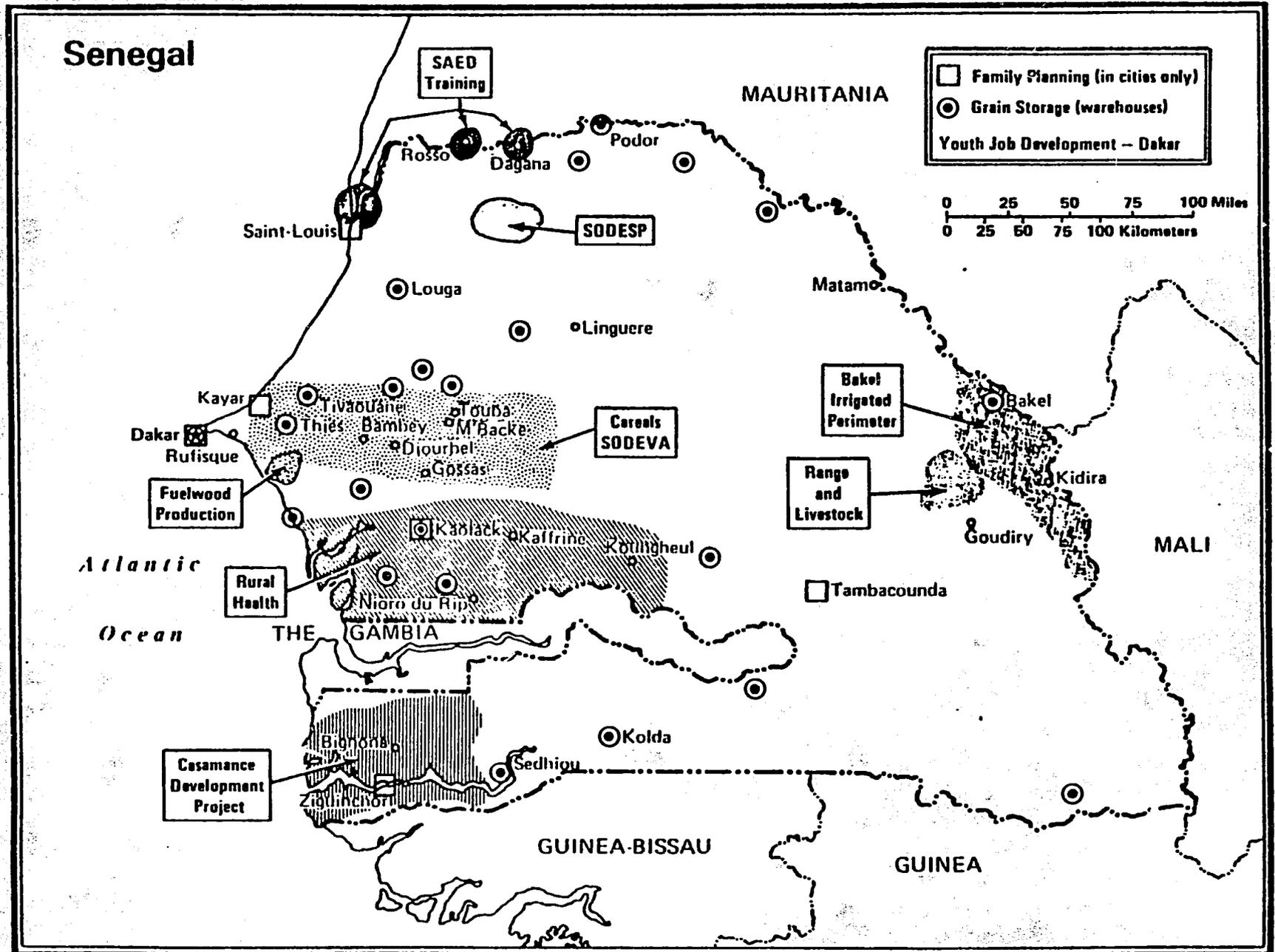
The primary objective of the project is to provide year-round improved grazing to the sedentary herdsmen over the medium term while at the same time to arrest further degradation of the range resources in the project area from overgrazing. The project will provide a pilot activity which may be used as a model for further rejuvenation of the Sahelian range...AID range experts have recommended that it be developed for year-round non-migratory, rest-rotation grazing for the exclusive use and the self-imposed management of the respective villages.

## 6.2 The Pastoral Setting in Eastern Senegal

The Bakel project was designed for sedentary village dwellers on the assumption that there was no pastoralist pattern of transhumance or nomadism. However, research on the communities of the region show that they are inhabited by Fulani-speaking Toucouleur and Peuls of cross-cutting ethnicity. The population follows a strategy of agro-pastoralism and regular transhumance in response to seasonal and multi-year cycles of rainfall.

Based on a study done in 1975,<sup>7</sup> the human population of the Diery (drylands) in which the project area was designated consists of approximately 2,500 inhabitants. They live on both sides of a ridge of rocky high ground known as the Continental Terminal. To the east the land slopes down to the Senegal River basin; to the west it descends toward the Ferlo, a broad Sahelian zone of Central Senegal. The Fulani groups in this area possess approximately twelve thousand cattle and a few thousand goats and hair sheep.

The main effects of the five-year drought that ended in 1974 were decimation of the herds, depletion of underground water supplies and reduction of the food supply needed to support the human population and the vegetation grazed by their herds. The demographic result was a decrease in livestock numbers of one-third or more and a ten percent decline in the



human population over the eight year period. The drought brought increased rates of infant mortality and decreased fertility levels; it encouraged out-migration of pastoralists to less affected areas.

Diery Fulani live in two distinct types of communities with differing ecological and geographic relationships to pastoralism:<sup>8</sup>

1) Larger stable villages of 100 to 300 persons with permanent wells located near the bottom of drainages on both sides of the Continental Terminal Ridge. These villages are dominated by Toucouleur social institutions and are sedentary in normal rainfall years, given over primarily to cultivation of rainfed lands. The populations own cattle, but confine them to the more nomadic segments of society who engaged in regular transhumance. Goats and sheep are kept near the villages as are dairy herds of cattle. A typical household owns about 40 head of cattle and a dozen small ruminants.

2) Smaller unstable hamlets of 30-75 inhabitants without deep wells since they are located further up the drainages nearer the grassy areas along the Continental ridge. These people, mainly Peul, are nomadic transhumants who migrate with their animals to the riverside during the dry season and spread out across the grasslands during the rainy periods. The Peul

average sixty or more head of cattle and some sheep and goats per extended family household, but also herd the cattle confided to them by Toucouleur villagers and outsiders.

When rainfall is good the smaller hamlets of Peul herders enlarge due to a shift of population and livestock from the larger communities in search of grass. But in times of drought the stabler settlements draw off population from the hamlets. Human group organization and herd size respond to vagaries of rainfall. Extended family compounds grow larger during drought periods when people cluster together to provide self-help; they split up in times of more adequate rainfall as the herd managing household units spread out over the range to find grasses for their enlarged herds.

The population of the Diery is stratified by ritual caste and occupational groups. Landholdings are less important than cattle holdings as sources of wealth, since there is much fallow land available for hoe-cultivation in the region. While most households exist by means of subsistence labor, the poorest are those which have lost the bulk of their herds during drought years. Their small adult labor force for herding and hoe-culture creates a labor and livestock bottleneck in achieving food production and consumption needs.

### 6.3 Pre-Project Nutristructure of the Fulani Pastoral Population<sup>9</sup>

The subsistence diet of Diery Fulani is derived from slash-and-burn cultivation of millet, maize and some sorghum or rice, consumed with ruminant milk. The people also barter milk or manure for extra millet, the staple grain, and other cereals from settled cultivators along the Upper Senegal River. Fulani women also gather a variety of leaves, fruits, stems and roots of Sahelian wild plants which are cooked with their cereals and milk. Goat or sheep meat is eaten irregularly, and Fulani men occasionally hunt wild game. Only on major ceremonial occasions are beef animals slaughtered for consumption. There is little poultry raised, and some dried fish meal is purchased in trade and added as relish to cooked dishes.

During the dry season Fulani pastoralists trek their livestock to the banks of the Upper Senegal River and its tributaries to obtain water and graze their animals on the residues of cultivated fields in exchange for animal manure and milk they supply to the farmers. The beginning of the rainy season in June-July draws the pastoralists back to the open range lands of the Diery. These are also the 'hunger months'. People hoe-cultivate fallow land for their grain crops while grazing livestock on new grasses. The combination creates heavy labor demands on all adults just when their food supplies

are at the lowest point of the year and the cows are calving and not yet in full milk. This is also the period when polluted water and insect disease vectors are most likely to circulate infections. It is the time when many women wean their babies from the breast and there is an elevation in the rate of young child malnutrition, diarrhea and mortality.

Rates of child protein-energy malnutrition tend to remain low during the years of good rains, increasing only seasonally during the hunger months. However, the persistent drought cycle results in an epidemic of young child malnutrition conditions such as Kwashiorkor and marasmus brought on from the loss of three major sources of protective foods: milk, grain and wild plants. Other vulnerable groups are the pregnant and lactating women, and the elderly.<sup>10</sup>

In order to maintain a balanced diet, Fulani divide the livestock milk production between human consumption and young animal consumption. The greatest nutritional stress falls on the poorer livestock graziers, the majority, who need milk for their children and themselves, but who also require milk to reconstitute their decimated herds after the drought. Although cereal cultivation is also affected by drought, relief grain supplied by the government ensured survival during the 1969-74 long dry spell. The main problem is not outright starvation but dietary imbalance. Donated cereal staples are available

and take the place of Fulani grains, but the necessary complementary dairy foods and wild foods are not plentiful enough during and after periods of rainlessness. A development project could be oriented to mitigate these nutrient imbalances and alleviate hunger.

#### 6.4 Part I: The Eastern Senegal Range/Livestock AID Project - Initial Design

Responding to a Senegalese government request for creation of a livestock development project on the eastern border lands, AID sent a regional design team to the Bakel area in 1974. The social analyst on the team was directed to incorporate elements recently mandated under New Directions legislation on providing for Basic Human Needs. The Project Paper reflected an extraordinarily insightful appreciation for beneficial nutrition impacts built into the project design. The key elements of this document are summarized below:<sup>11</sup>

The herding population of the project area is considered as the main beneficiary group. The project is to increase the local pastoralists' supply of milk, meat and income through sale of livestock and through work opportunities during project implementation. The project includes herder education and provision of markets for obtaining the best selling prices. A baseline data study permits a method for detecting the impact

of the project in these various aspects. The following statement from the Project Paper shows how well-tailored is the preliminary design:

Summary of Benefits: The benefits of this project fall into three categories: real, cash and asset maintenance. Real - much of the increased production, especially milk will be consumed by the herder and his family. Their improved nutrition constitutes a real benefit possibly even greater than the cash value of the milk....

Sheep and goats provide a substantial benefit...First, they are an important source of meat production. Second they are especially important for auto-consumption (even more important than cattle). Third, they produce much milk. Fourth, their reproductive rate is high, permitting a high off-take rate. Mutton and goat meat enjoy a premium price in the markets, selling about 15% above beef. Goat and sheep milk is priced the same as cows milk...The sheep and goat herds have generally been neglected by both the Government of Senegal and outside donors.

The primary impact of the project will be an increase in fecundity to 65% in cattle and 125% in sheep and goats, a decrease in calf hood mortality to 40% in all livestock and decrease in adult mortality to 8%; the offtake rate is projected to increase to 14% for cattle [currently 8%] and to 40-45% for sheep and goats [now 25%]. Present production of milk for human consumption is estimated to be 150 liters per milking cow and 75 liters per sheep or goat per annum. This is projected to double.

The project's real benefits--auto-consumption of meat and milk plus additional milk sold amounts to \$32.50 per animal unit per year. The internal rate of return is calculated to be just under 12%. The annual cash returns to the project will be nearly double the recurrent costs. Subsistence consumption benefits are expected to increase as follows:

	<u>Sheep/Goat Increase</u>	<u>Cattle Increase</u>
Milk	390%	367%
Meat	20%	33%

The third type of benefit, maintenance of the rangeland, is not quantifiable in dollar terms as land presently has only intrinsic value and no cash value, but it will be a longer range major benefit.

Other intended benefits include extension education of herder communities in a variety of fields including agriculture, home economics, nutrition, hygiene and family health for adults and youth. As stated in the annex on 'Human Constituents'<sup>12</sup>

Unless the project receives the full support of those at whom it is directed, the human constituents, it will fail. Thus the primary purpose ... is to achieve their maximum feasible participation in order to enhance the relevance of project planning, design and implementation [to their needs]...The people common to the project area will be the chief beneficiaries of project implementation...They will in turn directly influence the project itself...Project monitoring, evaluation and impact analysis are all natural correlatives of these considerations.

The project is designed to organize herder communities into grazing 'committees'; project zones will be led by councils made up of the leaders of each such committee; an assembly of appointed zone leaders will interact with the project technical and management staff on behalf of their constituents. The range management system based on rotation of mixed herds of cattle, sheep and goats within an unfenced area of grasslands according to water and grass availability gives maximum control over the

livestock to their herders. In addition a village-based milking herd would be maintained,<sup>13</sup>

...basically in the same way as at the present time. It will be kept in the villages at night and graze nearby during the day. The milking animals will be kept near the village only while they are producing milk for human consumption...Based on the needs of each village an adjacent area will be set aside for the animals to be milked...divided into a four pasture rotation system.

The cultivation of crops was to be encouraged on a sedentary village pattern and shifting cultivation by slash-and-burn methods would be discouraged where appropriate. As the Project Paper states,

The land to be cultivated in each block...includes areas around each village as well as other traditionally tilled areas...The needs of both the herders and cultivators must be adequately considered. Both groups are to be appropriately involved in the design of any rational grazing/cultivating system within the perimeter... Use of crop rotation system should include legumes and application of natural fertilizers should be encouraged.

The overall project also includes sub-segments focussed on improving the human drinking and household water supply, as well as that for use by livestock:

To make proper use of the range resources, substantial supplies of water must be developed for both livestock and humans...Water development has been given a priority in the project. Ponds used for human consumption as well as animal watering should be piped to troughs below the dam.

The project includes digging shallow wells and boring deep wells for village use. It envisages construction of a variety of underground and surface water reservoirs, deep pits, and

water-spreading dikes on the perimeter. In congruence with the emphasis on human nutrition, the plan points out that increased numbers of water points for village milk herds on their separate pastures will be needed "over that of a project based on a straight beef herd." In short, this project contains plans for all known major nutrition impact issue areas discussed in this paper. It also calls for attention to the possibility that transhumance of livestock and pastoralists may be a factor despite Senegalese government insistence that the population was sedentary. Therefore a detailed sociological study prior to implementation is recommended, intended to, "play a major role in the detailed design of the range management system implemented under the project." However, for a variety of reasons the sociological study performed by an independent consultant was not included in the detailed design. As we shall see, the nutrition benefits cited above were also removed.

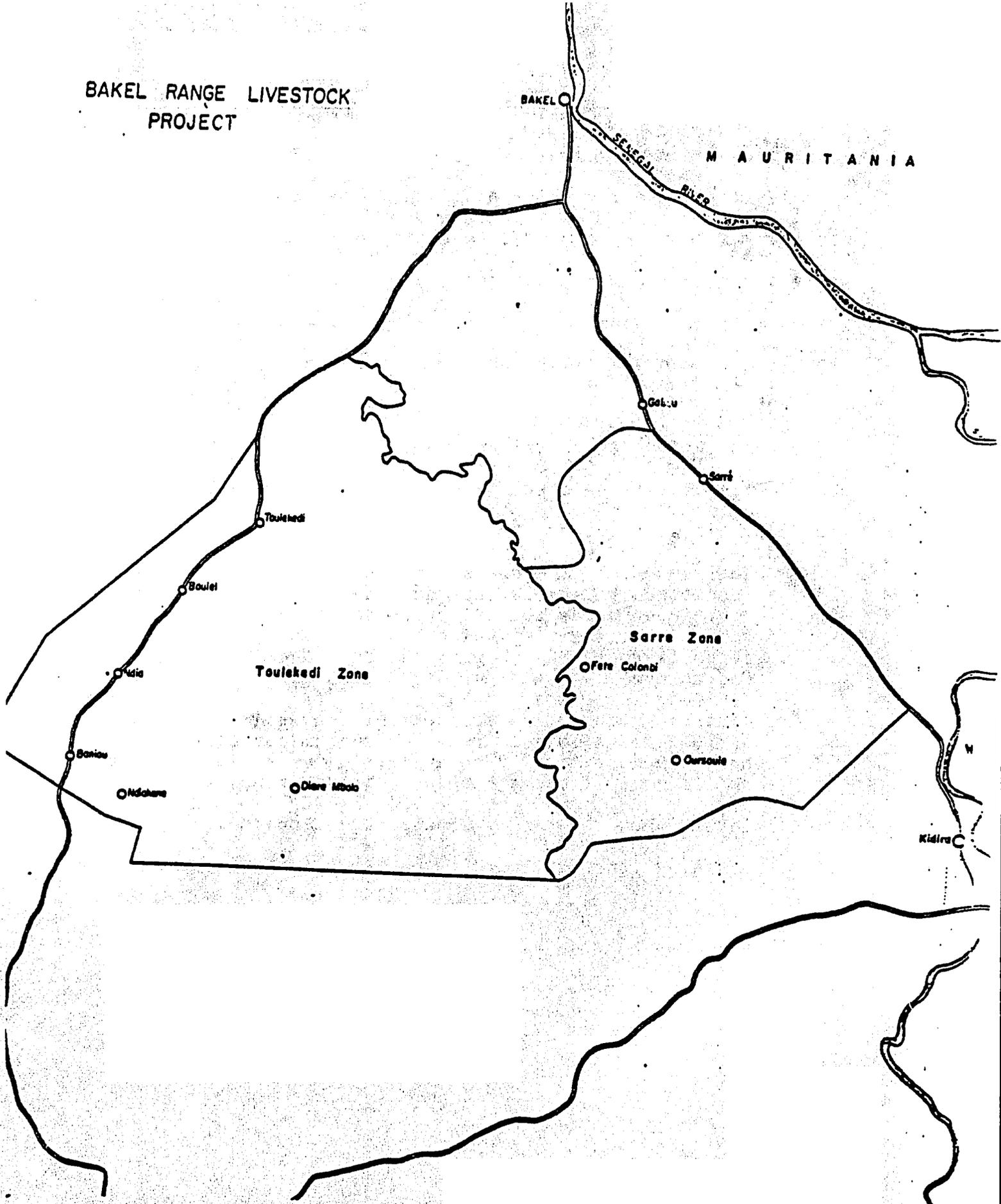
#### 6.5 Part II: Eastern Senegal - The Detailed Range Management Design.

In the summer of 1975 a detailed design contract team was dispatched to Eastern Senegal by AID for a period of 50 days. About two-thirds of the time was spent in the field, the remainder in the Dakar area. The sociological component of this design was slated to be a major feature in the overall

approach with critical attention paid to the basic needs of the pastoralist and farmer 'human constituents'. Despite the presence of a nutritional anthropologist and a health economist on the team, the contractor's eventual design report abridged or elided much of the socio-economic and nutritional elements for the final design document.<sup>14</sup> All aspects of subsistence consumption of products of the livestock development work were shunted to the appendix. Thus, concern for the milk herd, small ruminants, cereal cultivation and human water supply were not included in the up-front range management investment plan. The final design also assumed that the human constituents in the project area were sedentarized villagers despite a census of the area which revealed a significant nomadic-transhumant segment of the population (as described in the Setting, chapter 6.1)

The detailed design emerged as a standard beef production/range conservation project for herding cattle on a controlled range area without a human basic needs component. The only concession to the pastoral population was a separate range and community extension education program to be conducted by the Senegalese government rural extension agency. The project was designed as if the pastoralist population existed only as a hired or volunteer labor force relegated to fixed village sites with no control over the herds and without cultivable lands.

BAKEL RANGE LIVESTOCK  
PROJECT



## 6.6 Project Implementation and Evaluation

a) Project implementation was delayed until 1978 under direct hire AID technical staff. Meanwhile the Senegalese Ministry of Human Promotion received an AID grant to educate and sensitize the recipient population of the project area, and to carry out the recommended baseline socio-economic survey. This human development component was the first to begin operations in 1976. Senegalese staff carried out a survey of livestock and human groups in the area and began the extension activities.

An evaluation of this segment was conducted by the USAID/Dakar staff assisted by the Senegalese project director in 1978. It stated that,<sup>15</sup>

The Promotion Humaine assignment was worthwhile - it sensitized villagers, and advisablitiy of continuing activities needs investigation as it requires more funds...One activity which has not met design requirements is that dealing with the sociological study that was to provide baseline data. Even though a survey was conducted...it does not adequately furnish the baseline data on which future progress of the project can be evaluated. A more thorough mechanism for collecting baseline data for future evaluation of social acceptance and economic factors should be begun.

Later, when the range management component was underway, a second evaluation team composed of the Joint U.S.-Senegalese Assessment group visited the project in March-April, 1980. This group came to a very different conclusion concerning the role of Promotion Humaine,<sup>16</sup> stating,

Those serving as extension personnel are Promotion Humaine 'animateurs' rather than livestock technicians. They are not trained or inclined to gather necessary data or to give technical advice. Whereas their role has been to 'sensitize' the villagers, the evaluation team concluded that the animateurs have instead tended to become a barrier to better understanding between villagers and project leaders. The fact that the animateurs do not speak the local language (Pular) has hindered their own ability to communicate.\*

The Joint Assessment team also concluded that the Promotion Humaine survey of the project socio-economic conditions was inadequate for development and evaluation of progress in the range management and herder use of land and water resources for livestock, especially cattle, production. In short, the extension and research aspects of the project were found to be unacceptable or deficient.

b) Range Infrastructure Development: The construction of range water facilities for livestock began in June 1978, but had many delays. The Joint Assessment Team found that the backbone of the cattle watering system, a series of pit-type ponds dispersed across the grasslands, was incomplete in 1980. It then pointed to the need for human water supplies as well as herder participation: 17

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\* This conclusion was presaged during the design effort and reported by Teitelbaum (1976).

In as much as only two of twenty-six ponds were completed prior to onset of the rains in June, 1979, the evaluation team was unable to comment on the success or failure of the overall undertaking. The beneficiary study showed herder dissatisfaction; the ponds were 10-15 kilometers distant from some villages and being remote, attracted beasts of prey. The herders registered clearly in favor of digging of new village wells or the repair of old ones...It was not possible to verify any gains which may have occurred in forage or animal production...The survey indicates that the local herder organizations have only a 'paper' reality...Lack of participation by beneficiaries has restricted project accomplishments.

An AID/Senegal staff evaluation statement issued in 1980 gave a very different picture,<sup>18</sup>

Herder cooperation has been good. Though it is too early in the project for the herders to realize benefits, nevertheless they are enthusiastically contributing their attention, their time and their labor in cooperation... Herder organization is important and cannot be underplayed - it is the voice of the individual herder vis-a-vis government, middlemen, merchants, etc.

In the meantime an AID/Dakar mission cable to Washington in 1979 claimed to have discovered real development benefits, stating that the completed ponds were well used for livestock watering, that the Senegalese government was providing cattle transport vehicles for marketing of livestock, and that AID had established a revolving fund to purchase cattle for off-take. The cable said,<sup>19</sup>

Herder families benefited greatly by:

- 1) reduction in herd use of village water wells thus allowing more water for household use.
- 2) less arduous labor for drawing water
- 3) healthier cattle and higher milk yields
- 4) firebreaks preventing bushfires

In sharp contrast, the Joint Assessment team ended its brief report with the critique that the project was not helping pastoralists. It also stated,<sup>20</sup>

Even in design, the project was not well-linked with either the national livestock sector nor with other sectors, i.e., no plans were made for marketing activities. It is questionable whether the project can make any direct contribution to the national goal of meat self-sufficiency.

A problem recognized in both evaluation reports was the slow implementation of firebreaks to prevent range-burning. The AID Mission 1979 evaluation pointed out that many areas of the project zone had been deliberately burned despite the project objective of ending this practice, and that the education program to change it was not working. "Villagers set fires to frighten away predators (snakes and wild animals) hidden in high grasses...Other means of predator control are needed if bush fire control program is to succeed."

In one area only was there unanimity on the positive impact of a project activity - that of animal veterinary health care. The Veterinary Service component was found to have been properly implemented and providing regular disease control services. The survey showed herder satisfaction with this aspect, including vaccinations and medicines for the cattle. However, no health services for the human constituents were offered by the project and no mention is made in the evaluations of measurable human nutrition impacts of the project.

6.7 The Range/Livestock Project; Nutrition Impact Analysis.

Although the Eastern Senegal project suffered many delays and has only been initiated recently, its potential for fulfilling the detailed design objectives - increased beef production and decreased herd grazing pressures on the land - is already compromised. The increase in animal health was the only successful component, and this appears likely to raise the number of cattle on the range; the fire-prevention program is not working; the water ponds are too few and dispersed to offer a village-based range resource. Lack of an adequate marketing system further limits beef off-take. The Promotion Humaine extension activity appears to have come into conflict with the range management objectives of the project; also this agency missed an opportunity to collect appropriate baseline socio-economic data with which to measure project progress. As we have seen, two AID evaluation teams came to nearly opposite conclusions on major aspects of project implementation and utility, each based on qualitative impressions from quick visits to the field.

The positive nutrition-oriented goals of the Project Paper were completely abandoned by the detailed project plan which became the implementation document. Without this nutritional improvement focus the project seems incapable of addressing nutrition issues directly. This is a classic case

of a missed opportunity to test the effectiveness of a well conceived pastoralist-oriented project since the design was changed into a standard range management technological model. Animal nutrition took priority over human nutrition.<sup>21</sup>

Since the project was so little advanced, it could have little direct adverse impact on pastoralists. However, potentially, it could have a negative impact in preventing transhumance, since the design assumed that all the project area inhabitants lived in sedentary villages despite clear indications to the contrary. If forced to sedentarize, Fulani nutristructure would be undermined. The attention given to cattle to the exclusion of goats and sheep also could reduce the adaptability of the project to pastoralist dietary needs, especially for milk and some meat. In addition, the lack of planning for a dairy herd of cows near human settlements could deprive pastoralists and farmers of a significant share of their subsistence milk supply essential to their nutristructure. Since the detailed design did not include creation of a cultivation zone, but attempted to separate the livestock herds from the tilled areas, the loss of field manuring could reduce local cereal production. If slash-and-burn cultivation were banned to prevent bush fires, then this too could hurt fertilization and severely restrict fallow plots of land. Indeed, it seems that crop and livestock predators increased as a result of the

anti-fire precautions, thus further threatening indigenous food supplies. Possibly some wild plant and animal foods would be more plentiful in the absence of rangeland bush fires, but others may grow scarce.

Since the Fulani were no longer to be in charge of their household herds, the project had the potential of ignoring useful pastoralist knowledge of the environment, and succumbing to excessive livestock losses associated with major outside forces such as disease epidemics introduced from the outside or drought on the rangelands. The planned outlawing of herd mobility through transhumance and access to the riveraine areas could add to these losses.

Altogether, the Eastern Senegal Livestock/Range Management Project has the earmarks of a serious set of negative nutritional impacts should its technical inputs be implemented despite the non-cooperation of the pastoralist herders involved. Unless the implementation plan is re-evaluated and redesigned to once again introduce beneficial nutrition-related and economic components in an integrated fashion, its success in human and livestock terms appears unlikely. It is an example of a clear contradiction between the dietary and subsistence interests of the pastoralists of the area and the external demands of government and donor meat-production and soil conservation policy. The project defers all benefits for the human target

population for years and places a heavy burden of decreased food staples on grazier way of life and survival.

#### 6.8 Nutrition-Oriented Alternatives for the Development of Pastoralism in the Sahel and North Africa

It is clear from the project case studies and from available information on the nutristructure of pastoral peoples that range management as a priority technique for livestock development is open to question. The majority of AID projects of this sort have not been successful by their own criteria. Overly ambitious implementation schedules have been excessively delayed; some have engendered pastoralist resistance or non-cooperation. In the short term the deferred grazing and destocking aspects are synonymous with a reduction in subsistence dietary resources and wealth for pastoral populations. It is hardly surprising that pastoralists are "uncooperative". Over the longer run, range projects risk compromising the self-sufficiency and mobility of nomadic peoples in drought-prone environments, and hence their nutritional stability.

On the other hand, project designs which emphasize improvement of traditional pastoralist subsistence conditions and associated dietary resources tend to be discounted by meat production and land conservation oriented development planners in donor agencies and by host government agriculture officials.

Nevertheless, AID now has a greater variety of strategies that provide nutrition-oriented alternatives in project design, as a result of recent rethinking of policies and project objectives and methods. The following are some examples:

In the Sahel there are recently devised development projects which offer positive nutrition orientations. The Niger Range and Livestock Project initiated in 1979 is a fascinating example.<sup>22</sup> In addition to improvements intended to raise the capacity of land and water resources for livestock, its goals include provision of food grains and other food products to pastoralists, and social services including human health, water supply, and education. The project does not attempt a radical change in herding management systems for the migratory nomadic populations involved; nor is it preoccupied with immediate reductions in animal numbers. It strives to make the range improvement plan compatible with the seasonal transhumance of the pastoral nomads themselves.

This project is thus far the research precursor to a larger second phase to begin in the 1980's, which will involve a heavy component of animal health improvement measures and water development. Its nutritional implications are potentially positive; nomadic groups are to receive real improvements in livestock resources without major changes in traditional practices, thus increasing their dietary supplies and nutritional

health conditions, while retaining their mobility on the rangeland. For project of this innovative type it will be critical to build in a nutrition impact component based on empirical data describing the pastoralists' nutristructure and potential beneficial adaptations in diet as changes are introduced.

The Village Livestock Project in Upper Volta was initiated in 1977.<sup>23</sup> It is oriented toward an area of mixed farming and pastoralism, and aims to improve the dietary intake of the sedentary and nomadic ethnic communities of the region through a wide variety of animal husbandry and crop cultivation improvements. The first task was the preparation of a detailed baseline survey of the multiple factors affecting livestock raising among the ethnic communities of the project area. This report has been completed; it offers richly detailed data and analysis of micro-environmental conditions, community and household composition, and livestock holdings and practices. The study also deals with the perceptions about livestock-raisers by the various ethnic groups in the villages of the project area, and gives a strategic explanation of several degrees of nomadism in terms of the food and land resources available. The study serves as a benchmark for measuring the impact of interventions which could include a variety of husbandry improvements and community level education on household economics and diet.

More research-oriented than implementation based, this project is to be phased out. It is to be hoped that a carefully designed integrated livestock and agriculture improvement project will follow, taking full advantage of the research baseline data, and incorporating community perceptions and uses of livestock into the program. In this way the nutritional benefits for both nomadic systems for food-getting and settled farming operations can be optimized for pastoralists and cultivators of the area.

The SODESP project in Northern Senegal is another example of a compensatory livestock project that includes some adaptive nutrition elements<sup>24</sup>. AID is underwriting a section of the multi-donor project in the drylands near the Lower Senegal River irrigated agriculture zone. Due to on-going riveraine large-scale crop development, herdsmen can no longer transhume with their livestock to the river banks during the dry season. Fulani pastoralists have been obliged to sedentarize, creating environmental and livestock losses and human malnutrition. SODESP provides deep bore wells and reforestation with managed grazing areas away from the wells. The project is a part of the livestock 'stratification' offtake design that is national policy in Senegal. It is well situated to provide a cow/calf breeding area for coastal agricultural and urban communities.

However, the project supplies pastoralists with improved housing and water for human consumption, trucks in food for the herding communities, and offers medical services to people as well as veterinary assistance for their herds. It offers credit and marketing facilities for livestock offtake, including truck transport south toward Dakar. It also has a carefully devised sequential baseline data collection system built in. Although there is as yet little data to demonstrate positive nutrition impacts, the possibilities of this project are reasonably good. The scheme attempts to transform pastoralists who have lost their transhumant land and water base into specialized calf breeders on controlled ranges. In light of the difficulties associated with this approach to development, a carefully planned sub-project to assure a smooth dietary transition to new production and consumption conditions is essential. This project should be monitored for nutrition impacts.

In Morocco and other parts of North Africa, AID and the World Bank have planned range management projects with virtually no attention to the dietary conditions and nutritional needs of pastoralists or farmers. The recently designed Upper Moulouya projects are examples of this. However, both donor agencies and the Moroccan government have room for nutrition-oriented redesign of their project plans which are still

sufficiently vague and at flexible points in the process to be adapted to the nutritional and social conditions of the pastoralists and farmers of these areas.

A nutritionally appropriate design that fits the human geography of the Upper Moulouya was recently suggested by this author in a publication, as a system of managed transhumance:<sup>25</sup>

By following certain criteria a rural development agency can conserve the soil and vegetation of the Inter-Atlas, improve animal productivity and renew tribal social integration. To achieve this set of goals, tribal rights in collective lands should be reinstated rather than eliminated. Hills and plateaus should be limited to use by transhumant herds on a seasonal basis once again...A more modern form of transhumant sheep [and goat] herding is now possible...A new system of collective land use could build upon the geography of tribal settlement. Village communities are located like beads threaded along the tributaries of the Moulouya River. They form longitudinal chains from the foothills to the river channel with its tributaries as their cores...By redrawing (range) district boundaries to include entire tributaries, herdsman from all the villages along a stream would have access to summer (and autumn) grazing in the Atlas mountains and winter (and spring) grazing on the plateaux...Feed crops of high nutritive value can be raised to supplement forage when grasses are scarce...

Under these conditions measures to improve the productivity of herds and initiate range management programs may prove more successful...With the reintroduction of managed transhumance...marital bonds may be strengthened,... health measures could be introduced to control venereal disease and provide better sanitation and nutrition.

Since the World Bank project includes the entire watershed of the Upper Moulouya, it offers the potential for planning a

human nutrition-oriented, ecologically integrated and economically sound development structure that is responsive to the needs of semi-nomads and nomads as well as the settled farming populations of this rapidly changing highland region. The planning will require careful attention to the dietary resources and social conditions as well as environmental constraints. Without this, it is likely that more areas of grazing land will be converted to tillage as tribal populations attempt to counteract and preclude their transformation into range management zones beyond local control.

The opportunity to develop meat and fiber production for sustained offtake from small ruminants is better in this Moroccan context than for large animals. With proper attention to multi-purpose use of herds and encouragement of managed transhumance the development strategy has a reasonable possibility for success.

## 7.0 SUMMARY RECOMMENDATIONS AND SUGGESTED GUIDELINES FOR POLICY AND PROJECT PLANNING

As indicated in the analysis of pastoralist nutritructure, the AID range/livestock development project history and the Case Study illustrations, one finds little concrete information on actual nutrition impacts of past and current development efforts in this field. There is a built-in lag in the intended outcomes due to the deferred nature of benefits (income) expected from project inputs. However, a variety of unexpected impacts and concerns about adverse nutritional effects have been signaled in this paper. In fact, pastoralist resistance or non-cooperation and land takeovers provide clear indications that livestock/range development projects as currently designed do not meet their needs for food, health and income.

### 7.1 Recommendations for Project Design Criteria.

Project design should include a concern from the start with the real and immediate food and dietary needs of pastoralist populations. Short-term economic effects should be taken as seriously as longer-term production results. The following factors should be considered before launching a livestock project in a pastoral area:

- a) determination and allocation (if feasible) of land use and water access rights in the pastoral zone among the stock-keeping and owning populations.

From the nutritional point of view, this will provide a secure resource base for equitable exploitation of the range environment by pastoralists who depend on livestock for their basic food supply.

- b) Assessment of the availability of water for livestock and human groups for both home use and agricultural production, and adjustment of development plans to the vagaries of rainfall and ground water resources. Water resources management is a major element in the provision of a self-sufficient food supply for pastoralists; and adequate quantities of safe drinking water are essential to human health and nutrition.
- c) Maintenance of mixed species of livestock on the rangelands is necessary to the milk supply system of pastoralists. Milk herds should be considered first in livestock project design, as without them the nutristructure of the diet, across seasons, can be impaired. Also multipurpose economic herd products such as wool, hair and hides of various livestock species need to be considered in calculating project benefits and trade-offs.
- d) Pastoralists' cultivations on rangelands should be assessed and encouraged rather than discouraged. Cereal cultivation is a primary food/nutrient

energy resource. Use of natural livestock droppings as fertilizer should be retained and encouraged. Use of crop residues in the field should be considered for animal fodder as well as cut forages.

- e) Provision of human health care should be included along with the veterinary health care component of livestock project planning, especially preventive measures such as vaccinations and primary health care facilities and first aid. Nutritional rehabilitation and nutrition and child feeding education should also be elements of the design where epidemiologically and culturally indicated.
- f) An adaptive education program for adults concerning livestock and land improvements should be developed using project staff skilled in communications, knowledgeable of the pastoralist group language and culture, and willing to learn from the pastoralist as well as to provide extension education.
- g) Existing pastoral groupings suited to the range use conditions should be consulted and given increasing decision powers over project plans, and herding households should retain their capacity for mobility and close management of the livestock.

## 7.2 Suggested Nutrition Impact Guidelines for Pastoralist Project Planning

A variety of technical models are used in livestock/range development efforts among pastoral peoples. Each project must adapt its approach to the specific characteristics of the types of ruminants, geomorphology and soil, vegetation and climatic conditions of the range areas as well as the food production and consumption practices of the herding populations. It must, at times, also build in an off-take surplus of product in congruence with government policies and development purpose. However, it is fundamental to development policy aims that an improved nutritional outcome be designed into livestock projects in light of the sensitive dietary balances needed to maintain pastoralist nutriture and nutritional well-being.

The nutritional soundness of a project design is a necessary element of the social analysis and economic cost-benefit calculations. As this paper demonstrates, it involves cross-cutting inter-sectoral issues of pastoralist human ecology: subsistence production and consumption of food and water; dietary staples and supplements; the role of women in the pastoralist enterprise; and the health and population dynamics of the target group.

### Procedures

The following procedures for project identification, assessment and design are suggested as nutritional guidelines for AID consideration.

- 1) First, ask a set of necessary (see below) questions which bring out the obvious nutrition impacts of intended outcomes of the project for pastoralists.
- 2) Answers may suggest options to compensate for direct negative impacts with targeted interventions that improve the availability of scarce nutrients.
- 3) Next, raise questions that deal with unobvious or unintended potential spillover effects of projects, also to be addressed in the planning and monitoring processes. These include interactions that may indirectly deprive pastoralists of adequate nutrition by adversely impacting their food supply, income and price of food substitutes, or lessened availability of essential foods at critical points in project implementation. Moreover, some unintended interactions may also be shown to provide positive nutrition results.

Major nutrition-related questions to be answered in identifying and designing projects are as follows\*:

- 1) What are the nutritional problems prevalent in the pastoral population? Which members of the community are more malnourished according to strata and household age-sex category? How do deficient or vulnerable nutrition states of pastoralists relate to the basic dietary pattern of the population in relation to herding of livestock and use of livestock for food?

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\* These questions are drawn largely from Pinstrup - Anderson's list, and are reduced or expanded as appropriate to the special limitations of pastoral livestock project conditions.<sup>1</sup>

- 2) How will project activities affect the production levels and subsistence availability of pastoralist foods, especially those consumed by the most at-risk members of the population? Will home consumption of subsistence foods increase, decrease or be unaffected by the project?
- 3) Will the project alter seasonal availability of specific foods used by pastoralists, especially in seasons which are considered to be nutritionally precarious? How will project affect the food supply during extremes of adverse weather for food production such as drought, flood, etc.?
- 4) What will be the impact of the project on the market supply of pastoralist food products, in terms of availability and price? How will off-take of project foods affect the market price of these foods and the prosperity of pastoralists who consume them?
- 5) What will be the economic costs of the project to pastoralists, and how will these cost burdens be distributed across the population strata? What income improvements can be expected for pastoralists and other beneficiaries, and how distributed? What delays can be expected in receiving income from the project due to deferred use of resources?
- 6) How might the project interventions affect the expenditure of labor and time by pastoral society members, especially for the more deprived strata; within the household among men, women and children? How could the project impact upon the

existing intra-household distribution of income, food and budget expenditures? What effect could this have on the food consumption pattern of individuals, especially those in the nutritionally vulnerable groups such as mothers and their young children?

7) Does the project's overall degree and type of change lead to foreseeable major second round nutrition impacts which can be anticipated in the design?

### Project Design Stages

Once the questions have been asked at a preliminary stage, they should be reiterated at each stage in the development of a project design. These stages are the Project Identification Document, the Project Paper, baseline data collection, survey analysis, progress monitoring, and Project Evaluation.

1) At the Project Identification Stage, the AID Mission should seek to develop cooperative efforts between the Agriculture Division and the Health/Population/Nutrition Division staff in preliminary review of potential project sites. Host government agencies should be made fully aware that AID considers pastoral peoples' diet and nutrition to be of critical importance in setting the goals for a project area, and that a joint effort by host government central ministries and regional officials will be necessary in generating the technical assistance design. In addition, a variety of inputs from pastoral

group leaders or representatives in the design phase will be the essence in taking steps toward identification of project area inputs.

2) The Project Identification Document should include a presentation on the relationship of the proposed livestock development activity to the land tenure, land and water uses of pastoralists and other groups in the area. It should also define the boundaries of the project location suited to the human geography and ecology of the zone. The PID should state in general how the project is expected to impinge on pastoralists in terms of nomadic movements and possible sedentarization, on herd management techniques and the uses of herd products by pastoralists and others. It should identify the major food items in pastoralist diet and the nutritional importance of each food commodity in terms of human quantitative and qualitative dietary needs. It should state which herd products are intended as offtake and the expected output levels.

3) Based on the major questions posed above and the critical nutrition impact issues for pastoralists, a scope of work for field design of the Project Paper should include the items listed, and respond quantitatively to the potential effects of the project changes on pastoralist diets. A key member of the design team should be a pastoral anthropologist familiar with the languages and cultures of the project area; one able to translate dietary practices and foods into nutritional values and determine nutristructural linkages.

This project design effort requires coordination such that the following elements are built into the inputs and schematic of the design document: Anticipated effects of the project activities on milk production by livestock of each species according to their proportion in the herds; subsistence consumption levels of milk by pastoralists; division of labor in milking and herding, and seasonal marketing of milk products; anticipated effects of the project activities on pastoralist access to gathered and hunted foods on the range land; potential losses to livestock and food supplies from wild animal predators and crop pests.

The design team approach should also focus on the level of crop cultivation by pastoralists, type of tillage and food crops planted on project lands. The multiple uses of livestock products e.g., droppings as fertilizer and wool, hair and hides should be determined. The field team should also assess shifting cultivation, vegetation burning versus other forms of soil preparation, and the role played by draught animals from the herds in plowing and cultivation, transport of food crops and use of crop residues or byproducts for livestock feed. The actual degree of livestock intrusion and damages to cultivated plots should also be assessed, especially in areas of agro-pastoral interaction. A design team should attempt to judge the attitudinal context and experiences of the pastoral people with previous livestock development or conservation efforts and consider their openness or degree of resistance to new projects.

### 7.3.1 Pre-Implementation Stage Design

One component of all livestock projects should be a baseline socio-economic and dietary survey to provide information on the living conditions of pastoral peoples, and their livestock practices and other food acquisition methods. The baseline survey will serve as a pre-implementation benchmark to measure progress during the project by monitoring changes, and as a means of evaluating the effectiveness of livestock projects in both production and human nutrition impacts on the pastoralists. The data to be collected should include:<sup>2</sup>

a) The socio-demographic profile of the pastoralist groups including population size and composition by age, gender and type of residence; population dynamics including human fertility, mortality and morbidity trends, with special attention to the nutritionally at-risk segments the mothers and their infants and young children. Migration should also be measured since pastoralists form a 'moving' target population. Other factors such as seasonal movements with herds, in-migration and out-migration (in association with project changes), may be critical indicators of availability of nutritional resources in the area.

b) Nutrition-related health and morbidity should be measured including:

i) incidence of vector-borne diseases and changes in prevalence of zoonoses and parasitic infestations of

humans in close association with livestock herds; food and water-borne outbreaks. This can be obtained through veterinary and sanitary observations and health records.

ii) epidemic and endemic childhood diseases including: seasonal child diarrhea and intestinal infections, rates of young child dehydration. This will require health care data and epidemiological data.

iii) measures of anthropometric and clinical degrees of protein, energy or other forms of malnutrition, especially among weaned and growing children. This can be carried out through a monitoring survey such as the nutrition assessment surveillance system devised by the Center for Disease Control for use by AID.

iv) dietary intake and food consumption of households and vulnerable individuals should be determined by repeated sample studies of the target pastoral population as the project proceeds.

### 7.2.2 Design Review Stage

The review process for a Project Paper should include distribution to the following AID organizational units:

1) Social analysts and nutrition advisers in the Regional Bureaus should be given the opportunity to comment on the social and nutritional aspects of the project. Rural development economists should have an input on the basis for rate of return calculations and cost-benefit trade-offs anticipated.<sup>3</sup>

2) For analysis of the nutrient interactions and nutritional health components of the project and for advice on a consistent method for monitoring nutritional status of pastoral groups, the Nutrition Office should provide a comment and advisory function.

3) The role of the Program and Policy Coordination Office is three fold:

a) An evaluation component should be built-in to the project in close coordination with the Office of Evaluation. The baseline data collection instrument should be designed for consistency across projects as well as for measurement of specific aspects of each project. Evaluation should be considered part of the project design, rather than an afterthought. In addition to progress reports from the field a set of checkpoints for process evaluation of the project's nutritional impacts should be considered, with summative evaluation slated for a point in time when deferred effects of the project are expected to occur.

b) At the Central AID/Washington level the Project Paper should receive comments from the Women in Development Office, since the impact of livestock projects on women's roles is closely linked to the nutritional conditions of mothers and young children.

c) The Human Resources Office of PPC should provide the review function for pastoral/livestock projects to

produce development of food production, it is important that PPC consider each new project with care, note its use of range and livestock technology, and the track record for such project models of the past. PPC should also take a hand in determining the degree to which the national policy of the developing country government is conducive to protecting their pastoral peoples from the excesses of wider society development demands. This includes a review of other development projects in the vicinity and their potential effects on herd movements and linkage to national markets, as well as policies on rural land tenure especially in collective lands where individual ownership is problematic. One function of PPC should be to assess the degree to which the project plan involves pastoralists in the design and implementation, the adaptive aspects of the plan to suit pastoralist needs, and the compensatory and basic needs benefits the project expects to offer to pastoralists especially during the implementation phase.

d) PPC should also maintain liaison with other international donor organizations such as the international banks and bilateral agencies working in the livestock development field. It is important that projects financed by other agencies receive overall policy and location review at AID in order to prevent overlaps,

avoid conflicts in the field, and in order to devise strategies for coordination and cooperation in the area of enhancing nutritional impact through consistent guidelines.

### 7.3 Ending

During the past two decades the developing countries with pastoral populations have experienced a dramatic rise in national policy expectations for meat production from rangeland livestock as part of the development process, followed by a precipitous decline in donor-assistance in the livestock development sub-sector. The reasons for this turn-about, as described in this paper, are in part due to the lack of success in the range management/livestock meat production efforts of the 1970's. Some underlying reasons involve the lack of pastoralist willingness to participate in the projects as designed, and administrative or technical problems with which technical field staff and host governments cannot cope. Despite a policy mandate to increase food production in developing countries while serving the basic needs of the rural peoples, the number of livestock projects has declined and the budgets of donor agencies have not increased even as the total budget for food and agricultural development rose several fold.

With the beginning of the 1980's a broader set of pastoral development options has come into play. There is new opportunity to draw upon the lessons learned from past livestock projects and apply them to improving the chances for

achieving realistic development between now and the end of the Twentieth Century. One intent of this detailed analysis and review of AID livestock activities in terms of their nutritional impact is to focus the attention of development planners on the fundamental issues which place some project designs at odds with the nutritional needs and dietary patterns of pastoralists.

It is hoped that the critical nutrition impact issues highlighted here will contribute to improve project design, expectations and evaluation in the future. The goal is to make success possible through attention to pastoralist nutritional structure, to encourage a new commitment to appropriate development of pastoral economy, and to focus on pastoralists as part of the wider society to which they can make a particular contribution.

## APPENDICES

1.0 LIST OF EXPERTS CONTACTED IN ASSOCIATION WITH THE  
PREPARATION OF THIS REPORT

The following list includes individuals who assisted me in this study by direct contact or through provision of written materials. I wish to express my appreciation to all for their time and concern for the subject matter of nutrition impacts. However, full responsibility for the contents of this paper and interpretations of information received remains my own.

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## 2.0 FOOTNOTES

## Foreword

1. DS/DIU, Development Information Unit-filed documents on AID Livestock Projects, USAID, Washington, DC.
2. International Development Association, Workshop on Pastoralism and African Livestock Development, Harpers Ferry, WV, AID Program Evaluation Report No. 4, USAID, Washington, DC, June, 1980.

## Chapter 1.0

1. Agency for International Development, Agricultural Development Policy Paper, AID, Washington, DC, June, 1978, p. 12.
2. F. James Levinson, 'AID's Responsibilities in Nutrition', AID Circular to the Missions, A-198, FY 1979, May 18, 1979, p. 20.
3. President's Commission on World Hunger, Overcoming World Hunger: The Challenge Ahead, Washington, DC, March, 1980, p. 110.
4. Martin Forman, "AID and the Hunger Issue" USAID, Washington, DC, April, 1980, p. 6.
5. Club des Amis du Sahel, 'Elements of a Strategy: Health-Water-Nutrition' Ouagadougou, April 25, 1971, pp. 9-17.
6. Derrick B. Jelliffe, 'Maternal-Channelled Infant Feeding Food and Nutrition, 5: 1, 1979, pp. 9-17.
7. Leonardo J. Mata, 'Malnutrition-Infection Interaction in the Tropics'. American Journal of Tropical Medical Hygiene, 24: 4, July, 1975, pp. 564-74.
8. Club des Amis du Sahel, 1971, op. cit., pp. 1-12.
9. Kenneth H. Shapiro (ed.), Livestock Production and Marketing in The Entente States of West Africa, Summary Report to AID, CRED, University of Michigan, Ann Arbor, March, 1979, Chapter 1.
10. Per Pinstруп-Andersen, 'Nutritional Consequences of Agricultural Projects: Conceptual Relationships and Assessment Approaches" IFPRI, Washington, DC, mimeo, June, 1980, pp. 20-23.

11. Mogens Jul, 'Unexpected Benefits from a Dairy Project', Food and Nutrition Bulletin, 1, #3, 1979, pp. 15-19 (Also, see Cheryl Williamson, 'The Nutritional Impact of Operation Flood: A Framework for Analysis', Harvard University, Cambridge, MA, May 14, 1980).

#### Chapter 2.0

1. Joel M. Teitelbaum, 'Human Versus Animal Nutrition: A "Development" Project Among Fulani Cattlekeepers of the Sahel of Senegal' in T. FitzGerald (ed.) Nutrition and Anthropology in Action, Van Gorcum, Assen, The Netherlands, 1977, pp. 125-140.
2. Food and Agriculture Organization, 'List of Major Foods Consumed in Selected Countries', Food Policy and Nutrition Division, FAO, Rome, April, 1976.
3. FAO/WHO, Energy and Protein Requirements, Report of a Joint FAO/WHO Ad Hoc Expert Committee, Rome, March-April, 1971.
4. FAO, Handbook of Nutrients in African Foods, FAO, Rome, 1972
5. Jeremy Swift, West African Pastoral Productions Systems, Working Paper no. 3, CRED, University of Michigan, Ann Arbor, February, 1979.
6. S.K. Kon, Milk and Milk Products in Human Nutrition. FAO Nutritional Studies #27, FAO, Rome, 1972.
7. S.K. Kon, *ibid*, p. 14.
8. FAO, Kwashiorkor in Africa, FAO, Rome, 1962.
9. R. Passmore, B.M. Nicol, M.N. Rao, Handbook on Human Nutritional Requirements, WHO Monog. Series #61, WHO, Geneva, 1974.
10. Cecily Williams, 'Kwashiorkor, A Nutritional Disease of Children Associated with a Maize Diet', Lancet, 2: 1935, p. 1131.
11. G. Dahl and A. Hjort, Having Herds: Pastoral Herd Growth and Household Economy. Stockholm Studies in Social Anthropology No. 2., University of Stockholm, Sweden, 1976, pp. 140-169.
12. *Ibid*, p. 171

13. J. Murray and M. Murray, 'The Survival Advantages of Animal Milk for Nomadic Societies', unpublished, University of Minnesota, 1980, p. 5 (Also, see Murray and Murray, 'Toward a Nutritional Concept of Host Resistance to Malignancy and Intracellular Infection', Perspectives in Biology and Medicine, forthcoming).
14. Ibid, p. 7.
15. F. J. Simoons, 'The Geographic Hypothesis and Lactose Malabsorption: A Weighing of the Evidence', American Journal of Digestive Diseases. 23, 1978, pp. 963-980
16. Joel M. Teitelbaum, 'Primitive Peoples and Weaning: The Role of Weaning Behavior in Pre-Industrial Societies', in Proceedings of the Fifth International Congress of the International Organization for the Study of Human Development, May 5-8, 1980 Campione, Italy, pp. 4-7.
17. Rosa Frisch, 'Demographic Implications of the Biological Determinants of Female Fecundity,' Social Biology, 22:, 1975, pp. 17-22.
18. Joseph D. Wray, 'Health-Maintaining Behavior in Traditional, Transitional and Modern Societies,' American Association for the Advancement of Science, Proceedings, January, 1975.

### Chapter 3.0

1. C. Oxby, Pastoral Nomads and Development, International Institute, London, 1975.
2. Lucy G. Quimby, 'The Local Level Dynamics of Development in Sahelian States'., AID Contract No. Afr-C-1286, Washington, DC, July, 1977, p. 62.
3. Allen Hoben, 'Lessons from a Critical Examination of Livestock Projects in Africa'., AID Program Evaluation Working Paper #26, Office of Evaluation, PPC/AID, Washington, DC, June, 1979, pp. 9-14.
4. Kenneth Shapiro (ed.), op. cit. pp. 44-48
5. Z. A. Konczacki, The Economics of Pastoralism: A Case Study of Sub-Saharan Africa, Frank Cass & Co., London, 1978, p. 2
6. Jan Wienpahl, The Role of the Goat in Large-Stock Pastoralism of Tropical Africa, SUNY Binghamton, 1978, (mimeo).

7. Gerry Ogden, 'Navajo Sheep-Raising and U.S. Government Intervention' Agricultural History Society, U.C. Davis, California, 1977 (mimeo).
8. F.F. Darling, and M.A. Farvar, Ecological Consequences of Sedentarizing of Nomads,' in The Careless Technology: Ecology and International Development. M.T. Farvar & J.P. Milton, (eds.) The Natural History Press, Garden City, NJ, 1972.
9. Michael Horowitz, 'The Sociology of Pastoralism and African Livestock Projects' AID Program Evaluation Discussion #6, Office of Evaluation, AID, Washington, DC, May, 1979.
10. J. Comte, 'Making Social Forestry Work', CERES, FAO Review, #74 13, no. 2, March-April, 1980, pp. 41-44.
11. Ruth B. Dixon, Assessing the Impact of Development Projects on Women, 'AID Program Evaluation Discussion Paper #8, AID, Washington, DC, May, 1980.

#### Chapter 4.0

1. See F. James Levinson, op. cit., and AID Agricultural Development Policy Paper, op. cit.
2. AID Livestock Meeting, AID Assistance to Livestock Development in Africa' Brussels, Belgium, Dec 5-6, 1972.
3. Office of Agriculture AID, Guidelines for Improving Livestock Production on Rangelands, Technical Series Paper #2, AID, Washington, DC, February, 1971, pp. 1-3.
4. Don S. Ferguson, ' Conceptual Framework for the Evaluation of Livestock Production Projects and Programs in Sub-Saharan West Africa,' USDA, mimeo, 1977, pp. 1-2.
5. Frank Abercrombie, Range Development and Management in Africa, USAID, Washington, DC, August, 1974, p. 2.
6. Frank Abercrombie and G.B McLeroy, Procedures for Planning Integrated Range/Livestock Programs, AID Washington, DC, 1974, p. 14.
7. Lloyd Clyburn, A Range Management Strategy. AFR/CWR Technical Staff Paper, AID Washington, DC, March, 1974.

8. Lloyd Clyburn, 'The Process of Change in Certain Livestock Owner and Operating Groups in the West African Sahel', in Donald N. Hyder (ed.) Proceedings of the First International Rangeland Congress, Denver, CO, August 14-18, 1978.
9. Michael Horowitz, "Research Priorities in Pastoral Studies: An Agenda for the 1980's." Conference on the future of Pastoral Peoples Institute for Development Studies. Nairobi, August 4-8, 1980.
10. AID Bureau for Africa, 'Compilation of Livestock Development Projects being Funded by USAID as of July 16, 1980, (mimeo) AID, Washington, DC.
11. Development Alternatives, The New Directions Mandate, Report to AID Washington, DC, January 23, 1978, p. 3.
12. See Allen Hoben, op. cit., p. 24.

#### Chapter 5.0

1. R. Raynal, 'La Terre et L'Homme dan la Haute Moulouya' Bulletin Economique et Social du Maroc, XXIV: 86-87, 1961, pp. 281-346.
2. Joel M. Teitelbaum, 'Combatting Forage Abuses and Social Problems for Atlas Mountain Berbers' in J. Luchok (ed.) Proceedings of the International Hill Lands Symposium, West Virginia University Morgantown, WV, 1976, pp. 214-218.
3. Meril G. Carter, Range Management Recommendations for Morocco. AID, Washington, DC, October, 1966, pp. 2-3.
4. Joel M. Teitelbaum, 1976, *ibid*, pp. 216-217.
5. John Chiapuris, The Ait Ayash of the High Moulouya Plain. University of Michigan, Department of Anthropology Monograph #9 Ann Arbor, MI, 1979, p. 71.
6. Jacques May, The Ecology of Malnutrition in Northern Africa. Studies in Medical Geography, Vol. 7, Hafner Publ. Co., Introduction, p. xv, NY, 1967.
7. Joel M. Teitelbaum, "Toward a Solution of the Malnutrition Riddle in a Partly Developed Society: The First Moroccan National Nutrition Conference, February 13-15, 1978." in Proceedings of the Xith International Congress of Nutrition, IUNS, Rio de Janeiro, Brazil, August, 1978.

8. Joel M. Teitelbaum, "Anthropology of Child Malnutrition: Kwashiorkor Taboos among Tribal Moroccans", American Anthropological Association Meeting, Cincinnati, Ohio, November 28, 1977.
9. John Chiapuris, 1979, op. cit., pp. 87-91.
10. Joel M. Teitelbaum, 1976, op. cit., p. 216.
11. AID, Range/Livestock Improvement Project Paper, Morocco, PROP #608-11-130-098. AID, Washington, DC, 1968.
12. Joel M. Teitelbaum, 1976, op. cit., p. 217.
13. John Chiapuris, 1979, op. cit., Foreward, p. x.
14. AID/Morocco Airgram to AID/Washington, April 2, 1970.
15. AID/Washington Airgram to AID/Morocco, May 21, 1970.
16. AID/Morocco Airgram to AID/Washington, June 18, 1970.
17. AID PAR (Project Appraisal Report), Morocco, Livestock and Rangeland Improvement, #608-11-130-098, November 17, 1970.
18. PROP 608-11-120-098, op. cit., p. 2.
19. AID/Morocco Airgram to AID/Washington, January, 1971.
20. W. Graves, P. Roark, F.R. Vigil, and H. Bouyayachen, 'Increasing Animal Production in Morocco (North Africa) through Rangeland Renovation and Animal Management', in Donald N. Hyden, (ed.) 1973, op. cit.
21. AID/Washington, Audit Report on Moroccan Range Improvement Project, 1971.
22. W. Haney, A Review of the I.V.S. Range Management Team in Morocco, 1968-72. I.V.S. Washington, DC, 1973.
23. Leland Fallon, 'Livestock and Rangeland Improvement Project-Morocco, Preliminary Report', AID/Rabat, February, 1972.
24. AID Project Paper #608-0145, Morocco: Range Management Improvement, AID, Washington, DC February, 1980, p. 1
25. Ibid, pp. 3-4.
26. Ibid, p. 4.
27. Ibid, pp. 28-31.

28. Ibid, pp. 39-46.
29. Ibid, p. 46.
30. Meril Carter. 1968. op. cit.. p. 28.
31. AID Project Paper, #608-0145 Morocco Range Management, 1980, op. cit., pp. 35-36.
32. Ibid, p. 46.
33. Food and Agriculture Organization, Morocco: Project Moyer Atlas, Feasibility Report, #37/80 MOR. 18. FAO Rome. July, 1980, pp. 1-13.
34. Ibid, p. 6.

#### Chapter 6.0

1. MAB Technical Notes, The Sahel: Ecological Approaches to Land Use, The UNESCO Press, Paris, 1975.
2. John Ross and Reid Bryson, 'Food Man and Weather' War on Hunger USAID, Washington, DC, 1974.
3. G. Dahl and A. Hjort, Pastoral Change and the Role of Drought, SAREC Report, Stockholm, 1979.
4. Robert W. Kates, 'Drought Impact in the Sahelian-Sudanic Zone of West Africa', Draft Report AID Grant ATM 77-15-19, Clark University, Worcester, MA, 1980.
5. AID Project Paper #685-11-120-212, Senegal Range and Livestock Development, AID Washington, December 18, 1974, p. 3.
6. AID, Action Memorandum for the Administrator, Eastern Senegal Livestock Project, Preliminary Design, 1974, p. 1
7. Consortium for International Development, Senegal Range and Livestock Development, CID Team First Report, AID Project #685-11-120-202, Logan, Utah, November, 1975.
8. Joel M. Teitelbaum, 'Human Versus Animal Nutrition: A "Development" Project Among Fulani Cattlekeepers of the Sahel of Senegal', in T. FitzGerald (ed.) Nutrition and Anthropology in Action, Van Gorcum, Assen The Netherlands, 1977, pp. 125-140.
9. Joel M. Teitelbaum, 1976, op. cit., p. 21.
10. MAB Technical Notes, op. cit., p. 66

12. Ibid, p. 66-68.
13. Ibid, p. 73-77.
14. Consortium for International Development, Bakel Range/  
Livestock Project Eastern Senegal; Final Design Report,  
AID Project #685-11-120-202, Logan, Utah, January, 1976.
15. AID/Senegal, Internal Evaluation Report on Bakel Livestock  
Project, #685-11-202, Dakar, 1978.
16. USAID, Government of Senegal, Joint Assessment of U.S.  
Assistance Programs in Senegal, Dakar, July 9, 1980,  
pp. 5-14.
17. Ibid, p. 12.
18. AID/Senegal Staff Evaluation Report on the Bakel Livestock  
Project, 685-11-202, Dakar, 1979, pp. 1-4.
19. AID/Senegal cable Airgram to AID/Washington, August, 1979.
20. Joint Assessment....., op. cit., p. 10.
21. Douglas Butchart, Niger Range and Livestock Project Trip  
Report, AID Project #683-0202 AID, Washington,  
September 15, 1980.
22. W.G. Matlock, Baseline Report on the Upper Volta Village  
Livestock Project, AID, Washington, 1980.
23. Project Paper, SODESP-Livestock Production, Project Paper  
#685-0224 USAID, Washington, DC, July, 1978.
24. J. Teitelbaum, 1976, op. cit. p. 18.

#### Chapter 7.0

1. Per Pinstруп-Anderson, 'Nutritional Consequences of  
Agricultural Projects: Conceptual Relationships and  
Assessment Approaches. IFPRI, Washington, DC (mimeo),  
June, 1980, pp. 16-18.
2. AID, Impact Evaluation Handbook, USAID Washington, DC,  
October 24, 1979.
3. Heli E. Perret, Social Analysis and Project Design in the  
Agency for International Development: Review, Recom-  
mendations Guidelines, Final Report, AID Project #  
AID/OH-147-78-26. AID, Washington, DC, July 7, 1978.
4. AID, First Annual Report, Program and Policy Coordination  
Evaluation Studies, AID, Washington, DC, October, 1980.