



Uncertainty in Production

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Upper Volta: Environmental Uncertainty and Livestock Production

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To
Darren and Lisa

PREFACE

Livestock production in Upper Volta, as in other parts of Sahelian West Africa, is a major component of the subsistence strategy of the individual producers and a substantial contributor to the national economy. Despite our significant involvement in the Sahel with livestock development projects in the past few years, Americans have not made enough long-term comprehensive studies of the system to understand it well.

The Village Livestock Project, jointly sponsored by the U.S. Agency for International Development and the Government of Upper Volta, was initiated at six sites in three regions of Upper Volta in 1977. It was a unique project at that time in several ways. First, its focus was on the small-scale livestock producer at the village level. Second, it provided an initial phase for study of the system before attempting to implement changes. Third, and in my view most important, the field team included a social scientist working on a day-to-day basis with the "ubiquitous" technical scientists.

Dr. Richard Vengroff's book details his findings from a two-year assignment as social scientist with the team fielded by the Consortium for International Development. Obviously, even a two-year study is scarcely adequate for the complete understanding of a complex system. His work, however, will serve to clear up some misconceptions about social aspects of livestock production in Upper Volta and how social-technical interactions occur. Dr. Helen Henderson's chapter adds valuable information, heretofore unavailable, on the role of women in livestock production in Upper Volta.

This book is an important beginning to the understanding of livestock production systems in the West African savanna. Similar work needs to be continued to ensure a sound basis for development there.

W. Gerald Matlock
CID Project Director
Upper Volta Village Livestock Project

AUTHOR'S PREFACE

This book is designed to achieve several goals. The first goal is to fill in important gaps in our knowledge of current livestock practices employed by village level livestockmen in a variety of different locales in Upper Volta. Secondly, the research undertaken during the period October 1977 to June 1979 has identified problems experienced and perceived by livestock owners. Thirdly, the data gathered will serve as a benchmark against which the impact of technical interventions being introduced in the livestock sector in Upper Volta can be measured. Fourthly, an effort will be made to assess the utility and prospects for success of various technical interventions in the areas of range management and annual production, given the existing systems of production. Finally, propositions regarding the future role of livestock production at the village level will be examined, and the prospective role of donor agencies such as U.S.A.I.D. in the development of this system discussed.

In an effort to clarify these matters this book is divided into several sections:

1. Introduction—The setting;
2. The Research Sites—a discussion of the location, size, population, ethnic composition, and representativeness of the six sites in which this research was conducted;
3. Data Collection Methods—a discussion of the research methods employed and their relevancy to the problems at hand;
4. The Existing Cultural Milieu—an examination of gross cultural differences, social structure, economic specialization, the role of livestock in the socio-cultural system, land tenure systems, attitudes toward innovation, and inter-ethnic relations;
5. Local Livestock Management I—diseases and health practices;
6. Local Livestock Management II—herders, supplemental feeding, milk production, existing range management practices, transhumance routes, and burning;
7. Livestock marketing—the marketing motivation, income from sales, utilization of earnings, types of animals sold, types and location of markets used, seasonal variations in marketing, and determinants of price;
8. The Role of Women in Livestock Production: Some Preliminary Findings, by Helen Henderson, University of Arizona—an examination of the participation of Fulani, Rimalbe, and Mossi women in livestock production;
9. The Future—an assessment of the prospects for various technical interventions and suggestions regarding organizational means of

implementing potentially successful programs. This will include recommendations regarding funding and future personnel and training needs.

Before proceeding it must be stressed once again that the findings reported here represent an effort at applied research, an effort designed to establish baseline data and the necessary experience from which well-reasoned inferences can be drawn. These will require further examination both from the technical and sociological sides. The inferences to be drawn from this research focus on the potential success of various prospective technical interventions in the area of animal production from the perspective of the local livestockmen. It is hoped that the future determination of policy, both by the National Livestock Service of Upper Volta and by the various donor agencies, will benefit from the data and analysis contained in this book.

The research on which this report is based was conducted in the Republic of Upper Volta between October 1977 and June 1979. The Upper Volta Village Livestock Project, of which this work is a part, was funded by U.S.A.I.D. and the Government of Upper Volta under contract agreement #686-11-130-203. I wish to acknowledge the support of the institutional participants, the Consortium for International Development (CID), the prime contractor, the University of Arizona, the lead university, and the International Center for Arid and Semi-Arid Land Studies (ICASALS) of Texas Tech University, a CID member institution. Throughout the project I had the cooperation and moral support of the National Livestock Service directed by Dr. André Baré and the appointed project coordinators Dr. Guigma and Dr. Sioné.

Special appreciation must be given to my chauffeur and translator, Mr. François Ciga Zoungrana, who provided many useful insights into local culture and traditions. Likewise, this work could not have proceeded without the valuable field assistance of the projects extension agents Mr. Boly, Mr. Gandia, Mr. Kalondo, Mr. Kinda, Mr. Ouedraogo, Mr. Momenga, Mr. Bougare, Mr. Adama, Mr. Zeba, Mr. Alfred, and Mr. Barré. The fieldwork also benefited from the aid and advice of livestock service personnel Mr. Diolompo Frederick of Kaya, Mr. Boniface Ouedraogo of Kongoussi, Mr. Hubert Ouedraogo of Toungouri, and Dr. Badilo of Fada N'Gourma.

I had the pleasure of working with Mr. Scotty Deffendol (University of Arizona), a highly skilled range manager, Peace Corps volunteers Mr. Gregory Garbinsky (animal science), Mr. Alan Johnston (hydrology), Mr. Roger Hedge (agricultural technician), a Dutch volunteer, Mr. Dooda Koops (animal science), Mr. Emmanuel Traore, Mr. Koulibaly (National Livestock Service), Ms. Rebecca Nicc (U.S.A.I.D project man-

ager), Dr. David Cleveland (University of Arizona), Dr. Lee Sigelman (University of Kentucky), Dr. W. G. Matlock, Project Campus coordinator (University of Arizona), Mr. Calvin H. Raullerson (ICASALS—now with U.S.A.I.D. Washington), and Dr. Harold Dregne (ICASALS). The view of livestock production presented here has greatly benefited from the inclusion of an examination of the role of women in livestock production written by Dr. Helen Henderson of the University of Arizona. I have benefited from discussions with, and comments from, Dr. John Mue (Department of Veterinary Medicine, University of Arizona), Dr. Jay Smith (U.S.A.I.D., Ouagadougou), Dr. Richard Swanson (Ouagadougou), Dr. James McCullough (Department of Marketing, University of Arizona), Dr. Philip Dennis (Department of Anthropology, Texas Tech University) and Dr. Frank Hudson (Department of Animal Science, Texas Tech University). I also wish to thank Mr. Prabhu G. Pongshu and Ms. Kathryn H. McCorkle, information specialists, ICASALS, who provided extremely valuable editorial assistance. The maps included in this volume were expertly prepared by Dr. John Giardino and Dr. Claude Davidson of the Department of Geography at Texas Tech.

Last, but not least, I wish to thank Ms. Donna Beausalet and Ms. Chris Brown, who, under great time constraints, typed much of the first draft of this book in Ouagadougou. The current draft of this book was typed efficiently and professionally by Ms. Donna Aldridge and Ms. Sheila Hatcher of the Department of Political Science, Texas Tech University.

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I. INTRODUCTION

The Setting

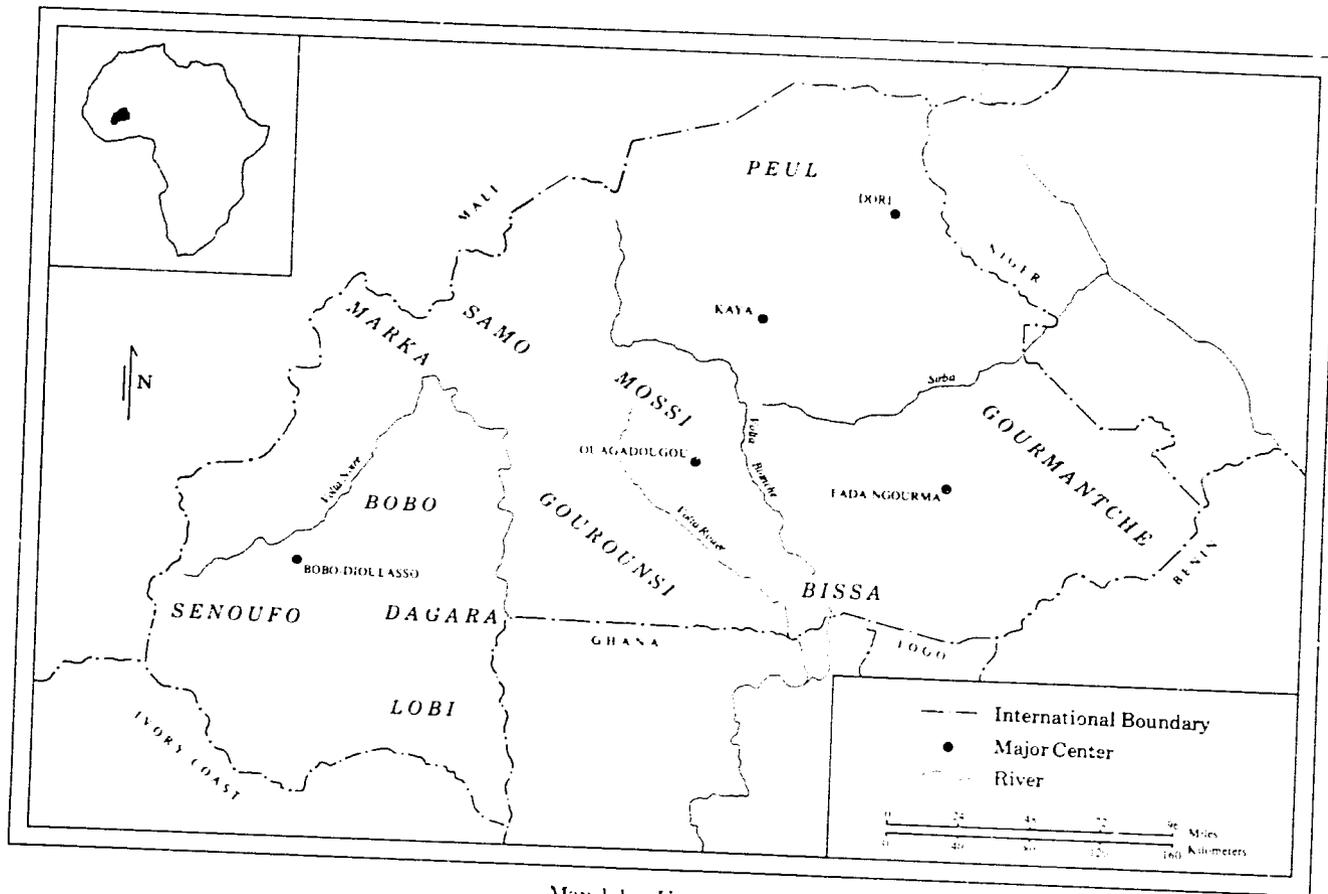
Located in the heart of West Africa, Upper Volta is a landlocked nation with an area about the same as Colorado (274,000km²). The country is bordered by the Ivory Coast, Ghana, Togo, and Benin to the south, Niger to the east and north, and Mali to the north and west. Access to the sea, over 500 kilometers away at its closest point, is by road or rail to Abidjan, and by road to Lome, Accra, and to a lesser extent Cotonou.

Upper Volta falls mostly in the Soudanian vegetative and climatic zone, between 9° and 15° north latitude, straddling the Sahel in the north. The landscape consists of slightly rolling or flat savanna, broken by occasional low hills and rocky outcroppings. Rainfall and temperature belts run from east to west, with average rainfall increasing from a meager 400 mm in the north near Gorum Gorum, to a high of about 1200 mm in the extreme southwest near the border with the Ivory Coast (Pallier, 1978). The country, particularly the northern areas, suffered severely from the ravages of the Sahelian drought especially during the time period of 1972-74.

There are distinct annual rainy and dry seasons. Although rainfall is highly irregular, it is confined to a season beginning approximately in May or June and extending through September. Rainfall is usually very volatile and highly localized. It is not uncommon for one village to experience adequate rains while only a few miles away crops wither and die in the fields from the intense heat and lack of water. The dry season begins around October, just before the harvest in November. It is divided into a relatively cold period extending through January and an extremely hot period roughly from February until mid-May.

The principal crops, sorghum, millet, maize, beans, peanuts, sesame, and cotton, are planted after the first rains in May or June. Condiments, such as peppers and ochra, are also planted, usually by women. Millet and sorghum, the dietary staples, are the prime concern of most farmers. Cash crops, such as cotton, peanuts, and sesame, are of some importance as income supplements. Maize, generally cultivated around the family compound, and where possible fertilized, matures during late August or early September. It is the main staple in the family diet through the worst of the hungry period preceding the millet harvest in November.

Transportation infrastructure within Upper Volta is extremely limited. The three largest rivers, the Red, White and the Black Voltas, from which the country takes its name, flow intermittently during the long dry season. None of the three are navigable for any distance. The RAN railway provides the major link for the largest towns, Banfora, Bobo Dioulasso, Koudougou, and the capital Ouagadougou. Proposals to



Map 1-1. Upper Volta

extend the railway northward have thus far floundered for lack of finance. Although there are some 900 km of road, less than 600 km are paved (Pallier, 1978, 177). Road conditions are highly variable, and many routes become impassable during the rainy season.

Upper Volta ranks as one of the world's poorest nations. Annual per capita income is in the neighborhood of \$130 (L'Observateur, 1979). Social infrastructure is as badly underdeveloped as the transportation system. The nation has the highest ratio of population to physicians of any nation in the world. Per capita enrollment in both primary and secondary school are among the lowest in Africa (Morrison, et al, 1972, p. 53).

The vast majority of the population, who earn their livelihood from the soil and or livestock, still live at the margins of subsistence. Their lives and fortunes depend on the combination of poor, often overworked soils, traditional farming techniques and implements (primarily the short handled hoe), traditional grain varieties (millet and sorghum), and the chance distribution and intensity of the seemingly capricious annual rains.

Upper Volta's resident population, estimated at more than 5.6 million (1975), is overwhelmingly rural (91%) and heavily concentrated on the central Mossi plateau (Pallier, 1978). This area continues to play its historic role as a reservoir of unskilled labor for its more affluent neighbors to the south, particularly the Ivory Coast. Many Voltaiques (some estimates run as high as one million at any given time) migrate in search of work on Ivorian plantations and as laborers and domestics in the port of Abidjan. In the past many also found work in Ghana, but a faltering Ghanaian economy and strict government regulations have largely ended this emigration (Gregory, 1974).

Foreign trade is limited and consistently results in a large deficit. Virtually all exports are primary products such as livestock (40%), oil seed (32%), and cotton (17%) (Pallier, 1978, p. 185-189). Imports consist of industrial wares, fuels, and processed goods. Industrial production is limited to a sugar refinery, two breweries, a moped and bicycle assembly plant, and some additional light processing facilities. Trade patterns are indicative of Upper Volta's high degree of dependence on a few nations. More than two-thirds of all exports go to just two trade partners, the Ivory Coast (48.1%) and France (18.8%). Imports are likewise dominated by these two nations, with 41.4 percent coming from France and an additional 19.6 percent from the Ivory Coast (Pallier, 1978).

Ethnically, the central regions of Upper Volta are dominated by the Mossi, who comprise nearly half (48%) of the national population. The second largest group, the Fulani (10%), although concentrated in the north, are to be found, with their herds of cattle, throughout the coun-

try. The western Mande groups, including the Bobo, are concentrated in the west. The Mande have consistently feared domination by, and loss of their home areas to the more numerous Mossi. Other important ethnic groups include the Lobi in the southwest, the Gourounsi and Bissa in the south-center, and the Goumvaiche in the east.

Livestock production plays an extremely important role in Upper Volta. The national herd in 1970 was estimated to include 2.5 million head of cattle and 4 million sheep and goats (SEDES, 1975). Although these herds were heavily decimated by the last drought, 1972-74, estimates are that the herd has now been restored to predrought levels. As of 1977, livestock accounted for just under ten percent of the gross domestic product (Pallier, 1978, p. 119) and forty percent of export earnings. Perhaps more importantly, livestock production constitutes an integral part of the lives and survival strategies of many Voltaics. It is from this perspective that the analysis of the existing livestock production system will proceed.

Important aspects of the political, administrative system of Upper Volta—as well as historical factors of importance in considering rural development—have been dealt with by this author elsewhere (Vengroff, 1978, 1980A, 1980B, 1980C). It should be noted here, however, that Upper Volta benefits from a basically open, democratic political system. Unfortunately, the combination of economic unviability, economic and political dependence, a nondevelopmental bureaucracy, severely limited budgetary resources, and the dominance of urban interests in the political arena do not provide much room for optimism regarding rural development (Vengroff, 1980B).

II. THE RESEARCH SITES

The Government of Upper Volta and the National Livestock Service specified that the research sites should be located in the territories of three of the country's eleven Regional Development Organizations (ORDs—Organismes Régionaux de Développement). The three ORDs designated for research sites are Central-North, Central-East, and East, whose administrations are located in Kaya, Koupela, and Fada N'Gourma respectively. The physical boundaries of each of these three ORDs correspond with the boundaries of the central administrative regions, the Prefectures. In the case of the Central East, the headquarters for the Prefecture and the ORD are found in different towns, Tenkodogo and Koupela respectively. For the other two ORDs, Prefecture and ORD offices are located in the same town.

The three ORDs selected represent a cross section of human-livestock interrelationships in Upper Volta in general, and perhaps for larger areas of West Africa, including parts of Mali, Benin, Togo, Niger, and Nigeria. Generalization to these larger areas should be made with extreme caution, however. In the Kaya ORD we find a combination of low population density and high livestock density. The Fada ORD is a region with low population densities of both humans and livestock. The Koupela ORD presents a combination of relatively high population density and low livestock density.

The three areas encompass a range of Sudanic rainfall levels and vegetation types. Most cattle in the three regions are zebu type, but the smaller and more trypano-resistant taurin varieties are found in the south in the Koupela ORD. A wide variety of ethnic groups and configurations are also found in these areas.

Two representative research sites were chosen in each ORD in coordination with the National Livestock Service and the respective ORD staffs. This author worked closely with a range manager to delineate the sites on the basis of both physical and social characteristics.

The distribution of ethnic groups within the sites is typical of the regions in which they are found. Physical characteristics are likewise not atypical of these regions. There is little reason to believe that livestock practices within the research sites differ markedly from such practices in other Soudanian zone areas of Upper Volta. Furthermore, the research sites are distributed from the edge of the Sabel in the north through the Soudanian zone in the south. Although the largest portion of Upper Volta falls in a similar environmental regimen, the reader should be cautious in extrapolating to the country as a whole.

2.1 ORD of Kaya (Central North Prefecture)

The two sites in the Central North ORD, Talogo and Kaya-koundi, lie in the transitional area between the Soudanian and Sahelian climatic and vegetative zones. Rainfall averages 650-700 mm (Pallier, 1978) per year.

The Talogo site, located approximately 70 km northeast of Kaya, comprises an area of about 50,000 hectares. Physically the area is well defined by several drainage basins (Deffendol, 1979). The ethnic composition of the site is predominantly Mossi, although there is a significant Fulani minority. Scattered groups of Marantse, Gourmantche, Bella, Rimalbe, and others also live in this area.

Administratively, Talogo is in the arrondissement of Tougouri which falls under the sub-prefecture of Boulsa. In the traditional sense there are three ritual chiefs over the land (*chefs de terre*). The largest section of the site, beginning in Talogo and including the area to the north and east (Talogo, Dassamtanga, Bougou, Seno, Djankoko) is under the chief of Narbingou. The second largest section of the site, the area to the north and west of Talogo (Bissinga, Dankanko Daga, Loangjou, Zougountenga), is the ritual domain of the chief of Dankanko. The remainder of the area to the southwest of Talogo falls under the chief of Pelga. Although both Dankanko and Narbingou are formally outside the site, these important chiefs were kept fully aware of the research efforts.

The ethnic composition of almost all the villages in the Talogo site consists of a combination of a Mossi majority and a Fulani minority, often with a smattering of other ethnic groups. The two exceptions are Seno and Dassamtanga which have Black Fulani (Rimalbe—former slaves of the Fulani) majorities. Unfortunately, the 1975 national census is aggregated into larger villages only. The village clusters found in the census for this site include areas both within and outside the territory of the site.

As can be seen from Table 2-1, the 1975 census delineated between 13,000 and 14,000 inhabitants of the larger region. A complete census of the adult population of the village of Talogo conducted for the author by Livestock Service extension agents counted an estimated total population for the village (all neighborhoods) of just over 2,000. This compares with a national census figure of approximately 2,500.

The national census estimate, however, includes several small surrounding villages in the Talogo total. This author has considerably more confidence in our census. Based on these figures it is estimated that the population within the area of the site is somewhere between 5,000 and 6,000. The population density is thus about 11 or 12 per km². Since the population tends to be clustered in the more productive agricultural

TABLE 2-1
Tafogo Site
National Census (1975)

Village	Residents	Defacto Population
Dankarko	5,181	4,903
Nagbungou	4,535	4,395
Peoga	1,697	1,633
Tafogo	2,623	2,515
Total	14,039	13,446

Research Census
Tafogo Village—All Neighborhoods (1977-1978)

Tafogo						
Adult		Percent of Adults	Compounds	Percent of Compounds	Estimated Total Pop.	
Mossi	944	85.0	195	83.7	Mossi	1717
Fulani	145	13.1	32	13.7	Fulani	264
Maranse	21	01.9	6	2.6	Maranse	38
Total	1,110	100.0	233	100.0		2,019

areas along the three lowlands, this figure does not give a true picture of actual population density.

In the village of Tafogo extension agents delineated 233 compounds, 83.7 percent of which are Mossi, 13.7 percent Fulani, and 2.6 percent Maranse. Mossi constitute about 85 percent of the total population while the Fulani account for 13.1 percent and the Maranse, 1.9 percent. In general, the compounds in the village are widely dispersed, with the Fulani occupying outlying areas away from the main agricultural zones.

The main crops produced in the area are millet and white sorghum, supplemented by cowpeas, peanuts, cotton, and various garden crops. It is a zone of intensive livestock production. An aerial survey of livestock conducted in December 1978 counted 2,793 cattle in the site, for a density of 5.8 per km². However, because of the very poor rains and minimal crop residue in the area, during this crop year (1978) considerable numbers of locally owned livestock were outside the area at the time. Estimates given by local people ran as high as 49% of the cattle outside at the time of the count. If this is a reasonable figure, the number of cattle normally in the area could run as high as 4,700. Also it must be noted that animals from outside the site which might normally spend part of the year there, did not come because of the poor rains. It is possible that during some seasons there are as many as 10 head of cattle per km². This will be verified by future aerial surveys.

TABLE 2-2
Koukoundi Site
National Census (1975)

Village	Residents	Defacto Population
Koukoundi	697	671
Sorgho (Fulani)	18	49

Research Census (1977-78)

Koukoundi

Adult	Percent of Adults	Compounds	Percent of Compounds	Total Pop.	% Total
Fulani 92	36.8	20	10.8	168	36.8
Mossi 158	63.2	20	59.2	288	63.2
Total 250	100.0	49	100.0	456	100.0
Sorgho					
Fulani 15	100.0	14	100.0	127	100.0

The second site in the Kaya ORD, Koukoundi, is located about 100 km due north of Ouagadougou and about 20 km southeast of Kongoussi. This site is confined to an area of about 6,400 hectares. Research in this village represents an effort to examine the possibility of engaging in small scale technical interventions on the village level. The site is centered on the villages of Koukoundi where two research assistants have been placed but includes surrounding villages such as Bisa, Sabse, and Sorgho. Ethnically, the population of Koukoundi is 36.8 percent Fulani and Black Fulani (Rimalbe) and 63.2 percent Mossi. Sorgho is entirely Fulani, Bisa is almost entirely Mossi, and Sabse is predominantly Mossi, with a Fulani minority.

Administratively, the area is in the sub-prefecture and ORD sector of Kongoussi. Traditionally, the Mossi canton chief (a defunct title that continues to maintain unofficial importance) in Sabse presides over the area. His younger brother serves as the chief of Bisa. The village of Koukoundi, settled over 80 years ago by the ancestors of the current Fulani residents, has a Fulani chief. Given differences in the degree of hierarchy in the social structure of the Mossi and Fulani, decision making in the village is a rather nebulous affair. The chief of Koukoundi is under the Mossi chief of Sabse. The Fulani village of Sorgho is under the jurisdiction of the chief of Koukoundi.

The population of Koukoundi is estimated by our census to be about 456. The settlement pattern is generally dispersed, although clusters of compounds are often found in the Mossi neighborhoods. Principal crops

TABLE 2.3
Site of Ougarou
National Census (1975)

Village	Residents	Defacto Population
Datougou	279	277
Gnifogma	691	673
Ougarou	317	539
Piega	1,132	1,158
Pomo Komi	306	291
Total	2,958	2,911

Research Census (Not including Gnifogma)
(1977-1978)

Village	Adults	Total Population
Datougou	78	112
Djmare I	122	222
Djmare II	15	82
Nymbary	112	201
Ougarou	179	327
Piega	161	291
Poin Yakoum	159	289
Lipati	13	79
Total	899	1,639

are millet and white sorghum, supplemented by maize, cowpeas, cotton, peanuts, and some garden crops.

There are large numbers of livestock owned by both Fulani and Mossi villagers. The majority of the Fulani owned herds spend a good part of the year outside the area, either in transhumance (see chapter 6) or, in some cases, permanently in areas to the south (e.g., Leo). Any estimate of livestock density other than on a seasonal basis is therefore not very meaningful.

2.2 ORD of Fada N'Gourma (East Prefecture)

The two sites in the Eastern ORD are centered on the villages of Namoungou and Ougarou, 30 and 70 km respectively northeast of Fada N'Gourma. Rainfall in this region varies between 800 and 900 mm per year. Vegetatively the area is in the Sudanian zone.

Administratively, both sites fall under the ORD sector of Fada. Ougarou is under the sector chief in Matiakoali, some 25 km to the northeast. Ougarou is also the base for the ORD subsector. Both sites fall under the chief of Fada, but Ougarou is by tradition also subject to the unofficial, yet influential canton chief in Matiakoali.

TABLE 2-4
Site of Ougarou

Village	Ethnic Group	Adults	Percent of Adults	Compounds	Percent of Compounds	Total Population	Percent of Pop.
Ougarou	Gourmantche	112	62.50	27	58.60	201	62.30
	(Peulh) Fulani	50	27.90	10	21.70	91	27.80
	Hausa	9	5.00	6	13.00	17	5.10
	Mossi	8	4.10	3	6.50	15	4.56
	Total	179	99.80	46	99.80	327	
Prega	Gourmantche	135	83.90	31	75.60	246	83.70
	Hausa	12	7.50	6	14.6	22	7.50
	Mossi	14	8.70	4	9.80	26	8.80
	Total	161	99.10	41	100.00	294	100.00
Datougou	Gourmantche	78	100.00	12	100.00	142	100.00
Nymbiarv	Gourmantche	71	63.40	16	64.00	129	63.20
	(Peulh) Fulani	41	36.60	9	36.00	75	36.80
	Total	112	100.00	25	100.00	204	100.00
Tibati	Gourmantche	30	69.80	5	62.50	55	69.60
	(Peulh) Fulani	13	30.20	3	37.50	24	30.40
	Total	43	100.00	8	100.00	79	100.00
Djaure I	Gourmantche	122	100.00	18	100.00	222	100.00
Djaure II	Gourmantche	45	100.00	9	100.00	82	100.00
Poun Yakouni	Gourmantche	115	72.30	19	73.10	209	72.30
	(Peulh) Fulani	44	27.70	7	26.90	80	27.00
	Total	159	100.00	26	100.00	289	100.00
						Total 1,639	

TABLE 2-5
Site of Namoungou
National Census (1975)

Village	Residents	De facto Population
Boadiri	257	251
Bandringu	269	261
Kodjonti	582	583
Mabangani	118	116
Madem	221	226
Mangoudem	139	131
Namoungou	837	806
Sampenga	291	280
Sitongou	397	381
Total	3,110	3,014

Research Census
(1977-78)*

Namoungou	Adult	Percent Adult	Tot. Pop.	Percent Tot. Pop.
Fulani (Poulh)	51	15.0%	99	15.1
Gourmantche	295	82.2%	537	82.0
Mossi	10	2.8%	19	2.9
Total	359	100.0	655	100.0

*Several Hausa concessions were not delineated.

The two sites are physically drainage basins, with very low population densities. Namoungou comprises an area of approximately 101,000 hectares, and Ougarou is only slightly smaller with 97,000 hectares.

The national census (1975) counted 2,958 residents of the Ougarou site. Our census (1977-78) counted 1,639 residents, excluding the village of Gmologma which is included in the national census. These discrepancies are quite large, but it is felt that figures reported here are more accurate than those obtained in the national census. For the Namoungou site the census lists a population of 3,110. Their figure for Namoungou is 810 while our census of the same village lists 655. Whichever figures one accepts it is clear that the population density of both sites is very low (between 2 and 3 per km²).

Ethnically both sites are predominantly Gourmantche, with a significant Fulani minority. Small concentrations of Hausa and Mossi are also found throughout the region. The villages are not as widely dispersed as those in the Kaya ORD. During the rainy season many Gourmantche move out to houses located near their bush fields. The Fulani tend to settle on the perimeters of the Gourmantche villages.

The principle crops are sorghum, millet, cow peas, peanuts, maize, rice and a variety of garden crops. The same low density figures that pertain to humans also apply to livestock. It is estimated that there are 5-8 head of cattle per km² in the region. However, given the ratio of cattle to people and the vast area potentially available for livestock use, one can see the importance of the zone for the future of livestock production.

2.3 ORD of Koupela (Central-East Prefecture-Tenkodogo)

The principle research site in the Koupela ORD is centered on the village of Gnanguedin, located some 45 km south of the prefecture administrative capital at Tenkodogo. This site encompasses an area of about 46,200 hectares. The second site, Gorgou-Moaga, is located in the area just east of Tenkodogo on the road to Ouargaye. Both sites are in the southern part of the Soudanian zone, with rainfalls averaging about 950 mm per year. Both are densely populated and in general the remaining tree cover is minimal.

Census figures for the area are too grossly aggregated to be of much use. Our figures for Gnanguedin are instructive. Although this is traditionally a Bisa village, there has been considerable movement south into the area by Mossi from Tenkodogo. The Mossi have been attracted by the greater abundance of fertile land and pastures for their cattle. There has apparently been a similar southward movement by the Fulani. Our population estimate for the village itself is 1,218, of whom 73.2 percent are Mossi, 23.2 percent Bisa, and 2.8 percent Fulani. The Fulani estimate is too low as it does not include several camps 3-4 kilometers outside the area of the village. Population density in the Gnanguedin area is estimated at between 30 and 50 per km². Most of the other villages in the site, such as Dema and Loba, are predominantly Bisa with a Fulani minority and a few Mossi.

The Gorgou-Moaga site is composed of two villages. The village of Gorgou is a combination of Mossi, Bisa and Fulani. Of 76 concessions, 22 (28.9%) are Mossi, 44 (57.9%) are Bisa and 9 (11.8%) are Fulani. The village chief is Mossi, but six of the eight neighborhoods are Bisa. There is one neighborhood each for the Mossi and Fulani. The village of Moaga, 10 km further east, is predominantly Mossi with 123 (75.0%) Mossi compounds and 41 (25.0%) Fulani compounds.

Administratively, both sites in the Koupela ORD were under the sub-prefecture of Tenkodogo. Traditionally, both areas fall under the purview of the chief of the ancient Mossi Kingdom in Tenkodogo. The chiefs in the Gnanguedin site are directly under the chief of Bane, who in turn owes allegiance to Tenkodogo.

TABLE 2-6
Site of Ghanguedin 1977-78

	Adults	Compounds	Total Pop.
Bissa	155 (23.2%)	38 (21.5%)	282
Mossi	489 (73.2%)	108 (69.7%)	890
Fulani (Peullo)	19 (2.8%)	5 (3.2%)	35
Other	6 (0.9%)	4 (2.6%)	11
Total	688	155	1,218

Settlement patterns are relatively tightly knit, especially among the Bissa. The main crops are red and white sorghum, millet, and cowpeas. Maize, manioc, and other garden crops are intensively grown in fertilized plots and lowlands (bastonds). Livestock production is an integral part of the local production system.

The Ghanguedin site is unique in that there is a large area between the main north-south road and the Nuahoa River to the east which is almost totally devoid of agriculture. The A.V.A. (Volta Valley's Authority) is planning to take away the principle pasture areas to the west of Ghanguedin and establish a zone of irrigated farms near the White Volta. The area to the west, near the Nuahoa, will probably eventually be developed as a zone reserved for livestock production.

III. DATA COLLECTION METHODS

Research findings and data analysis are never completely independent of the strategies and methods employed in the gathering of data. In order for the reader to adequately assess the findings presented here and compare them to similar studies, it is important that one be at least familiar with the methods of data collection. The presentation of research methods is not a mere academic exercise which can be ignored by development planners and administrators with a professional interest in specific substantive areas. On the contrary, the representatives of donor agencies should have the opportunity to assess the applicability or representativeness of applied research findings. Only then can data gathered in the course of an investigation be properly evaluated and employed in new or existing projects.

It is also important to understand two relatively simple but highly important concepts: 1) statistical significance; and 2) strength of association. The former refers to the probability that an apparent relationship between two factors is the result of chance. It refers to the degree of confidence one has in stating that an observed relationship in the sample is indicative of an actual relationship in the universe from which the sample is drawn. For example, suppose in a sample of livestockmen one finds a higher percentage of Fulani than of Mossi who regularly vaccinate their cattle against anthrax. Is this observed difference a real difference between ethnic groups or an accident of sampling (i.e., is the sample representative of the population as a whole)? Normally in the social sciences if there is less than one chance in 20 (.05) or one in one hundred (.01) of drawing a sample with the observed differences as great as they are by chance, then one will reject the null hypotheses (which in this case would be that there is no systematic relationship between ethnicity and health practices employed with one's animals). The rejection of the null hypothesis leads to the acceptance of the hypothesis that such a relationship actually exists.

Tests of statistical significance enable one to confidently state there is a relationship between two factors (our independent and dependent variables). It *does not* enable one to say precisely how strong the relationship is. That is, we do not know to what extent we can predict or explain the dependent variable on the basis of the independent variable(s). We only know that the two are in some way systematically related.

Usually there are many factors (independent variables) which enter into any explanation of a phenomenon (dependent variable) with which one wants to deal. In order to design or assess the probable impact of a technical intervention, it is necessary to know the relative

importance of, and interrelationships between, the independent variables. Only then can one intelligently decide what independent variable(s) are most important, what is the most propitious way to intervene (what independent variables can or should one try to modify), what will be the probable effects of the intervention(s) on the dependent variable (that which one is trying to change), and finally, what are some of the likely unintended effects of these actions.

Thus, the analysis presented here will try to follow these steps: 1) description, 2) explanation, 3) assessment of the prospects for local acceptance of interventions, 4) evaluation of the probable success of interventions, 5) examination of possible unintended consequences, and 6) weighing of the probable direct benefits and positive consequences against the negative consequences and resulting dislocations.

3.1 Sampling

Given the vast area, diverse ethnic groups, and tremendous distances between research sites, it was decided that a large portion of the data gathering effort would have to rely primarily on survey research. Where possible, direct observation of particular forms of behavior is used to supplement and verify the survey data. Two forms of interviewing were conducted. The first consisted of open-ended, exploratory interviews with elites—village chiefs, elders, ritual specialists, and local government officials. The second type of interview, based on a formal, systematic survey instrument, was used to delineate the attitudes and practices of the average livestockman.

The first major sampling task was to decide on the unit of analysis. The immediate problem was to utilize a unit of analysis which was reasonably comparable between the four major ethnic groups (Mossi, Fulani, Gourmantche, Bira). The compound head, normally the eldest male, was identified as the most appropriate unit from the standpoint of livestock production. In terms of agricultural production this unit would not be comparable between ethnic groups. However, it does provide a reasonably common unit for the herding of animals, particularly cattle.

The second major task was to delineate the universe from which appropriate samples could be drawn for interviewing purposes. Two procedures were followed. First, in certain select villages in each site a complete census was conducted by livestock extension agents. This helped clarify population characteristics. Secondly, lists of compound heads, broken down by ethnicity, were compiled for other villages within each site. Thus, the samples could be drawn from a near universe of compound heads.

The first survey instrument employed was designed to test attitudes

TABLE 3-1
Innovation Survey
(Sample selection criteria)

Ord	Site	Sample Universe	Ethnicity	N
Central-North	Tafogo	Compound heads	Mossi	15
			Fulani	1
			Total	16
Central-North	Koukououdi	Compound heads	Mossi	30
			Fulani	12
			Total	42
East	Ougarou	Compound heads	Gourmantche	23
			Fulani	23
			Total	46
East	Nanoungou	Compound heads	Gourmantche	32
			Fulani	30
			Total	62
Central-East	Gnanguedin	Compound heads	Bissa	17
			Mossi	22
			Fulani	3
			Total	42
				Total N = 208

toward innovation, particularly differences in the sense of modernity, efficacy, and affect toward local and central government. Given great disparities in the distribution of the various ethnic groups and the expected importance of ethnicity as an independent variable, samples stratified on the basis of ethnicity were drawn in five sites: Koukououdi, Tafogo, Ougarou, Nanoungou, and Gnanguedin. The sixth site, Gougou, had not been chosen at the time of the survey. Lists of compound heads were grouped by ethnicity in each site and assigned numbers. A table of random digits was then employed to draw a random sample within each ethnic group in each site. Replacements for those who could not be located were identified. The interviewing was satisfactorily completed in all sites except Tafogo. In that site interviewing was prematurely halted because of the illness of the extension agent assigned the task of conducting the interviews.

The second major survey, which examined livestock management practices, required a somewhat different sampling universe. After considering a wide variety of alternative strategies and the goals of the survey, it was decided to limit the sample to cattle owners (of all important ethnic groups found in the research sites). For these purposes cattle

TABLE 3-2
Livestock Management Survey
(Sample selection criteria)

Ord	Site	Sample Universe	Ethnicity	Selected Villages	N
Central North (Kaya)	Tafogo	Livestock owners*	Mossi	30 Tafogo	49
			Fulani	19 Seno	
				Dassantanga	
				Douka koDaga	
				Djamkoko	
				Bougou	
Central North (Kaya)	Koukoundi	Livestock owners	Mossi	28 Koukoundi	38
			Fulani	10 Sabse	
East (Eada N'Gouma)	Ougarou	Livestock owners	Gourmantche	17 Ougarou	33
			Fulani	16 Guilogma	
				Datougou	
				Fibou	
				PamYakoum	
				Nymbilav	
				Djone2	
Central-East (Koupela)	Gnanguedin	Livestock owners	Bissa	15 Gnanguedin	37
			Mossi	8 Dema	
			Fulani	11 Loba	
				Lall-	
				Gaone	
TOTAL N = 157					

*All male compound heads owning one or more cattle, other than, or in addition to traction animals.

owners are defined as all male compound heads owning one or more bovines, other than, or in addition to traction animals.

The delineation of the sample universe was completed in the following manner. Lists of livestock (cattle) owners were compiled based on information gathered in the course of the attitudinal survey, from other research efforts, from contacts and information gathered by project extension agents, and finally, from village chiefs. Lists of compound heads were read to traditional village chiefs who were asked to identify all cattle owners; this procedure proved most useful in completing and reconfirming lists of livestockmen already compiled by other means.

From the universe of cattle owners, stratified random samples of livestockmen were selected for interviewing. The samples in each of the four sites surveyed (Koukoundi, Tafogo, Ougarou, Gnanguedin) were stratified on the basis of ethnicity (Mossi-Fulani for Koukoundi and Tafogo, Gourmantche-Fulani for Ougarou, and Bissa-Mossi-Fulani for Gnanguedin) and by village.

3.2 Testing

Both of the interview schedules were tested by two methods. First, extension agents in all sites were given a draft of the instrument to examine. They freely commented on problems, such as questions which would be difficult to pose in the local culture context, wording changes, etc. Each instrument was also tested in an actual field situation to allow for further refinements.

3.3 Translations

The original research instruments were written in French. Project extension agents are all native speakers of at least the dominant language in their respective sites. The principle language spoken by the 12 extension agents are Mõre (6), Ffulfulde (2), Bousansi (2), and Gourma (2). Each extension agent was responsible for the translation of the research instrument into his own language. Translations of at least two speakers of each language were compared. Translators were brought together and a "best" translation of each question was decided on in each language. The completed translations were recorded on cassette tapes. These tapes were then used by extension agents to memorize the questions in their language (none are literate in a language other than French). Satisfactory translations were produced in Mõre, Ffulfulde and Gourma. Bisa interviews were conducted in Mõre, occasionally with the assistance of an agricultural service extension agent who was a native Bousansi speaker.

3.4 Training and Interviewing

All project extension agents were given a short training course on interviewing techniques, problems likely to be encountered in the interviewing process, and the means of dealing with them. This was supplemented by practice interviews conducted in the presence of the author. When it was deemed that the interviewers were ready, they were sent in the field for actual interviews. The author remained available for several days to clarify issues and answer any questions that might arise. All interviews in the first survey were conducted by the extension agents.

Training for the livestock management survey was conducted in the field. As a result of the extension agents' past interviewing experience, only a short training session was necessary.

Because of the complexity of the research instrument, the author decided to conduct all interviews, except those in the Koukoundi site, personally. The extension agents acted as translators. Since most livestockmen and traditional authorities in the selected research sites were familiar with the author and supportive of his work, it was deemed both feasible and valid to proceed in this fashion. The opportunity this pro-

vided for probing into a variety of interesting areas clearly compensated for any losses, or error factor introduced in the data by the cross-cultural contact entailed in the interviewing.

3.5 Processing

The surveys were designed so that all data gathered in the systematic interviews would be in machine readable form. The data were coded and programmed and then sent to the computer facility at Texas Tech University for key punching and processing.

3.6 Additional Data

Additional data involving subjects such as land tenure, kinship, and transhumance were gathered on the basis of in-depth interviews. These data were then used to supplement and corroborate more systematically gathered data. In the case of transhumance routes, several were verified by following the actual routes with the help of experienced guides. The extension agents were able to provide a valuable service to local livestockmen (animal vaccinations) and support initial small scale interventions such as the construction of animal health facilities, wells, and poultry breeding units. These services provided an excellent basis for acceptance by local people and support for the author's applied research efforts. The opportunity for access and broad based communication through livestockmen's committees established by the author proved invaluable. The careful cultivating of relationships with traditional authorities was also a necessary and integral component of this process.

IV. THE EXISTING CULTURAL MILIEU

In this chapter some important cultural differences and practices which have an impact, or potential impact, on livestock production will be discussed. This section is not intended as an ethnography of any of the four ethnic groups discussed here. That is a task which has already been largely completed by others, and is in any case beyond the scope of this publication. Many of the important differences between ethnic groups in relation to livestock production are included in subsequent sections in which specific topics such as animal health, herding, transhumance, and marketing are discussed.

The most important issues to be examined from the perspective of the existing cultural milieu are the basic economic orientation of each group and the relationship of the ethnic group to the land. Both issues are closely related. It can not be too strongly emphasized that the somewhat artificial polar types, sedentary—nonsedentary and crop production—livestock production do not adequately describe the economic orientations of ethnic groups in Upper Volta (Swift, 1979).

4.1 Economic Orientation

An examination of the major ethnic groups in the areas covered here seems to indicate a slow convergence of modes of production. Significant proportions of people generally regarded as sedentary agriculturalists (farmers), Mossi, Gourmantche and Bissa, are very much involved in livestock production. This applies to small ruminants (goats and sheep) and poultry, which are very widely held, as well as to large ruminants (cattle) which are held by a relatively small but growing minority. In the village of Talogo, for example, just under 25 percent of the Mossi compound heads own at least some cattle. Furthermore, there is an increasing trend on the part of the Mossi and Gourmantche to rely on their own children as herders. This trend is less pronounced among the Bissa who continue to rely quite heavily on the Fulani to herd their cattle.

On the other side of the coin, the Fulani, traditionally regarded as nomadic to semi-sedentary cattlemen, are becoming increasingly sedentarized. It is difficult to find a Fulani who does not have his own fields in which he produces millet, sorghum, maize, and cowpeas. In fact, of the 57 Fulani interviewed as part of the livestock management survey, 56 (or 98.5 percent) have their own fields. Although Fulani fields are generally smaller than those of the Mossi, Bissa, and Gourmantche, the grain produced still forms a significant portion of their annual consumption (Delgado, 1977). In fact 12.5 percent of the Fulani sampled indicated that their own harvests produced enough to satisfy all their needs.

On the average the Fulani are growing 3.3 different crops, compared

with 5.2, 6.6, and 7.3 for the Mossi, Bissa, and Gourmantche respectively ($F=41.13$, $P<.0001$). The further south one moves, the larger the number and variety of crops produced by all four ethnic groups. The Fulani take good advantage of the dung produced by their animals to fertilize their fields, especially those on which maize is grown. The result is relatively high output.

The major difference between the Fulani and the other ethnic group sampled is the labor input into their crop production. The average male labor devoted to agricultural work per compound is 2.70 for the Fulani and 3.88, 3.59, and 1.07 for the Mossi, Gourmantche, and Bissa respectively. This difference ($F=3.67$, $P=.02$) is further compounded by the fact that virtually no Fulani women work in the fields other than at the time of the harvest. The other ethnic groups average between three and four women in the fields on a regular basis. In total, the Fulani average just under three agricultural workers per concession while the other groups muster 7.9 (Mossi), 8.4 (Gourmantche), and 11.1 (Bissa) ($F=11.74$, $P<.0001$). Additionally, and somewhat surprisingly, the Fulani are much less likely than other cattle owners to use animal traction. Only 5.1 percent of the Fulani sample use this method while for the Mossi (46.9%), Gourmantche (41.2%), and Bissa (86.7%) cattle owners the figures are much higher ($X^2=41.21$, $P<.0001$, Cramer's $V=.54$). Thus total labor inputs, both human and animal, into agriculture, are considerably lower for the Fulani than for the other ethnic groups.

The preferred life style for a Fulani is still the life of a herder. This ideal is, however, being eroded by the realities of the environment and the development of more reliable strategies for dealing with uncertainty.

Both traditional sedentary farmers such as the Mossi, Gourmantche, and Bissa, and traditional herders such as the Fulani, are recognizing the advantages of a mixed farming system. In the general sample (which included both cattle owners and non-owners) of those who said they did not produce enough grain this year to make it through the year, 36.6 percent said they would sell animals to purchase grain. Many of those who merely said they would buy grain undoubtedly will also use resources gained from livestock sales. (This issue is more fully discussed in chapter 7, Marketing.)

Contrary to the conclusions suggested by Delgado (1977), this author believes that a mixed farming strategy maximizes the survival capacity of all ethnic groups involved. Those who are primarily dependent on their crops are provided with a form of drought insurance by their livestock. This strategy can not cope with large scale drought such as that experienced in the late 1960s and early 70s, but it does provide a means for coping with the shorter, more localized droughts experienced by farmers throughout the region.

TABLE 4-1

How will you get the grain for your family to finish out the year? (Asked only of those who said they had not produced enough grain for themselves this year.)

	N	Percent
No problem	2	2.0
Will buy	53	52.5
Sell animals	37	36.6
Borrow	9	8.9
Total	101	100.0

When the extremely localized rains fail in an area, farmers sell off some animals to pay for the grains needed to sustain their families. Furthermore, since livestock are mobile, the effects of localized droughts can be minimized by transferring the herds to areas which have received adequate rains.

The Fulani also benefit from this system. In good years they produce some of their own millet and sorghum, thus minimizing the number of animals which must be sold to purchase grain. In turn this increases the number of animals available for sale in bad years, without threatening the overall herd and its ability to reproduce. From the perspective of this author, the most rational strategy appears to be a convergence of production strategies (diversification) rather than the maintenance of a high degree of specialization. It is this strategy of diversification which many rural Voltaiques appear to be following.

4.2 Traditional Socio-Political Structure

There are several important distinctions in social structure between ethnic groups, which have an impact on organizational efforts as well as methods of managing livestock. The Mossi have a hierarchical social structure based on the nobility of their ancient, but to some extent still functioning kingdoms. Administrative, judicial and religious policies were determined at the center. Although local variations occurred, the villagers were dependent on the local village chief and land chief for most important decisions regarding ritual blessings and allocations such as land (Skinner, 1964; Hammond, 1966).

The Fulani fall at the opposite end of the spectrum with "chiefs" who do not so much rule as seek cooperation and compromise through a process of consensus building. Their positions right up to the present day are lacking in any form of force or enforcement powers. Instead they depend on local moral consensus. The mobility of the Fulani herder provided the option to move away from unwanted or unacceptable authority. The patrilineage is the most important organizational tie, but

the lineage head must also depend on his ability to build a consensus as a means of maintaining his authority (Dupire, 1962, Riesman, 1977).

The structure of the other two ethnic groups encompassed within this study falls somewhere between that of the Mossi and Fulani. Authority among the Bissa is somewhat analagous to that among the Mossi, but less hierarchical and all encompassing (Regard, 1965). Except in times of warfare, the Gourmantche have an even less rigidly structured political organization (Philippe, et al, 1977). The power of the chief is somewhat diffuse. Even organizational units such as the clan and lineage have a relatively weak hold on the individual.

Two important points must be made relative to these organizational differences. Control of land (arable land) is centralized among the Mossi, more diffuse among the Bissa and Gourmantche (generally centered on the lineage) and, with exceptions, virtually non-existent among the Fulani. Interestingly, when livestockmen were asked where or how they obtained the land they are currently cultivating the modal responses differed greatly by ethnic group. For the Mossi the most common response was from the village chief (53.8%). For the Gourmantche the most frequently cited source of land was from relatives (76.5%). In the case of the Fulani and Bissa the modal response was that they had asked no one, but merely cut an area of the bush for their fields (55.3% and 66.7% respectively).

Although land is communally held, normally as long as sufficient land remains unexploited or at rest in the rotation system, all families, whether local or strangers, are granted usufruct rights. For strangers this does not include the right to plant trees, an act which signifies permanent ownership. The rights of groups such as the Fulani, who may cut bush fields without informing traditional sedentary authorities, are the subject of debate and, in some cases, interethnic conflict.

Pastureland and forest land are open to all. Even though such areas may formally fall within the territory of a chief (among the Mossi) no limitations are put upon use. Everyone has equal access to pasture, wood, and wild fruits. Thus, virtually all land used for grazing purposes is open and uncontrolled. Even grazing on village fields after the harvest is generally open. Some formal arrangements for use still exist, but by and large the system is unregulated. The emphasis placed by some analysts (Delgado, 1979) on the value of the exchange of fertilizer for forage (crop residue) seems to be somewhat exaggerated.

Of equal importance is the fact that ownership of livestock, unlike ownership of farmland is not communal, but is individual, or confined to a patrilineage. Livestockmen remain rigidly individualistic in this regard. The identification of ownership is hidden for several reasons. Most obvious among them is the government tax of 200 FCFA (West

African Francs) per head of cattle. It is also viewed as preferable not to let one's neighbors and relatives know the extent of one's resources. Otherwise livestock owners may be called upon to share these resources with others to a greater extent than they would like.

From this perspective, it must be noted that successful interventions in the area of livestock production probably must rely on individual rather than communal ownership. Given individual ownership and free access to pasture resources, it is obvious that for development purposes pasture resources must in some way be managed in the interests of the collectivity. The alternative approximates the tragedy of the commons (Hardin, 1968).

4.3 Interethnic Conflict

There is considerable interethnic hostility, particularly between the dominantly agricultural groups, Mossi, Gourmantche, and Bissa, and the largely livestock oriented group, the Fulani (Philippe, Some and Diawara, 1977; Delgado, 1978). It is not uncommon to hear gross stereotypes and ethnic slurs, generally aimed against the Fulani. The major source of inter-ethnic disputes centers around the issue of land use. In that sense, the conflict is really economic, but it is compounded by cultural differences.

The problem is a general one between livestockmen and farmers, regardless of ethnicity. Almost half (49%) of the livestockmen interviewed said that they had problems with the farmers in their villages. When this figure is broken down by ethnicity it is interesting to note that a higher percentage of Mossi (60.0%) than Fulani (52.6%) livestockmen experience this problem. The figures are considerably lower for the Gourmantche (17.6%) and Bissa (26.7%).

The most important immediate source of conflict (96.1%) arises from the accidental destruction of crops by herds of cattle. Disputes center around culpability and compensation. Currently this issue is dealt with by agricultural agents employed by the ORD. These agents are charged with assessing crop damage and awarding compensation. Since the judges are agricultural extension agents the herders feel that they are held accountable to a system which is rigged against them.

The question of compensation remains a serious and difficult issue. Sometimes herders, in order to avoid payment, flee with their herds. More commonly, payment is made without the need for intervention by the gendarmes (national police). Where cattle consigned to others have caused crop damage, de jure it is the herder who is responsible, but the owner usually makes a contribution to the settlement.

Access to water sources is an equally volatile issue. Over 43 percent of the livestockmen sampled identified this as a problem for them. Since

TABLE 4-2
Percentage of Livestockmen Experiencing Problems

	N	Mossi 65	Fulani (Poulh) 57	Gourmantche 57	Bissa 15	Total 154	N ² 154	P<
Conflict with farmers	Percent Yes	69.0	52.6	17.6	26.7	49.4	13.00	.005
Access to water	Percent Yes	43.1	52.6	11.8	53.3	44.2	9.13	.05

there is no real concern on the part of the government for land use planning and little, if any, coordination between the livestock and agricultural services, streams, ponds and wells have been encircled by gardens and bush fields. Livestockmen are effectively denied access to vital traditional water resources. Because they lack adequate, or in some cases any access routes, livestockmen are afraid that their stock will enter fields and gardens, causing crop destruction for which they will be held personally responsible.

A third important issue involves trust between a farmer-livestockowner and his herder where cattle have been consigned to the Fulani. When an animal dies the herder generally brings the hide to the owner as proof of the death. In many cases there is a lingering suspicion on the part of the owner that his animal was not well cared for. Additionally, cases of animal theft create strong negative reactions toward the Fulani as a whole, rather than toward the culpable party. Both sides in the cattle consignment relationship seem less and less eager to want to continue this type of arrangement (this is more fully discussed in the section on herding in chapter 3).

1.1 Attitudinal Dispositions

It is important to know to just what extent both culture and experiential factors impact on the openness of diverse groups to development efforts and to innovation in general. Here an attempt has been made to examine some of these attitudinal dispositions among four ethnic groups. The dependent variables include past contact with both central and regional (ORD) government officials, the affect of that contact (positive or negative), association membership, attitudes toward modernity and the sense of efficacy. Four major independent variables were selected for examination: ORD region, ethnicity, religion and site or village.

Before looking at the data it will be useful to examine the author's expectations based on the ethnographic literature. It is generally believed that sedentary agriculturalists are easier for government agents to contact than are herders. Given the mobility of herders this is not an unreasonable inference. To the extent that these distinctions correspond to ethnicity, it seems probable that the more sedentary groups will have more contact with both national and regional government, more positive reactions to that contact, a greater understanding of modernity and a higher sense of efficacy, than less sedentary groups, notably the Fulani.

Religion is also expected to be related to attitudes toward modernity, and the sense of efficacy. According to the conventional wisdom, Animists are believed to be less modern in their orientation than members of major world religious groups (Muslims and Christians). The samples were not stratified on the basis of religion. The number of Christians (14

TABLE 4-3
Contact with Government

Independent Variable	Percent having contact	N	X ²	p<	Cramer's V	
Ord	North Central	51.1	57	30.60	.001	.39
	East Central	39.0	41			
	East	11.0	107			
		N=205				
Ethnicity	Mossi	42.2	64	14.89	.002	.27
	Fulani (Peulh)	35.3	68			
	Gourmantche	10.9	55			
	Bissa	35.3	17			
		N=204				
Religion	Animist	26.8	71	3.33	N.S.	N.S.
	Christian	14.3	14			
	Muslim	35.0	120			
		N=205				
Site	Ougaton	21.4	45	39.41	.0001	.44
	Namoungou	6.5	62			
	Gnanguedin	40.5	42			
	Konkoundi	46.3	41			
Talogo	75.0	16				
		N=206				

of 205—a figure close to the distribution of Christians in the population of Upper Volta) is too small to make adequate comparisons possible. It also must be emphasized that ethnicity and religion covary. That is, virtually all Fulani are Muslim while virtually all Gourmantche sampled are animist. It is not possible to sort out the two.

Region, ORD, and site, to the extent that they represent variations in the degree of isolation, are expected to be related to the dependent variables. That is, the more isolated sites are expected to manifest attitudes more traditional than those sites which have had the benefit of more direct contact with modern life. It must be specified that, although the ORDs vary in their degree of isolation from Ougadougou, the sites are about equivalent in their distance from their ORD centers (Talogo, 80 km and Koukeundi 85 km from Kaya; Gnanguedin, 90 km from Koutepela; Namoungou, 30 km and Ougorou, 70 km from Fada).

4.4.1 Communications Infrastructure—Contact with Government

Two communications factors are identified here: the degree to which people have had contact with government, and the affective orientation generated by that contact. That is, it may be important whether people who have experienced government contact regard such interaction in an

TABLE 4-4
 Contact With Government
 If you had contact did they help you?

Independent Variable		Percent		N ²	p<	Cramer's V
		Yes	N			
Ord	North Central	79.1	31	1.33	N.S.	.13
	East Central	68.2	22			
	East	66.7	18			
			N=74			
Ethnicity	Mossi	65.7	35	13.06	.005	.42
	Fulani	100.0	21			
	Gourmantche	45.5	11			
	Bissa	75.0	8			
			N=75			
Religion	Animist	66.7	27	1.55	N.S.	.14
	Christian	66.7	3			
	Muslim	79.5	44			
			N=74			
Site	Ougarou	62.5	16	4.73	N.S.	.25
	Namoungou	100.0	2			
	Gnanguedin	69.6	23			
	Koukoumndi	89.5	19			
	Tafogo	66.7	15			
			N=75			

affectively positive or negative light. As can be seen from Table 4-3 there is a significant relationship between region (ORD) and the level of contact with representatives of the central government services. This relationship appears to vary directly with the distance of the ORD from Ouagadougou. In the Kaya ORD just over half, 54.4 percent, of those interviewed had some contact with government while the figures are 30 and 14 percent for the Koupela and Fada ORDs respectively. Ethnicity also covaries with the level of contact. Highest contact is experienced by the Mossi (42.2%) followed by the Fulani and Bissa (35.3%) and the Gourmantche (11%).

It appears that the degree of contact with government is influenced by a combination of region and ethnicity, with the former having the greater impact. Contrary to expectations, the Fulani contact with government is not less than that of the more sedentarized groups. However, when a control is introduced for region, the impact of ethnicity disappears. There are no significant differences between ethnic groups within the same ORD. There does not appear to be any significant relationship between religion and contact with government.

For those who had contact with representatives of the central govern-

TABLE 4-5
Contact With Regional Government

Independent Variable		Percent Yes	N	N ²	p<	Cramer's V
Ord	North Central	32.8	58	26.16	.0001	.36
	East Central	10.0	46			
	East	6.8	103			
			N=201			
Ethnicity	Mossi	40.6	61	39.94	.0001	.42
	Fulani	1.5	66			
	Gourmantche	11.3	53			
	Bissa	47.1	17			
			N=200			
Religion	Animist	25.7	70	1.31	N.S.	.008
	Christian	15.4	13			
	Muslim	19.5	118			
			N=201			
Site	Ongarou	13.0	46	41.02	.0001	.45
	Namoungou	1.8	57			
	Gnanguedia	41.5	11			
	Koukoundi	21.4	12			
	Talogo	62.5	16			
			N= 202			

ment services the only independent variable which is significantly related to the positive or negative nature of that contact is ethnicity. Surprisingly, the Fulani had a uniformly positive response (probably to livestock service vaccinators), followed by the Bissa, Mossi, and finally the Gourmantche. Even though the number of respondents is small, the fact that the Gourmantche are the only group with a majority of negative responses to government contact must be noted.

The second level of government contact examined is contact with the regional government, the ORD, and its representatives. Once again one finds broad differences between ORDs. The relationship between ORD and contact with ORD officials is highly significant and the level of association is moderate. In Koupela (CE), 40 percent of those interviewed had some contact, while the comparable figures for Kaya and Fada are 32.8 and 6.8 percent respectively. Basic contact between the rural peasant and his government seems to be almost totally lacking in the Fada ORD.

The relationship between ethnicity and contact with ORD authorities is also significant and shows an even stronger level of association. Mossi and Bissa have relatively high levels of contact with ORD officials (40.6 and 47.1% respectively), while for all intents and purposes Gourmantche and Fulani have virtually none (11.3 and 1.5% respectively). Ethnicity and region interact to produce these relationships. When a control is

TABLE 4-6
 Contact With Regional Government
 If you had contact did they help you?

Independent Variable		Percent Yes	N	X ²	p<	Cramer's V
Ord	North Central	76.2	21	17.27	.0002	.58
	East Central	66.7	21			
	East	0.0	10			
			N=52			
Ethnicity	Mossi	71.2	31	14.14	.003	.52
	Fulani	25.0	8			
	Gourmantche	0.0	5			
	Bissa	66.7	9			
			N=53			
Religion	Animist	51.7	17	0.40	N.S.	.09
	Christian	66.7	3			
	Muslim	56.3	32			
			N=52			
Site	Ougarou	0.0	3	18.70	.001	.59
	Namoungou	0.0	7			
	Guanguedin	68.2	22			
	Koukoundi	66.7	12			
	Falogo	88.9	9			
			N=53			

introduced for region, the impact of ethnicity is greatly weakened. Region appears to be the crucial independent variable. Religion is not a factor which has any explanatory power.

When the question of affect is examined, although the numbers are relatively small (N=52), the same general trend holds. The relationship between ORD and a positive evaluation of past contact with the ORD is significant and reasonably strong (Cramer's V=.58). In both the Kaya and Koupela ORDs the experience of contact is overwhelmingly positive. Contact in the Fada ORD is uniformly negative. The relationship also holds for ethnicity. Bissa and Mossi have generally favorable responses while Gourmantche and Fulani are overwhelmingly negative. Religion is not a significant factor.

Another extremely important aspect of the administrative infrastructure for development is the degree of membership in associational groups. Elsewhere in Africa associational groups have been found to provide the core around which individual participation in development efforts are stimulated (Vengroff, 1974, 1977). One finds significant variation in associational membership between the three ORDs considered here. The strength of the relationship is, however, rather weak. In accord with other findings presented in this section, the Fada ORD shows the

TABLE 4-7
Association Membership

Independent Variable		Percent Yes	N	N ²	p<	Cramer's V
Ord	North Central	31.0	58	6.36	.05	.18
	East Central	41.5	41			
	East	21.2	104			
			N=201			
Ethnicity	Mossi	30.8	65	16.11	.002	.28
	Fulani	25.0	68			
	Gourmantche	15.4	52			
	Bissa	64.7	17			
			N=202			
Religion	Animist	21.4	70	3.86	N.S.	.14
	Christian	46.2	13			
	Muslim	30.0	120			
			N=203			
Site	Ougarou	18.2	44	7.92	N.S.	.20
	Namoungou	23.2	60			
	Gnanguedin	10.5	42			
	Koukoundi	35.7	42			
	Tafogo	18.8	16			
			N=201			

TABLE 4-8

Modernity

To have a better life it is necessary to return to the manner of living of our ancestors.

Independent Variable		Percent Agree	N	N ²	p<	Cramer's V
Ord	North Central	19.1	57	7.05	.03	.19
	East Central	12.5	40			
	East	29.0	107			
			N=204			
Ethnicity	Mossi	49.2	63	11.38	.01	.24
	Fulani	21.7	69			
	Gourmantche	10.7	51			
	Bissa	41.2	17			
			N=203			
Religion	Animist	51.4	70	11.33	.005	.24
	Christian	14.3	14			
	Muslim	30.8	120			
			N=201			
site	Ougarou	62.2	45	44.19	.0001	.46
	Namoungou	4.8	62			
	Gnanguedin	41.5	41			
	Koukoundi	46.3	41			
	Tafogo	56.3	16			
			N=205			

TABLE 4-9
 Modernity
 Smart men economize to satisfy their needs in the future
 rather than for immediate pleasures.

Independent Variable	Percent Agree	N	X ²	p<	Cramer's V	
Ord	North Central	60.3	58	29.67	.0001	.38
	East Central	70.0	40			
	East	91.3	105			
		N= 203				
Ethnicity	Mossi	61.1	61	22.10	.0001	.33
	Fulani	92.6	68			
	Gourmantche	88.7	53			
	Bissa	61.7	17			
		N= 202				
Religion	Animist	72.5	69	3.54	N.S.	.13
	Christian	85.7	14			
	Muslim	83.3	120			
		N= 203				
Site	Ougarou	89.1	16	38.02	.0001	.43
	Namoungou	98.3	59			
	Gnanguedin	70.7	41			
	Koukoundi	69.0	42			
	Fatogo	37.5	16			
		N= 204				

lowest rate of group membership of the three ORDs, followed by Kaya and Koupela.

Ethnicity is also significantly related to organizational membership, again with a relatively weak level of association. The trend is clear. The Bissa have the highest level of group membership (61.7%), followed by the Mossi (30.8%), the Fulani (25.0%), and the Gourmantche (15.4%).

The problem of an infrastructure for development efforts is relatively clear. Although infrastructure development is generally weak throughout the country, in the Fada ORD the magnitude of the problem is greater. Contact with officials at all levels, is minimal, and reactions to existing contact is generally negative. The same does not appear to be the case in project sites in either the Koupela or Kaya ORDs. The relatively non-hierarchical, socio-political structure found among the Gourmantche, as well as their Fulani neighbors, further complicates efforts to undertake broad scale interventions in this area. The Mossi-Fulani and Mossi-Bissa-Fulani culture complexes do not present problems of the same magnitude.

TABLE 4-10

Modernity
 Before deciding on a new crop it is useful to know if it sells expensive or cheap.

Independent Variable	Percent Agree	N	X ²	p<	Cramer's V	
Ord	North Central	40.4	57	99.05	.0001	.70
	East Central	17.9	39			
	East	96.2	106			
		N= 202				
Ethnicity	Mossi	33.9	62	62.98	.0001	.56
	Fulani	79.1	67			
	Gourmantche	91.5	55			
	Bissa	29.4	17			
		N=201				
Religion	Animist	67.6	71	3.8	N.S.	.14
	Christian	85.7	14			
	Muslim	60.7	117			
		N= 202				
Site	Ougarou	97.7	44	116.79	.0001	.76
	Namoungou	95.2	62			
	Gnanguedin	17.5	40			
	Koukoundi	24.4	41			
	Tafogo	81.3	16			

4.4.2 Attitudinal Predispositions—Modernity and Efficacy

It is clear that the organizational basis for developmental efforts is highly variable. This does not mean that the willingness of local people to work closely with a project parallels the organizational strengths and weaknesses of the ORD or of past central government efforts. In fact this author has found the people, both Gourmantche and Fulani of Ougarou in the Fada ORD to be very supportive and cooperative.

In examining several items designed to measure attitudes toward modernity, the pattern evident in the organizational and communications infrastructure is reversed. Attitudes toward modernity are significantly more positive among the people in the Fada ORD than in either of the other two ORDs in which this research was conducted. Ethnic differences are also reversed. Significant differences in attitudes toward modernity between groups uniformly favor the Fulani. The Gourmantche score significantly better than both the Mossi and Bissa groups on two of the three items. It must be noted that broad contradictions have been found in the literature between attitudinal dispositions toward modernity and successful development efforts (see for example Horowitz, 1969).

TABLE 4-11
Efficacy
Difficult to Adopt New Techniques of Production

Independent Variable		Percent Agree	N	X ²	p<	Cramer's V
Ord	North Central	38.6	57	15.55	.001	.28
	East Central	59.0	39			
	East	70.5	105			
			N=201			
Ethnicity	Mossi	15.2	62	10.40	.02	.23
	Fulani	62.1	66			
	Gourmantche	72.7	55			
	Bissa	47.1	17			
			N=200			
Religion	Animist	61.3	70	2.45	N.S.	.11
	Christian	42.9	14			
	Muslim	57.3	117			
			N=201			
Site	Ougarou	82.2	45	23.66	.0001	.31
	Namoungou	61.7	60			
	Gnunguedou	57.5	40			
	Koukoundi	46.3	41			
	Lafogo	18.8	16			
			N=202			

4.4.3 Efficacy

Efficacy is considered to be a factor separate from attitudes toward development. By efficacy is meant the feeling on the part of an individual that his actions count. That is, an individual may or may not believe that he personally has the ability to have an effect on events around him. Whether or not he thinks modernity is a good thing, if a person feels that he has no control over events or ability to bring about change, he is likely to take no action at all.

One of the principal aims of the community organization efforts of the Village Livestock Project, on which this research is based, has been to generate an increased sense of efficacy on the part of local livestockmen. Locally selected animators (Committee members) must therefore constantly be encouraged to express their ideas and opinions. This alone is not enough. They must also see their suggestions bear fruit in the form of concrete projects, even if on a very small scale (Vengroff, 1980A).

Significant relationships exist between ethnicity and region on the one hand and the sense of efficacy on the other. The responses to the efficacy items employed in this study clearly indicate that the lowest sense of efficacy exists among the interviewees in the Fada ORD. In fact the gap between the Fada ORD and the other two ORDs, Koupela and Kaya,

TABLE 4-12

Efficacy

Some work is for foreigners not villagers like us.

Independent Variable		Percent Agree	N	N ²	P<	Cramer's V
Ord	North Central	36.2	58			
	East Central	60.0	10	52.72	.0001	.52
	East	91.6	95			
			N = 193			
Ethnicity	Mossi	13.8	61			
	Fulani	80.9	68	31.46	.0001	.40
	Gourmantche	88.1	13			
	Bissa	58.8	17			
			N = 192			
Religion	Anmist	63.3	60			
	Christian	78.6	11	1.48	N.S.	.09
	Muslim	69.7	119			
			N = 193			
Site	Ougarou	91.4	35			
	Namoungou	91.7	60			
	Gnanguedin	61.0	41	61.81	.0001	.56
	Koukoundi	47.6	12			
	Tafogo	6.3	16			
			N = 194			

TABLE 4-13

Responsibility for Development Efforts

	Government	Influential Villagers	All Villagers	Government and Villagers	N
Ord					
North Central	23 (41.1)	1 (1.8)	7 (12.5)	25 (44.6)	56 (100.0)
East Central	12 (31.6)	1 (2.6)	3 (7.9)	22 (57.9)	38 (100.0)
East	75 (70.1)	12 (11.2)	9 (8.4)	11 (10.3)	107 (100.0)
N = 201					
Ethnic Group					
Mossi	24 (39.3)	1 (1.6)	4 (6.6)	32 (52.5)	61 (100.0)
Fulani	38 (55.1)	11 (15.9)	13 (18.8)	7 (10.1)	69 (99.9)
Gourmantche	40 (74.1)	2 (3.7)	2 (3.7)	10 (18.5)	54 (100.0)
Bissa	8 (47.1)	0 (0.0)	0 (0.0)	9 (52.9)	17 (100.0)
N = 201					

included in the study is very large. These results are at least partially a function of ethnicity. The Gourmantche are consistent in manifesting the lowest sense of efficacy of all ethnic groups. The Fulani are a close second. The gap between these two groups and the Mossi and Bissa is considerable. Since the sample in the Eastern ORD is composed of Gourmantche and Fulani, the gap between ORDs is also quite large. However, the relationship between ORD and efficacy is stronger (Cramer's V) than the relationship between ethnicity and efficacy, it seems that at least part of the gap must be accounted for by the experience of people in the region with governmental or other development efforts.

The overall conclusion to be drawn from this examination of attitudinal differences between regions and ethnic groups is that the successful introduction of new techniques of production will probably require more time and greater effort in the Fada ORD than in either the Kaya or Koupela ORDs. In this sense it is wise to proceed slowly and cautiously with efforts there. It is perhaps best to initially concentrate only on interventions which have been at least moderately successful elsewhere. Small scale activities are probably the best to pursue initially.

V. LOCAL LIVESTOCK MANAGEMENT I: DISEASES AND HEALTH PRACTICES

The animal health statistics presented in this section were gathered as part of the livestock management survey conducted in the research sites. These data are not strictly veterinary in nature. Several caveats are in order before proceeding. First, the data are based on what local livestockmen *perceive* to be the causes of actual deaths of both large and small ruminants. The data are not diagnostic. No blood samples or other formal procedures were undertaken to verify these data from a veterinary perspective. In fact, such a capability does not at present exist within the livestock service of Upper Volta.

Second, it should be noted that the four ethnic groups included in the survey differ greatly in the depth of their experience with, and understanding of, livestock diseases and their symptoms. Even linguistic problems occur where people do not know the names of certain diseases in their own language, confuse various names, or use the same name for several diseases. Their reports are therefore not of uniform quality. For this reason the data have been broken down not only by site, but by the ethnic group of those reporting the losses. It is expected that reports provided by the Fulani are in general more accurate than those provided by the other three ethnic groups. However, it must be noted that due to different management practices, particularly transhumance, Fulani herds may in fact differ from the herds of the other ethnic groups in terms of the types of diseases they are exposed to and contract. Thus, there may be real differences in the actual causes of livestock mortality for different ethnic groups.

Thirdly, the figures presented here do not strictly deal with the incidence of various diseases, but rather with the perceived incidence of *fatal* diseases. Various diseases or conditions (e.g. parasites) which may be debilitating, thereby decreasing the resistance of animals to other fatal diseases or simply resulting in production losses (weight for example), but not causing deaths, are underreported. What is being examined here are the number of animals reported by livestockmen sampled to have died (the sample includes 157 livestock owners with reported losses for 1978 of 456 cattle, 671 sheep and 555 goats). Thus, we have a picture of the relative frequency of various causes of animal losses.

Fourthly, it must be stated that it is the belief of this author that in spite of possible errors of perception and local diagnosis (diagnoses by local livestockmen include post mortems in most cases), there is a probable high positive correlation between perceived causes of livestock losses and the actual causes. These data can be reasonably well employed

TABLE 5-1
Names of Major Cattle Diseases in Local Languages

English	French	Mossi	Fulani	Bissa	Gourmantche
Trypanosomiasis	Trypanosomie	Massere	Péowa	Poum	Blissé
Pasteurellosis	Pasteurellose	Báko	Boorabudo	Krényaba	Pouy Blissé
Rinderpest	Peste Bovin	Sáaga	charrah chaáda	Sáaga	vakiama Fougpouadou
Pleuropneumonia	Péripneumonie	Fulufubaaga	Boukge	hóhomouyaba	Yamkiamo
Blackleg	symptomatique	Kaagabaaga	kwéngale	Foutouyaba	O Fouado
Anthrax	Charbon Bactérien	Tindrébaaga	Saamo	Yamba Gonfa	Yampavéby
Tuberculosis	Fuberculose	Konsogokéngo	Soyou	Danyaba	O Kgarou
Lumpy skin disease	Dermatose	Zanggo	Gwinva	Maibollgi	Mogary
Mange*	LaGale	Zankada, Zankara	Yaavadé	Maiboyaba	Mogary
Brucellosis	LaBrucellose	—	—	—	—
Foot-and-mouth	Fièvre aphteuse	—	Suffa saffa	Ninyaba	Saffa

*Exact type unknown.

TABLE 5-2
Percentage of Animal Losses Attributed to Each Cause for Four Sites*

Disease or cause of death	Cattle	Sheep	Goats	
1. Trypanosomiasis	19.19	21.59	12.88	
2. Rinderpest	0.00	12.82	9.01	
3. Blackleg	11.77	0.89	1.26	
4. Anthrax	0.15	1.79	0.00	
5. Pasteurellosis	15.31	33.09	12.43	
6. Pleuropneumonia	0.66	0.00	0.72	
7. Diarrhea	0.90	11.17	11.24	
8. Tuberculosis	0.11	0.89	0.90	
9. Bronchitis	0.00	0.11	3.60	
10. Parasites	0.00	5.21	7.92	
11. Hunger and thirst	11.41	0.11	0.00	
12. Cold	0.00	0.71	3.60	
13. Mange	0.00	0.29	0.00	
14. Lumpy Skin Disease	1.66	0.00	0.00	
15. Constipation	0.11	0.00	0.00	
16. Aborted	0.22	0.00	0.51	
17. Birth	0.11	0.00	0.18	
18. Accident	2.85	0.71	0.00	
19. Wild animals	2.11	3.38	3.61	
20. Unknown disease	9.13	16.84	9.91	
	N	456	671	555

** Total Animal Mortalities

*Gnanguelin, Koukoundi, Ougaton, Lafogo

** The sums of the percentages are greater than 100 because many animals had several diseases at the time of death.

as a proxy measure for actual animal diseases until a more adequate diagnostic service can be put in place.

Finally, while we are dealing only with perceptions of causes of animal deaths, these figures should not be disregarded, even by the most skeptical professional veterinarian. People may perceive certain factors to be the causes of their losses, even if these are not in fact the causes. It is these perceptions which will guide their efforts to obtain either preventative or curative treatment. That is, if livestockmen believe that their animals are dying from trypanosomiasis and the cause is in fact pasteurellosis, they will still seek treatments for trypanosomiasis. The overall results will be: (1) improper treatment or preventative medicines will be sought; (2) when these treatments fail to have the desired effect, the credibility of the agents of the livestock service in particular and of modern veterinary medicine in general will be decreased. It is imperative that these data be supplemented by more adequate local diagnostics. Educational programs need to be developed to make it easier for local live-

TABLE 5-3
Age and Sex of Cattle Losses—1 Sites

Age	Males	Females
Average (X)	2.88	5.92
Age-maximum	9	20
Age-minimum	1	1
Age-median	2-3	6-7
Mode	1-2	3-4

Median age—males & females: 5-6 Years

Average age (X): 5.78 years—Median: 4.5 years

Maximum: 19-20

Minimum: 0-1

stockmen to understand the causes of, and correctly identify the symptoms of a variety of animal diseases.

5. Ruminant Losses

An examination of overall reported animal losses during 1977-78 identifies the most commonly attributed causes of death. For cattle, trypanosomiasis presents the largest single problem. Over 49 percent of all cattle losses were attributed to this single cause. Other important perceived causes of losses are pasteurellosis (15.3%) and blackleg (charbon symptomatique—14.8%).

The most important reported killers of sheep (ovines) are pasteurellosis (33.1%), trypanosomiasis (24.6%), and rinder-pest (12.8%). A symptom, diarrhea, which could be attributed to a number of disease causes, but is probably the result of internal parasites, is also quite important (11.7%). This cause becomes even more important if it is added to the parasites category (5.2%). The parasite problem is the explanation suggested by the director of the national livestock service for diarrhea.

Losses of caprines (goats) show a slightly different pattern. Trypanosomiasis is the most important killer (12.95), followed by pasteurellosis (12.1%), and rinder-pest (9.0%). The somewhat diffuse category of diarrhea (11.2%) is actually the second largest cause of mortality. If much of this can be attributed to internal parasites, then the combined parasite category (7.9%) and diarrhea category cause over one fifth (22.1%) of all goat losses.

The regional incidence of the reported causes of livestock losses may differ significantly. This possibility will be further examined in the following paragraphs. First, however it may be useful to look at the age and sex distributions of animals lost.

Since males are sold off at a relatively young age, while females are

likely to be kept with a herd much longer, it is necessary to examine mortality figures for male and female animals separately.

Many more female than male losses are reported. This again is probably a function of the fact that males are sold off and slaughtered at a younger age. Fewer males have the opportunity to contract the diseases which plague their species.

For male cattle, the average age of mortality is 2.88 years (range 1-9, median 2-3, mode 1-2). The comparable figures for females are 5.92 years on the average (range 1-20, median 6-7, mode 3-4). The average age of all animals lost is 5.78 years (median 4.5). These figures are broken down by age category and site in Table 5-4. There do not, however, appear to be any significant differences in the age of mortality between the various research sites.

As expected, the incidence of the various reported causes of bovine losses greatly varies from one region to another. There is also considerable variation in reported causes of bovine losses between ethnic groups within each region. Trypanosomiasis is identified as the major killer of cattle in Ougarou and Falogo. Over half of all cattle losses in these areas are attributed to this cause. It is also important in Gnanguedin where it accounts for about 20 percent of all cattle losses. The problem in the Ougarou site is dead. It is a relatively wet area, with low population density, a high degree of bush type ground cover, and in close proximity to a game reserve. Conditions are ideal for the maintenance of the disease's principal vector, the tsetse fly. The problem is further complicated by the generally low level of veterinary services (principally the shortage of personnel) available to the population in the Fada ORD in the past. The area of Gnanguedin is generally wetter than other project areas. Veterinary service coverage of the area has been above average. Thus, while the disease continues to be important in the area, it seems to be at least partially under control. This author can not adequately account for the high incidence of this cause of animal death in Falogo.

A high incidence of blackleg (charbon symptomatique) can be noted for both Koukoundi and Gnanguedin, especially among the herds of the Fulani. The incidence is also quite high among the Mossi and Bissa of Gnanguedin and Gourmantche of Ougarou. Pasteurellosis appears to be an important killer in Ougarou and to a lesser extent in both Falogo and Gnanguedin. Koukoundi seems to be relatively free of the disease. It should be noted that the incidence of undetermined causes of death is much higher in Koukoundi than elsewhere. The differences in causes of death between this site and the others may result from either a lack of knowledge of and inability to identify certain diseases, or the influx of a formerly unknown disease in the area in the recent past.

The distribution of cattle deaths attributed to undetermined causes by

TABLE 5-4
Age and Sex of Cattle Losses for Each Site*

Age**	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-20	Total
Site													
Koukoundi													
Males	6	3	2	4	4	5	4			1			29
Females	3	4	1	4	2	7	10	4	2	1	1	3	42
Ougarou													
Males		9	3	5	3								20
Females		9	8	3	4	4	4	2	6	6	1	2	49
Gnanguedin													
Males	1	3	2	1	1		1	1					10
Females	11	3		17	1	4	1	2	2	1	1	2	35
Tatogo													
Males		8	13	2	7	4	2	1					37
Females			1	3	6	8	4	11	5	8	12	3	61
Total (N)	11	39	30	39	28	32	26	21	15	17	15	10	283
Males (All sites)	7 (7.3)	23 (24.0)	20 (20.8)	12 (12.5)	15 (15.6)	9 (9.4)	7 (7.3)	2 (2.1)	0	1 (1.0)	0	0	96
Females (All sites)	4 (2.1)	16 (8.6)	10 (5.3)	27 (14.4)	13 (7.0)	23 (12.3)	19 (10.2)	19 (10.2)	15 (8.0)	16 (8.6)	15 (8.0)	10 (5.3)	187
Percent of animal mortalities	3.89	13.78	10.60	13.78	9.89	11.31	9.19	7.42	5.30	6.01	5.30	3.53	100.00

*Omitted from these results are bovines for which the age and/or sex was not given.

**0-1 = 0-99, — 1-2 = 1-1.99, etc.

TABLE 5-5
Percentage of Cattle Losses Attributed to Each Cause by Site and Ethnic Group

Disease or Cause of Death	Koukoundi (Kaya Ord)		Ongaron (Fada Ord)		Gnangandin (Koupela Ord)		Falogo (Kaya Ord)	
	Mossi	Peulh (Fulani)	Germaniche	Peulh (Fulani)	Mossi - Bissa	Peulh (Fulani)	Mossi	Peulh (Fulani)
1. Trypanosomiasis	15.38	0.00	19.09	93.73	2.00	20.00	65.05	29.31
2. Rinderpest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3. Blackleg	2.56	58.86	27.27	2.68	2.00	10.00	1.21	0.00
4. Anthrax	5.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5. Pasteurellosis	0.00	0.00	7.27	11.65	13.33	3.33	7.23	10.71
6. Pleuropneumonia	0.00	2.90	0.00	0.00	0.00	0.00	2.11	0.00
7. Diarrhea	5.13	6.00	0.00	0.00	0.00	0.00	0.00	0.00
8. Tuberculosis	0.00	0.00	1.82	0.90	0.00	0.00	0.00	0.00
9. Bronchitis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10. Parasites	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11. Hunger and thirst	25.64	0.00	12.73	0.00	0.00	0.00	6.02	51.72
12. Cold	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13. Mange	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14. Lumpy skin disease	0.00	0.00	0.00	0.00	0.00	35.00	0.00	0.00
15. Constipation	0.00	0.00	0.00	0.00	13.33	0.00	0.00	0.00
16. Aborted	2.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17. Birth	0.00	0.00	0.00	0.00	13.33	0.00	0.00	.00
18. Accident	2.56	8.80	0.00	0.00	6.67	1.67	9.64	0.00
19. Wild animals	2.56	2.90	10.91	2.68	0.00	0.00	0.00	0.00
20. Unknown disease	11.02	20.60	3.64	0.00	26.00	0.00	14.46	8.63
Total Percent	102.56%	100.00%	112.73%	111.65%	106.66%	100.00%	106.12%	100.00%
Total N	39	31	55	112	15	60	83	58

ethnic group (Table 5-5) tend to indicate that the Fulani are much more familiar with, and better able to diagnose, animal diseases than are livestockmen of the other three ethnic groups. The margin of the difference, however, is nowhere as great as expected.

5.2 Reported Causes of Sheep and Goat Losses

The pattern of cattle diseases is duplicated for goats and sheep. Trypanosomiasis appears to be a major killer of both goats and sheep (more so for goats than sheep) in Ougarou and Tafogo, and to a lesser extent in Gnanguedin. Pasturellosis is the only major cause of mortality, with the incidence being higher among sheep than goats. Pasteurellosis appears to be most important in Ougarou and Gnanguedin and much less so in Tafogo and Koukoundi. There is some indication from the survey data that some livestockmen confuse the symptoms of pasteurellosis and trypanosomiasis in small ruminants, especially in the Tafogo area. It is thus possible that the incidence of pasteurellosis is higher and that of trypanosomiasis somewhat lower than reported for this site. Parasites and diarrhea are also reported to be important small ruminant health problems in project sites. One major cause of diarrhea is probably internal parasites. Therefore the parasite category probably should be much larger than it appears.

5.3 Individual Stock Losses

An extremely important issue from the perspective of animal production is the impact, or potential impact, of livestock losses on individual livestock producers. It should be noted at the start that 57.8 percent of cattle owners interviewed reported losing at least one head in the last year. Similarly, of those owning sheep and goats more than two-thirds (67.1%) reported losing animals in the past year.

As can be seen from Table 5-7 the percent of livestockmen suffering animal losses is similar for three of the four ethnic groups studied. The exception appears ($X^2=9.66$, $P<.05$) to be the Bissa. Several explanations for this anomaly are possible. The Bissa sampled are all in the Koupela ORD in the site of Gnanguedin. Stock losses in this area tend to be lower than for the other two ORDs for all types of animals. In general, veterinary services (vaccinations) in the Koupela ORD are better than those in Kaya or Fada (see following subsection on vaccination). The Bissa take advantage of livestock vaccinations to a greater extent than do the other ethnic groups studied. Animal losses for the Mossi also tend to be relatively low in Gnanguedin. Bissa herds also tend to be smaller than those of the other ethnic groups. The result is lower total losses per livestockmen and decreased chances of losing an animal in a given period of time.

TABLE 5-6
Percentage of Sheep and Goat Losses Attributed to Each Cause by Site and Ethnic Group

Disease or Cause of Death	Koukoundi		Ougadougou				Gnangoudan			Labogo						
	Mossi	Peulh (Fulani)	Peulh (Fulani)	Gourmanché	Peulh (Fulani)	Mossi + Bossa	Mossi	Peulh (Fulani)								
1. Trypanosomiasis	—	—	—	—	11.81	71.75	21.51	30.28	10.25	6.36	—	—	51.17	65.85	50.00	51.96
2. Rinderpest	—	—	—	—	—	—	—	—	11.05	12.90	25.50	52.38	37.50	21.75	3.05	—
3. Blackleg	—	1.21	—	—	—	—	—	—	15.28	19.35	—	—	—	—	—	—
4. Anthrax	—	—	26.67	—	—	—	—	—	—	—	—	—	—	—	—	—
5. Pasteurellosis	—	—	—	15.79	88.89	25.61	32.31	27.78	18.73	25.80	101.96	91.00	—	—	—	—
6. Pleuropneumonia	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10.21	7.61
7. Diarrhea	35.10	56.79	8.89	21.05	—	—	—	—	—	5.55	—	—	—	—	—	—
8. Tuberculosis	—	—	—	—	—	—	—	—	82.06	61.51	—	—	—	—	8.16	6.87
9. Bronchitis	—	—	—	—	—	—	—	—	—	—	1.97	—	3.47	3.10	—	—
10. Parasites	3.19	16.05	—	—	—	—	1.51	27.78	—	—	—	—	—	—	—	—
11. Hunger and thirst	—	—	—	—	—	—	26.15	23.61	—	—	11.76	—	3.17	8.69	1.09	—
12. Cold	—	—	—	—	—	—	1.51	—	—	—	—	—	—	—	—	—
13. Mange	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5.09	15.26
14. Lumpy skin dis.	—	—	—	—	—	—	—	—	—	—	—	—	1.39	—	—	—
15. Constipation	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
16. Aborted	—	3.70	—	—	—	—	—	—	—	—	—	—	—	—	—	—
17. Birth	—	1.23	—	—	—	—	—	—	—	—	—	—	—	—	—	—
18. Accident	3.19	—	—	—	—	—	1.51	—	—	—	1.95	—	—	—	—	—
19. Wild animals	—	—	—	—	3.71	25.61	—	—	—	—	—	—	—	—	—	—
20. Unknown causes (total animal mortality)	58.52	20.99	61.11	63.16	—	—	15.38	1.16	—	16.13	5.89	—	2.08	—	15.30	7.61
mortality: N =	91	81	45	19	135	39	65	72	39	31	51	21	111	161	98	131

Some animals died while having several diseases at the same time—this explains why the totals for certain columns are greater than 100%.

*The first column under each ethnic group is sheep; the second column is goats.

TABLE 5-7
Percent of Livestockmen (by ethnic group) Having Lost Animals in the Last Year

		cattle	sheep & goats
Mossi	N (livestockmen)	65	64
	% (who lost animals)	63.1	75.0
Fulani	N	58	57
	%	60.3	63.2
Gourmautche	N	17	17
	%	58.8	82.4
Bissa	N	15	15
	%	20.0	33.3
		N=155	N=153

In examining the actual losses per livestockman, it is important to keep herd size in mind. In general, Fulani herds in all sites are larger than the herds of the majority ethnic groups (Mossi, Bissa, Gourmautche) in the same sites. Therefore, the livestock losses per Fulani are expected to be higher than those suffered by the other groups. In comparing areas it therefore makes sense to compare the Fulani of each site only with the Fulani of other sites, and the Mossi, Bissa and Gourmautche with each other.

Before proceeding it should be noted that three sets of figures are presented in Tables 5-8 to 5-10, the mean (\bar{X}), the median, and the range. The mean (average) provides a figure that can be used to compare one ethnic group with another and one area with another. It does not provide a true picture of the actual animal losses suffered by livestockmen. The mean can be grossly distorted by one or two livestockmen who lose large numbers of animals. As can be seen from the range (minimum and maximum losses in each group) in virtually every category there are "extreme" cases in which a livestock owner lost 15 or even 30 head. Therefore the median (losses for the middle livestockmen) in each group gives a clearer picture of how most livestockmen are affected.

As expected, the average cattle losses per livestockmen are higher for the Fulani in each site than are those of their counterpart ethnic group(s) ($F=4.02$, $P<.01$). The same holds true for maximum losses suffered. Median losses are also consistent, except in the case of Tafogo where median Mossi cattle losses are higher than those of the Fulani.

A look at the median figures indicates that the typical livestock owner loses about one or two head of cattle per year. However, the distribution also indicates that some livestockmen suffer rather severe losses in any given year. In some cases once one animal in a herd contracts a particular disease and is not immediately isolated, many other cattle in the same

TABLE 5-8
Reported Cattle Losses Per Livestockman by Site and Ethnic Group.

Site	deaths N	livestockmen N	losses livestockmen \bar{X}	losses livestockmen Median	losses livestockmen Minimum-Maximum range
Koukoundi	73	38	1.92		
Mossi	39	28	1.39		0-15
Peulh (Fulani)	34	10	3.40	1.0 1.5	0-5 0-15
Tafogo	141	49	2.88		
(Mossi)	83	30	2.77		0-15
Peulh (Fulani)	58	19	3.05	1.5 1.0	0-15 0-12
Gnanguedin	75	37	2.03		
Mossi + Bissa	15	23	0.65		0-16
Peulh (Fulani)	60	14	4.29	0.0 1.5	0-7 0-16
Ougarou	167	33	5.06		
Gourmantche	55	17	3.24		0-30
Peulh	112	16	7.00	1.0 4.0	0-22 0-30

herd catch the same disease. Once again this phenomenon is associated with the vaccination process. Most livestockmen vaccinate their whole herd at one time. Thus, where disease strikes an unvaccinated animal, the whole herd is often subject to the consequences. The failure to vaccinate may thereby have rather dire consequences for the affected cattle owner. Unfortunately many livestockmen wait until a disease strikes their own or a nearby herd before seeking vaccinations for their animals.

In examining the cattle losses per livestockmen in the different sites, a clear distinction appears. Livestock losses in Ougarou (Fada ORD) are significantly higher than in any of the other sites. The mean, median, and maximum losses for the Fulani of Ougarou are higher than those for the Fulani elsewhere. Similarly, the mean and maximum figures for the Gourmantche are higher than those for the Mossi and Bissa elsewhere. There are several possible explanations for this difference. It is partly accounted for by the environmental conditions in Ougarou which are supportive of animal diseases, notably trypanosomiasis, which is often fatal. Additionally, because of the vast area covered and the relatively low population density in the Ougarou area, herd size tends to be larger than in the more confined territories of the other sites (Philippe, Some and Diawara, 1977). Thus, at least part of the difference is expected.

Sheep losses show a high degree of variation between sites, but much less so between ethnic groups. In general, Fulani suffer greater losses than other ethnic groups, but the margin of the difference is not as great as with cattle. Highest sheep losses are reported for the Talogo site (Kaya ORD) for both Mossi and Fulani. In that area a typical sheep owner lost between four and five head in a year. The Fulani of Koukoundi (ORD of Kaya) also suffered high sheep losses. Typical losses in Ougarou were about three head (including one livestock owner who reported losing 100). Losses suffered in Guanguedin were again lower than for the other sites for both ethnic groupings.

The pattern of goat losses follows that for sheep. Greatest losses are found in Talogo where the typical Mossi lost five animals and the typical Fulani, seven. It must be noted, however, that typical goat herd size in this area on the edge of the Sahel is greater than for the other regions studied. Ougarou is a distant second, followed by Koukoundi and Guanguedin. Fulani losses are higher than Mossi and Bissa losses in Talogo and Guanguedin respectively. Oddly, in Ougarou, Gourmantche goat losses are higher than those for the Fulani, while in Koukoundi the same holds for the Mossi over the Fulani. This probably reflects ownership patterns more than anything else. The size of herds of goats generally decreases as one moves south into the higher rainfall areas. It does seem,

TABLE 5-9
Reported Sheep Losses Per Livestockmen by Site and Ethnic Group.

Site	deaths N	livestockmen N	losses livestockmen \bar{X}	losses livestockmen Median	losses livestockmen Minimum-Maximum range
Koukoundi (total)	139	38	3.66		0-15
Mossi	91	28	3.36	1	0-15
Fulani	45	10	4.50	5	0-10
Talogo (total)	242	46	5.26		0-20
Mossi	144	28	5.14	4.5	0-15
Fulani	98	18	5.44	4.0	0-20
Gnanguedin (total)	90	34	2.65		0-16
Mossi + Bissa	51	22	2.32	0.0	0-12
Fulani	39	12	3.25	0.0	0-16
*Ougarou (total)	200 (100)	27 (36)	7.41 (3.85)		0-100
Goumantche	65	15	4.33	3.0	0-20
Fulani	135 (35)	12 (11)	11.25 (3.18)	3.0	0-100

*Figures in parenthesis represent the total excluding one livestockmen who reported losing 100 sheep in the year.

TABLE 5-10
Reported Goat Losses Per Livestockmen by Site and Ethnic Group.

Site	deaths N	livestockmen N	losses livestockmen \bar{X}	losses livestockmen Median	losses livestockmen Minimum-Maximum range
Koukoundi (total)	100	38	2.63		
Mossi	81	28	2.89	0.5	0-15
Peulh (Fulani)	19	10	1.90	1.5	0-6
Talogo (total)	292	46	6.35		
Mossi	161	28	5.75	5.0	0-25
Peulh (Fulani)	131	18	7.28	7.0	0-20
Gnanguedin (total)	52	34	1.53		
Mossi + Bissa	21	22	0.95	0.0	0-7
Peulh (Fulani)	31	12	2.58	1.0	0-10
Ougarou (total)	111	27	4.11		
Gourmantche	72	15	4.80	2.5	0-20
Peulh	39	12	3.25	2.0	0-10

TABLE 5-11
Percent of Livestock Owners Who Vaccinate Their Animals by Ethnic Group.

	Cattle		Sheep and Goats	
	%	N	%	N
Mossi	98.1	63	52.1	63
Fulani (Poulh)	95.0	57	40.7	54
Gourmantche	94.1	17	23.5	17
Bissa	100.0	15	40.0	15
Total	96.1	152	43.6	149
	N = 343	p = 1 N.S.	N = 592	p = 2 N.S.

however, that the disease problem in Falogo and Ougarou is of a different magnitude from that in either Koukoundi or Gnanguedin.

5.1 Animal Health Measures

The only significant preventive health measures available to local livestockmen in Upper Volta are vaccinations against known diseases. The product used against trypanosomiasis is not in fact a vaccine. For the sake of simplicity the popular term vaccination is used here to cover the use of both vaccines and chemo-prophylaxis. This form of preventive measure is widely accepted, although poorly understood at the village level. The degree of acceptance of cattle vaccinations is, as can be seen from Table 5-11, very high. Over nine out of ten livestockmen of each ethnic group claimed to have vaccinated their cattle. This figure is undoubtedly much higher than normal because of the presence in these areas of extension agents who vaccinate livestock. It is possible that individual responses were geared to please the interviewer. However, when one examines the comparable figures for sheep and goat vaccina-

TABLE 5-12
Percent of Livestock Owners Who Vaccinate Their Cattle Against

	Percent Vaccinating	N=148
Trypanosomiasis*	81.1	
Blackleg	56.8	
Pleuropneumonia	23.0	
Pasteurellosis	21.6	
Anthrax	8.1	
Rinderpest	37.8	

*The product used against trypanosomiasis is not a vaccine. For the sake of simplicity the popular term vaccination is used here to cover the use of both vaccines and chemo-prophylaxis.

TABLE 5-13
Number of Different Cattle Vaccinations Given to an Individual's Cattle.

Number	N	Percent
0	6	4.1
1	23	15.5
2	61	41.2
3	42	28.1
4	13	8.8
5	3	2.0
	148	100%
		$\bar{X}=2.28$

tions, the notion that respondents purposely distorted their responses is not supported. Otherwise one would expect these figures to be as high as those for cattle.

What are the vaccines which livestockmen say they use, or think they use? This author has observed a number of cases in which people thought they had vaccinated their animals against one disease, but in fact their animals had received a vaccine for another. When cattle owners were asked what diseases their animals had been vaccinated against; the livestockmen himself had to name the disease. He was not given a list to select from. Thus, the results are clearly not an artifact of the interview schedule. The most common disease named was trypanosomiasis (81.1%), followed by blackleg (56.8%). Vaccinations against rinderpest (37.8%), pleuropneumonia (23.0%), pasteurellosis (21.6%), and anthrax (8.1%) were given to their animals by a minority of livestockmen.

The average number of different vaccinations an individual gives his

TABLE 5-14
Average Number of Vaccines Given to Cattle by Ethnicity and Site.

	N	\bar{X}	std. dev.
<i>Ethnicity</i>			
Mossi	62	2.15	0.90
Fulani (Pendu)	56	2.25	1.08
Gourmantche	16	2.50	1.32
Bissa	12	2.92	0.90
		$F = 2.16$	$p < .10$ NS
<i>Site</i>			
Koukoundi	38	2.18	.77
Lalogo	45	1.71	.84
Gnanguedin	34	2.97	.80
Ougatou	31	2.48	1.29
		$F = 12.58$	$p < .0001$

TABLE 5-15
Vaccines*

Site	Ethnicity	Trypanosomiasis**	Pasteurellosis	Blackleg	Rinderpest	Pleuropneumonia	Anthrax
Lalogo	Mossi	12 (40.00)	1 (3.34)	3 (10.00)	19 (63.34)	15 (50.00)	0 (0.00)
	Peulh	(46.94)	(2.05)	(10.21)	(57.15)	(42.86)	(0.00)
Ghanguedm	Mossi	8	1	8	1	0	0
	Bissa	(89.19) (80.00)	(40.54) (44.48)	(89.19) (82.00)	(43.24) (34.78)	(2.70) (1.55)	(0.00) (0.00)
	Peulh	12	6	11	1	1	0
	Peulh	13 (92.86)	5 (35.70)	14 (100.00)	8 (57.14)	0 (0.00)	0 (0.00)
Ouagaton	Peulh	13 (81.25)	1 (25.00)	5 (31.25)	8 (50.00)	8 (50.00)	0 (0.00)
	Gourmantche	(84.85)	(36.37)	(48.49)	(33.34)	(33.34)	(0.00)
Koukoundi	Mossi	26 (92.86)	3 (10.72)	20 (71.43)	1 (3.58)	2 (7.15)	11 (39.29)
	Peulh	(94.74)	(10.53)	(76.32)	(2.64)	(5.27)	(38.85)
	Peulh	10 (100.00)	1 (100.00)	9 (90.00)	0 (0.00)	0 (0.00)	3 (30.00)

*The figures in bold type are the percentages of all livestockmen in each site who vaccinated their cattle against this disease.

**Chemoprophylaxis not vaccine.

cattle in a given year is 2.28 for the entire sample. Only 10.8 percent of those sampled had administered four or more of the six available cattle vaccines. None received all six. Given the fact that vaccines must be paid for by the livestock owners, it is not surprising that the number is relatively low. Livestockmen in general will only vaccinate against a disease if they perceive it as a real threat to their herds. Added to this is the fact that the livestock service lacks the logistical support to successfully mount broad vaccination campaigns. Finally, certain vaccines (anthrax, for example) are only given by the livestock service in those areas in which there has been an outbreak.

There is considerable variation in the number of vaccinations done by ethnic group and region. As a group, the Bissa and Gourmantche claim to employ more vaccinations than either the Fulani or Mossi. However, this is more a function of region (site and ORD) than ethnicity. Differences between sites are highly significant ($P < .0001$). Livestockmen in Gnanguedin (Koupela ORD) average almost three (2.97) vaccines a year for their animals, while those in Ougarou (Eada ORD) receive 2.48. Livestockmen in the Kaya ORD receive fewer vaccines than those in other ORDs. The mean number of vaccines administered are 2.18 and 1.71 for Koukoundi and Talogo respectively.

An examination of the distribution of various types of vaccinations by site and ethnic group is in order. In three of the four sites treatments against trypanosomiasis are almost universal, regardless of ethnic group. In Talogo, an area with relatively high losses from this disease, only about half of the livestockmen vaccinated against the disease. Vaccinations against pasteurellosis are most common in the wetter areas, Gnanguedin and Ougarou. Anti-black leg vaccinations are widely given in Koukoundi and Gnanguedin, moderately given in Ougarou, and rarely administered in Talogo. Vaccinations against rinderpest and pleuropneumonia, because of the need to keep the vaccines refrigerated, are irregularly given during government vaccination campaigns. Anthrax vaccinations are employed only in those areas in which known corridors for the disease exist.

Interestingly, reported animal losses are generally lower in the Gnanguedin site than elsewhere. Ease of access to the area for the livestock service is one possible contributing factor. The main paved north-south road to Togo passes through the site. The relatively high number of vaccinations in Ougarou (Eada) is coupled with high mortality rates. In Ougarou, vaccinations are a rational response by livestockmen to an environment which is heavily infested with disease.

The relatively low number of vaccinations in the Kaya sites may be the result of the inability of the service to operate effectively because of a lack of support by the ORD, or the perception of the existence of fewer

important diseases in the area, or both. An additional contributing factor in the case of Talogo was the extremely poor harvests over the last two years. As a result most disposable cash was required for the purchase of grain. Few people had the money to vaccinate their livestock.

Vaccinations for small ruminants (goats and sheep) are much less widely understood, accepted, or employed. Only 42.6 percent of those owning sheep and/or goats vaccinated their animals against pasteurellosis (the only vaccine locally available for small ruminants). The Mossi are the most frequent users of this vaccine (52.4%), followed by the Fulani (40.7%), Bissa (40.0%), and Gourmantche (23.5%).

The lack of understanding of small ruminant vaccinations is quite clear. For those who did not vaccinate their animals, the most frequent explanation offered (52.9%) was that they did not know that there was such a vaccine available. Of those who claimed that they had vaccinated their small ruminants, only a little more than half (54.8%) correctly identified the vaccine as being employed against pasteurellosis.

Medicines, principally Exhelm, are being widely used against internal parasites for both large and small ruminants. The overall distribution and effectiveness of these drugs has, as of this time, not been delineated.

From the preceding it can be concluded that animal health programs need to be improved from three perspectives. First, educational programs need to be mounted among local livestockmen so that they will better understand the causes, transmission, symptoms, and appropriate preventive measures for animal diseases. Secondly, a campaign should be mounted to deal with those diseases which are causing heavy losses to livestockmen in particular regions. Production would be increased and the risk of losing an entire herd or a large portion of a herd greatly reduced. Finally, an effective diagnostic service is needed to provide the necessary scientific backup for the other efforts.

VI. LOCAL LIVESTOCK MANAGEMENT II: HERDERS, HERDING AND TRANSHUMANCE

In order to effectively plan successful interventions in the livestock sector, it is necessary to have a firm grasp on, or understanding of, those practices currently being employed by local livestockmen. Who are the individuals who herd the livestock? What are the relationships between herders and owners where the two differ? What are the major problems experienced by herders? Who, how, when, where, and why do people go in transhumance with their animals? How are pastures selected, utilized, allocated and managed?

6.1 Herders

The owners (those who formally exercise control over a household herd) of livestock, cattle in particular, are rarely the individuals who actually herd these animals. Of those livestockmen interviewed, only 3.2 percent actually were physically involved in herding. Owners do provide regular, sometimes daily, direction and instructions to the herders. Most commonly, cattle herders (71.7%) are the sons of the owners, but a variety of other relationships exist. The same holds true for herders of sheep and goats. Daughters, however, may also be involved in sheep and goat herding.

A picture of those actually engaged in herding is presented in Table 6.1 for three different research sites in three different ORDs. The youth of most herders stands out. The average age of 178 male cattle herders is only 15 years (range 5-41). Male herders of goats and sheep are even younger (\bar{X} = 9.2 years). Many girls are also employed to herd small ruminants (26.6% of the herders). The average age for female shepherds is only 8.7 years.

There are differences between cattle herders from different ethnic groups. Fulani herders are on the average older (\bar{X} = 17.2 years) than those of the other ethnic groups (\bar{X} = 13.7 years). There are several explanations for this age difference. Fulani herders generally are charged with guarding larger herds, covering greater distances with their herds, and staying away for longer periods of time (transhumance) than herders of other ethnic groups. Since livestock production provides the largest share of Fulani income, the potential labor losses to agricultural work are viewed as justified among this group to a greater extent than is the case with the more agriculturally oriented groups.

The same does not hold true for those charged with the care of goats and sheep. There are no significant differences between either sites or ethnic groups regarding male herders of small ruminants. In the case of

TABLE 6-1
(Herders—Sex and Age by Site and Ethnicity)

Site	Ethnic Group	Statistic	Cattle		Sheep and Goats		
			Boys	Girls	Boys	Girls	
Gnanguedin Bissa	Mossi	X	12.50	—	8.60	8.30	
		N	35	—	18	7	
		Min.-Max.	6-30	—	6-15	7-12	
	Fulani (Peulh)	X	8.80	7.50	8.40	8.40	
		N	5	2	5	5	
		Min.-Max.	7-13	8-17	5-12	6-12	
	Falogo	Mossi	X	16.19	—	7.70	9.30
			N	21	—	9	3
			Min.-Max.	12-23	—	5-12	6-14
Fulani (Peulh)		X	13.90	8.50	9.30	7.70	
		N	11	1	31	10	
		Min.-Max.	5-30	7-10	6-20	6-10	
Black Fulani (Peulh Non)		X	20.20	—	9.90	13.00	
		N	13	—	7	2	
		Min.-Max.	10-30	—	7-15	11-15	
Ougarou	Gourmantché	X	12.00	—	9.70	13.00	
		N	6	—	7	1	
		Min.-Max.	7-15	—	6-12	13	
	Fulani (Peulh)	X	15.40	—	9.60	8.60	
		N	32	—	16	10	
		Min.-Max.	8-30	—	5-20	5-18	
	Fulani (Peulh)	X	16.10	—	10.40	—	
		N	28	—	9	—	
		Min.-Max.	9-41	—	6-25	—	
Fulani (All Sites)	X	17.20	—	9.30	—		
	N	65	—	25	—		
	Min.-Max.	9-41	—	6-25	—		
Total All Ethnic Groups	All others	X	13.70	—	9.20	—	
	Bissa-Mossi	N	113	—	80	—	
	Gourmantché	Min.-Max.	5-30	—	5-20	—	
Total All Ethnic Groups	All	X	15.00	—	9.20	8.70	
	All	N	178	6.00	105	38	
	All	Min.-Max.	5-41	—	5-25	5-18	

females, fewer Fulani than other ethnic groups use young girls as herders. Very young children, often only five or six years of age, are sent to herd sheep and goats around the village. This takes place generally during the growing season. After the harvest, goats and sheep are allowed to run free in the fields and to search for pasture wherever they can find it.

Because of the youth of the herders very little farm labor is actually lost. Furthermore, this serves as a kind of school for the young, who may

later be called upon to watch cattle. Often younger boys accompany their older brothers or neighbors when they begin herding cattle. The larger herds of sheep and goats are generally attended to by older males. Female herders are usually employed out of necessity (the lack of sons) rather than as a preference on the part of the family head. However, there do not appear to be any strong negative connotations to having young females engage in this work.

6.2 Contractual Herding Arrangements

Traditionally sedentary agriculturalists, such as the Mossi, Bissa and Gourmantche, who own cattle, entrust them to Fulani herders. This form of economic specialization seems to provide benefits to both groups. The agriculturalists obtain the services of experienced herders, without sacrificing any of their own agricultural labor force. This system enables the agriculturalists to effectively keep secret, from both neighbors and government tax collectors, the number of cattle they own, or, in many cases, whether they own any cattle at all. Finally, the Fulani herders could be invited to pasture their herds in the fields of the agriculturalists after the harvest, thus providing both much needed fertilizer for future crops, and valuable forage for the cattle.

From the perspective of the Fulani, the milk from the agriculturalists' cattle is the main advantage. It involves little additional herding effort for the Fulani to add 8-10 head of cattle belonging to someone else to his herd. All milk produced by the cows then becomes the property of the Fulani herder (normally his wife). Additionally, the Fulani could expect small annual gifts of grain and clothing. A cash gift is also often provided to the herder for handling the sale of an animal entrusted to him.

This traditional relationship between ethnic groups seems to be declining. Significant numbers of sedentary agriculturalists are now employing their own sons rather than the Fulani as herders. The major rationale provided for this change is distrust of Fulani herders. The most commonly cited fears are of theft, lack of adequate care and attention, and the potential destruction of crops. For their part, the Fulani indicate that the benefits often are not worth the difficulties encountered in dealing with farmers who do not really understand the problems of animal production. It should be pointed out here that some cattle are entrusted by farmers to other farmers, usually relatives, of the same ethnic group. Those entrusted with the cattle of others generally have larger herds and considerably more livestock experience.

Of those livestock owners sampled, 26.5 percent (N= 153) entrust their cattle to others. The figure is only slightly higher (32.9%) when one excludes the Fulani from the calculations. As can be seen from Table 6-2 the Bissa tend to entrust their cattle to others to a greater extent (66.7%)

TABLE 6-2
Percent Who Entrust Their Cattle to Others by Ethnic Group

	Mossi	Fulani (Peulh)	Gourmantche	Bissa
Percent	30.6	11.1	11.8	66.7
N	62	54	17	15

	Mossi	Fulani (Peulh)	Gourmantche	Bissa
Percent	27.7	33.3	23.5	26.7
N	65	57	17	15

than do the other ethnic groups. About one out of three Mossi (30.6%) and only about one out of nine Fulani and Gourmantche do not herd their own cattle. It should be noted that these figures probably slightly underestimate the number of cattle owners who entrust their cattle, especially those who own only one or two head.

The percentage of livestockmen who had others' cattle entrusted to them (28.7%, N=157) is about the same as that for those who entrust their cattle. The variation among ethnic groups is much less than expected. Fully a third (33.3%) of the Fulani are herding the cattle of others, while the comparable figures are 27.7, 26.7, and 23.5 percent respectively for the Mossi, Bissa, and Gourmantche. Among the sedentary groups, those with just a few head of cattle often entrust them to relatives who have larger herds and presumably more experience in the care of livestock. There are also a few cases in which a Mossi, for example, had cattle entrusted to him and then in turn entrusted these, plus his own cattle, to a well known, reliable Fulani herder.

Those sampled who engage in the practice of entrusting cattle were asked to define the nature of the "contract" between the owner and the herder. In more than two-thirds of the cases (67.9%) the compensation given was the milk plus an occasional gift of grain, clothing or cash. For an additional 30.2 percent the arrangement involved milk only. If the herder is asked to arrange the sale of an animal for its owner he will usually be given cash for his efforts when the deal is satisfactorily concluded.

Only 20.5 percent of those involved in this relationship said they had problems as a result. The most commonly identified problem is the destruction of crops by cattle who accidentally enter into fields or gardens before the harvest. Other areas of concern are theft and disease. When an animal becomes seriously ill the herder will usually personally inform

the owner or send someone to inform him. The owner, if not too far away, will then come to inspect the animal and decide what to do. If the situation is grave, the animal will usually be slaughtered before it can die naturally. The meat will then be sold to a local butcher. If an animal dies before having its throat cut, the owner will still usually sell the meat, but only to non-Muslims. Muslims are prohibited by their religion from consuming meat from sick or improperly slaughtered animals. In cases where an animal dies or is slaughtered before the arrival of the owner, the herder will sell the meat and bring the hide and the money to the owner.

Necessary services are regarded as the joint responsibility of the owner and herder. Normally, the herder will inform the owner when it is time to vaccinate his cattle. The owner will then either advance him the money, or reimburse him after the vaccinations are completed. In only a few cases did owners reportedly refuse to pay or to have their animals treated. In cases where cattle are in transhumance at the time of the vaccination the question may be a bit more complicated. Mutual trust between owner and herder is very necessary if the health of the herd is to be preserved.

An additional responsibility involves payment for crop destruction caused by a herd of cattle. Legally the herder is the responsible party. In fact, owners of cattle involved are expected to, and do make significant contributions to such settlements. This is contrary to the assertions made by Delgado, who based his findings on judicial records rather than on actual payments made (Delgado, 1978). Most restitution takes place without the necessity of court proceedings.

A very important responsibility which universally rests with the owner is the payment of taxes (200 FCFA per head). Some owners try to avoid payment by entrusting their cattle, and thus keeping ownership secret in their home areas. Rarely are such small scale violators apprehended or prosecuted.

6.3 Transhumance

Transhumance, the seasonal movement of livestock between pasture zones and water sources, remains an important part of the cattle production system of Upper Volta. This system provides the opportunity to successfully exploit seasonal regional variations in environmental conditions. At the same time it allows for the regeneration of grasses in an area after the departure of the herds.

Although this practice is nowhere near as universal in the Soudanian zones as in the Sahel per se, it is still widely employed. Of those interviewed, 57.9 percent either go in transhumance themselves, or send their herds with their children, brothers, or contract herders. As can be seen

TABLE 6-3
Those Whose Herds Go in Transhumance by Ethnic Group

	Mossi	Fulani (Peulho)	Goumanche	Bissa	Total
Percent who transhum	46.2	86.0	37.5	21.4	57.9
N	65	57	16	11	152

from Table 6-3, 86 percent of the Fulani send their cattle in transhumance. In essence, this represents the continuation of a long tradition. What is somewhat surprising is that nearly half of the Mossi (46.2%), and more than a third (37.5%) of the Goumanche cattle owners, also send their herds in transhumance. The figure for the Bissa, who like to have their livestock close at hand is only 21.4 percent.

Of some interest is the surprising fact that a large percentage of the Mossi (59.2%) and Goumanche (66.7%) who send their cattle in transhumance use sons and/or other relatives, rather than the Fulani, as herders. This is indicative of the degree to which formerly sedentary farmers have mastered the techniques of cattle production. Many Mossi and Goumanche herders have learned their trade from the Fulani. Quite often, young Mossi or Goumanche males will be sent in transhumance with local Fulani in order to become more familiar with local grasses, water sources, and problems and techniques of herding. This service, provided free by the Fulani, has helped create a bond of friendship between livestock owners from the two ethnic groups.

Among both Fulani and other cattle-keeping people of Africa, herds are often split and sent to different pasture areas. (This is discussed by Switt, 1979, pp. 66-67.) The main advantages are the minimization of risks from theft and disease. This practice is not generally followed in Soudanian Upper Volta. Less than nine percent (8.6%) of those going in transhumance either divide their herds or have divided their herds to follow different transhumance routes. This may be a function of herd size. Many Fulani said that when a herd approaches or is larger than one hundred head it becomes necessary to divide it in two parts for management purposes. The Fulani estimate that the optimal herd size for a herd in transhumance is about 49 (\bar{X}). Beyond this size obtaining water, finding adequate pasture, and preventing crop damage become very difficult for the herders.

Although the herds are not generally split for transhumance, some cattle are almost always left at home. For the Fulani it is especially important that some milk cows be left behind for the use of women, children and elders who remain at the semipermanent settlement site all year round. The milk is very important to the Fulani both as a dietary

TABLE 6-4
Percent Herders for Herds Which Go in Transhumance

Owner	Sons and/or brothers	Relative and other Fulani	Entrusted to Fulani	N
Mossi	59.2	7.4	33.3	27
Fulani (Peulh)	91.4	—	8.5	47
*Gourmantche	66.7	—	33.3	6
*Bissa	0.0	—	100.0	2
				N=82

*N for these two groups, i.e., those who send their cattle in transhumance is too small to use as the basis for generalizations.

supplement and as a source of disposable income for women. On the average Fulani leave about seven head (mostly cows and their calves) at home when the herd leaves in transhumance. For the most part the Mossi and Gourmantche send the whole herd. The average number of head which stay behind with the Mossi and Gourmantche is only two. Often these are traction animals rather than milk cows. Sick animals and calves may also be left behind.

The seasonal transhumance movements tend to be fairly stable (over a five-year period). Less than one-fifth (19.2%) of those going in transhumance had changed areas in the recent past. More or less the same route is followed each year. Often, close relationships with local livestockmen who reside along the route, or in the area which is the eventual destination, are maintained. In most cases the owners, or those actually with the cattle, send one of their number on ahead to survey the situation. The most crucial variable is the availability of water. This is closely followed by an evaluation of the quality and quantity of pasture in a given area. Also of some importance in the decision-making process are possible outbreaks of disease and the past history of conflict and cooperation with farmers. Thus, although the route is fixed, there are minor variations in pastures and water sources used in any given year. Based on the best available information the owner and/or the herders will decide exactly where the herd will go.

The exact season of transhumance varies considerably from one region to another. Table 6-5 provides a list of the months of departure in and return from transhumance in four research sites. The most common times of departure are between September and December, just before and during the harvest season. Additionally May, the time of the first rains, is a common time to follow transhumance routes. The May departure is usually to search for water and new grasses in those nearby areas which receive the first rains.

The return from transhumance seems to be clustered in two periods.

TABLE 6-5
Time of Transhumance

	Month of Departure (Percent)	Month of Return (Percent)
January	—	2.2
February	—	5.4
March	—	—
April	3.3	—
May	14.3	18.5
June	4.4	12.0
July	—	7.6
August	—	—
September	16.5	—
October	20.9	14.1
November	27.5	29.3
December	13.2	9.8
N	91	92

For those who go in transhumance for only a short period, October through December are modal months for the return. For those who depart for longer periods, a return in May or June is more common.

Before examining the specific transhumance routes for each site, a methodological note is in order. Information on transhumance routes was gathered in several ways. First, several local livestockmen were asked where and when they moved their herds. Secondly, samples of livestockmen were systematically surveyed to delineate the routes and seasons in which they move. Finally, these routes were delineated on the ground with the help of experienced livestockmen, who are familiar with these routes. Thus, this author has a high degree of confidence in the accuracy of the results reported below. Of course, the routes plotted

TABLE 6-6
Modal Time of Transhumance by Site.

Site	Season	Destination	Kilometers
Tafogo	October-November	Doti	120 kms.
Guanguedin	November-May	Zabré	45 kms.
Koukoundi	September-November May-June	Ziniare, Mane	70 kms.
Ougarou	Complex (about 40% go in transhumance twice a year.)	NE Tapao River	20-30 kms.
	May-June	SE Nassougou	35 kms.
	September-November December-February	Most Common Periods	

TABLE 6-7
Transhumance Route—Tafogo Site

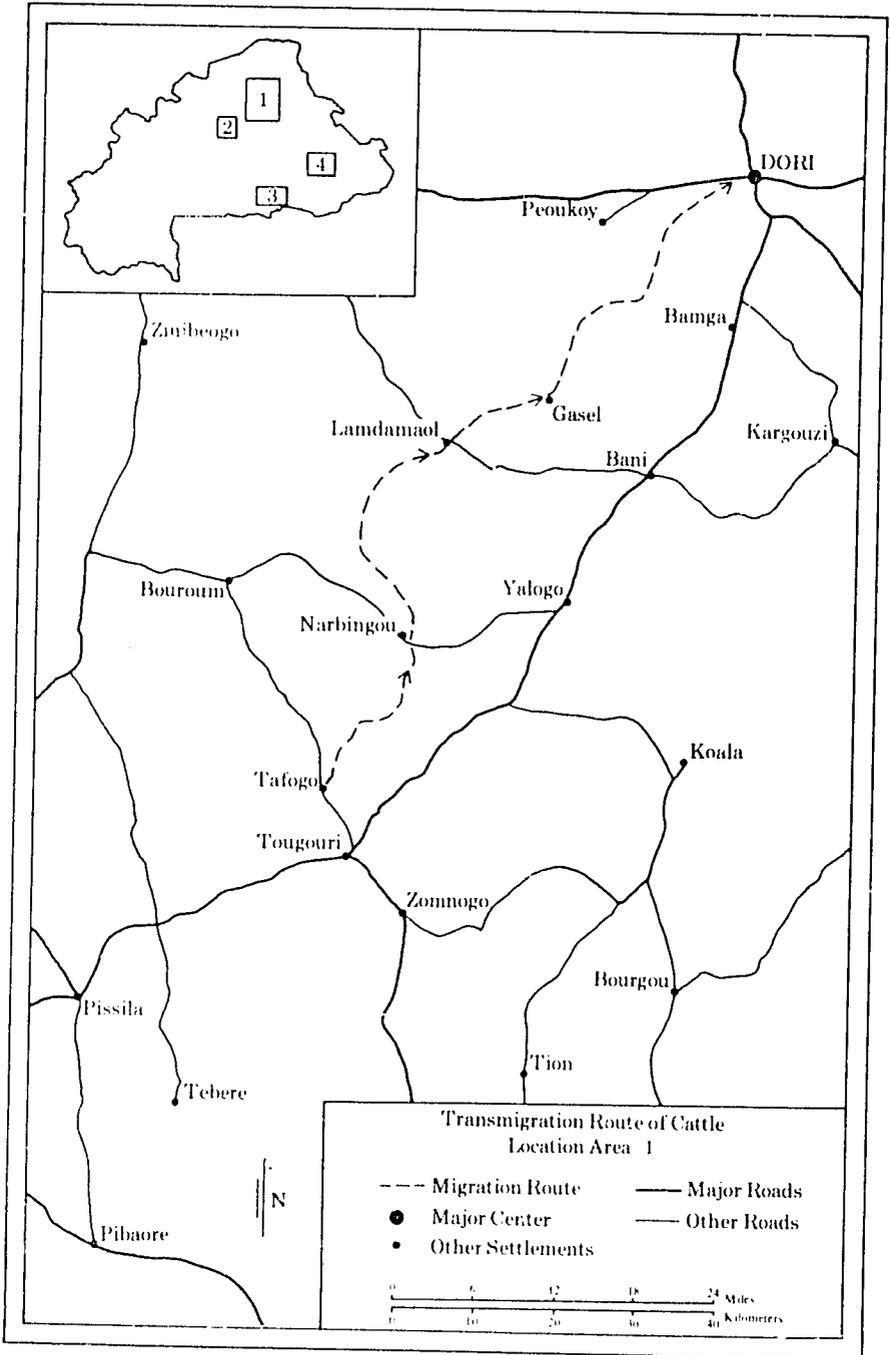
Direction	Km from Tafogo	Name of village or Landmark
Tafogo	0	Tafogo
N.E.	6.0 kms.	Siene Tanga hill
N.E.	9.0 kms	Kasokenga stream bed
N.E.	11.7 kms.	Seno Village
N.	11.7 kms.	Gorongo stream bed
N.	16.7 kms.	Kamchenga
N.	20.3 kms.	Kontanga hill
N.	21.5 kms.	Narbingou village
N.	27.2 kms.	Lecomoug village
N.E.	30.3 kms.	Peise hills
N.	34.7 kms.	Kilichoko village
N.	41.7 kms.	Peise village
N.	49.7 kms.	Lamdamaol Village (salty earth east of village)
N.E.	62.7 kms.	Gassi Village
N.E.	70.8 kms.	Sorsala Village
N.E.	79.5 kms.	Fetobah Village
E.	87.2 kms.	Malboogo Village
N.E.	93.6 kms.	Nelba Village
N.	100.3 kms.	Mallere Village
N.	104.2 kms.	Damchiadi Village
N.	108.4 kms.	Thiommtonga Village
N.	120.1 kms.	Dori Village

are subject to slight variations from one village to the next in the same site, and to localized seasonal variations and yearly variations in environmental conditions (rain).

6.3.1 Tafogo

The further north one goes, the longer the transhumance routes tend to be. For the Tafogo area the most common transhumance route is to Dori, about 120 km to the northeast. Normally this route is followed in late October through November. Depending on environmental conditions, the stay outside the area may last through December. The main aim of the transhumance trip is to obtain the salt cures for the livestock in the area just east of Lamdamaol (49 km northeast of Tafogo) and to take the animals to good grazing areas away from the millet fields, just before the harvest. Normally, the herds return to the village just after the harvest to graze on the millet stalks remaining in the fields.

The actual trip takes about five days. The first night after leaving Tafogo is spent in Djilimsombe, a neighborhood of Narbiagou (22 km northeast of Tafogo). Subsequent nights are spent near Peise, Lamdamaol, Gassi, and Dori respectively. Usually the herds are pastured near



Map 6-1. Transhumance Route—Tafogo Site

TABLE 6-8
Transhumance Route—Koukoundi Site

Direction	Km. from Koukoundi	Name of village or place
South	7	Liliga
South	17	Goren
South	33	KouKoumé
Southeast	58	Mané
Southeast	70	Ziniare (Rassénaga, Salabo, Balui)

Dori for about a week before returning to Falogo by the same route. Cattle in the Falogo area are in the local area almost all year long. Only this relatively brief period of transhumance interrupts their stay.

6.3.2. Koukoundi

In the second most northerly site, Koukoundi, the transhumance routes and seasons more nearly approximate the typical expected pattern. The main goal is to find adequate pasture and water (generally surface water). Cattle are taken to the southeast during the months of September through November. The route, about 70 km, goes due south to the White Volta. Upon reaching the Volta the herds are moved east along the river to Mané and then south to the area just west of Ziniare. The cattle return to Koukoundi in late November or early December to eat the crop residue. Some depart once again, but generally stay within a short distance of their home village.

Formerly some of the herds from Koukoundi transhumed as far south as Leo. This route has now been broken. There are numbers of cattle owned by Koukoundi Fulani, which stay permanently in the lush pasture areas of Leo all year round. These are herded by Fulani settlers from Koukoundi.

6.3.3. Gnanguedin

In the southernmost site, Gnanguedin, the transhumance route is relatively short (about 40 km), but the time spent in transhumance is very long (6-7 months). Most herds leave the area in November, just after the harvest, and stay away through the entire dry season. They return in May after the first rains. The route followed is from Gnanguedin directly west to the White Volta, and across the river to the village of Sampiama. Sampiama serves as the center of what is known as the Lere region. From here the various herders set out to either Barganze, 9 km to the south, or Zabre, 18 km to the southwest. Alternatively, there are some herders in the Gnanguedin area who go 20 km to the east or southeast to the Noubao River. The pasture along the White Volta is, however, gen-

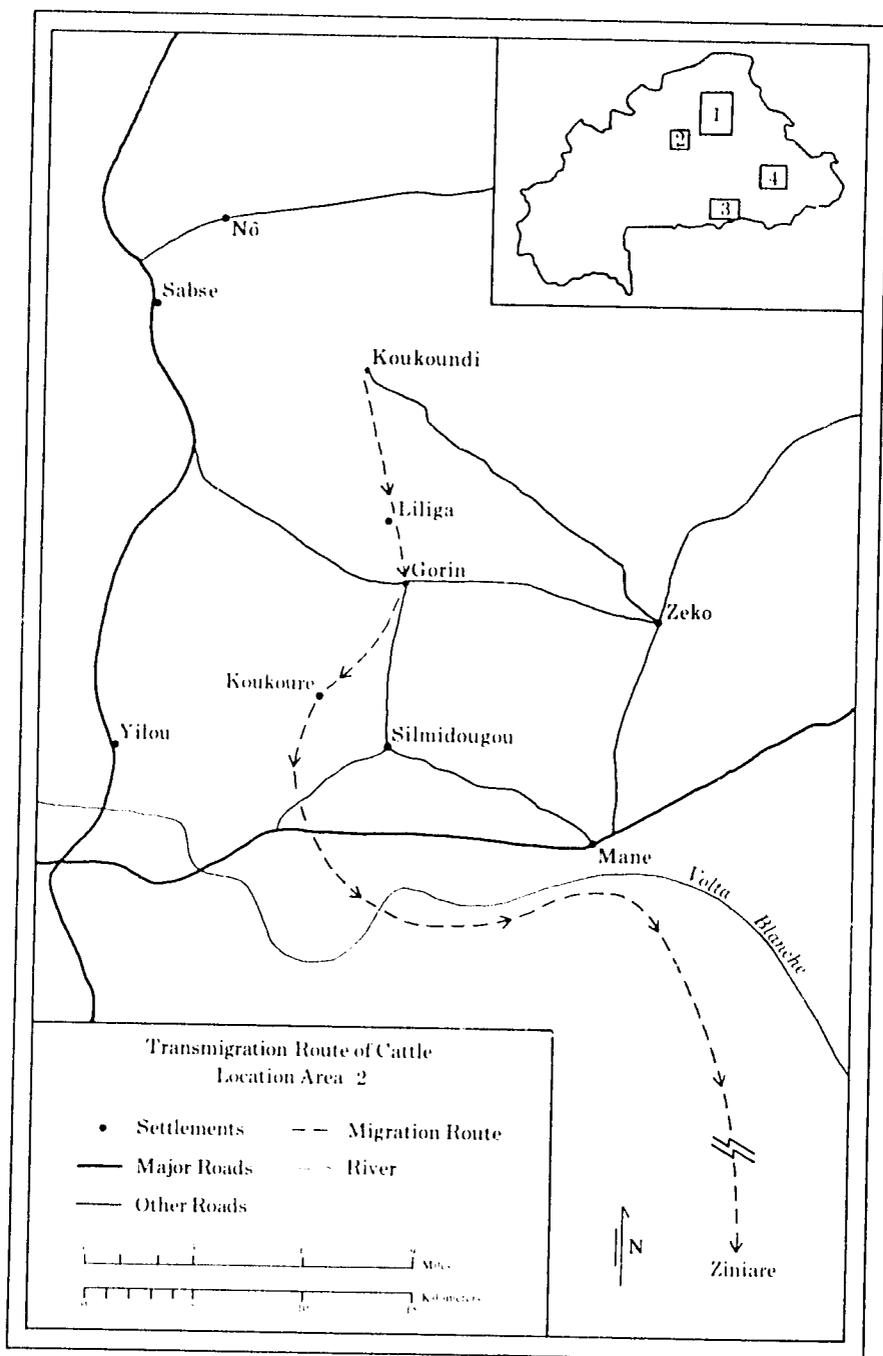


TABLE 6-9
Transhumance Route—Gnanguedin Site

Direction	Km. from Gnanguedin	(Name of village or landmark)
Gnanguedin	0	Gnanguedin
West	4	Dema
West	6	Loba
West	12	River (Lembila)
West	16	River (Lembila)
West	18	River (Lembila)
West	20	White Volta River
Region of Lere		
West	25	Samprema (Center of transhumance area)
or South	37	Panganze
or Southwest	43	Zabre

crally preferred to that of the Nonhao. The transhumance route and pasture to the west, will in the near future, be converted by the A.V.V. (Volta Valleys Authority) into an area of irrigated cropland. Transhumance patterns will at that time probably be redirected to the east.

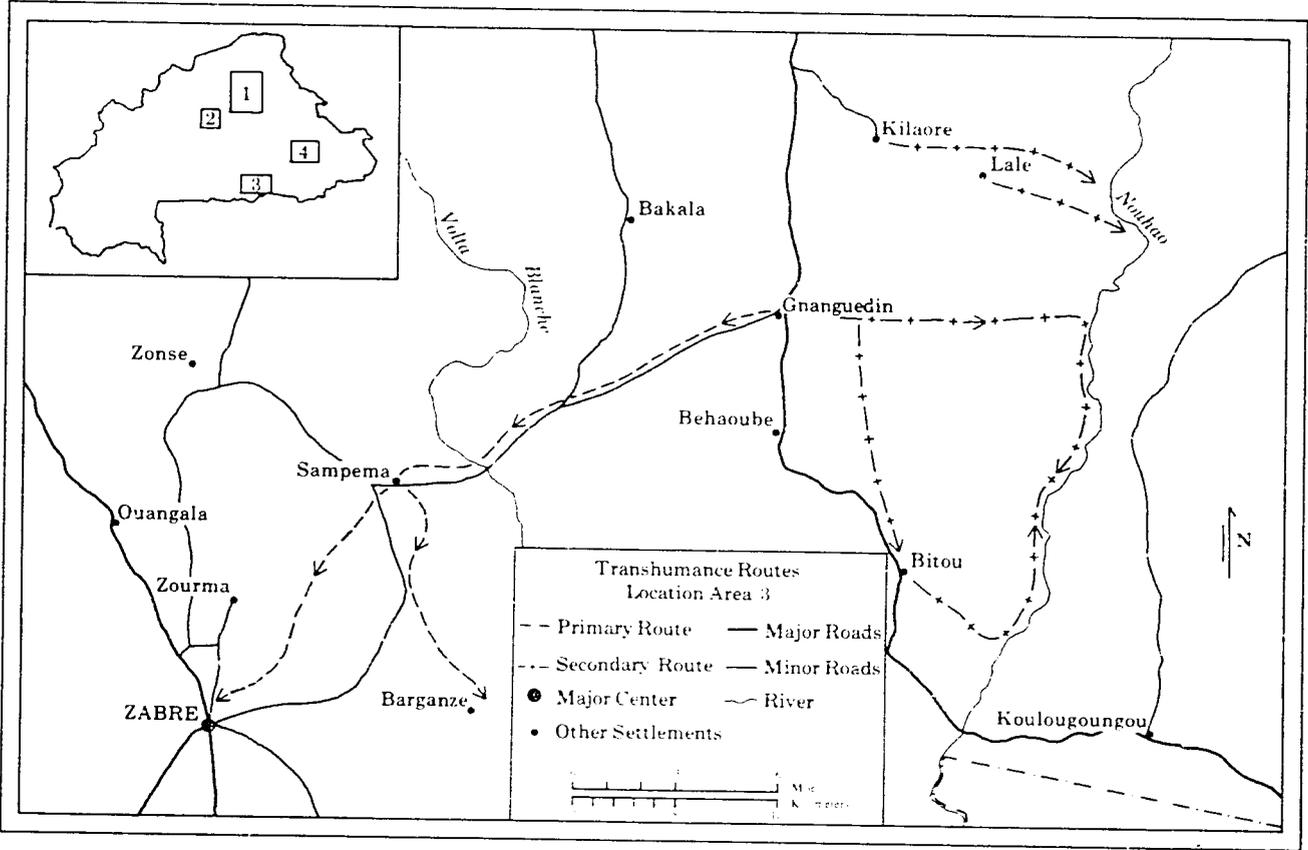
6.3.4 Ougarou

The situation in the easternmost site, Ougarou, is quite complex. Transhumance routes tend to be relatively short, between 20 and 40 km. The people in the area move their herds in the planting season, May through July. Many leave again in September and return after the harvest in November. There are also some herders who leave after the harvest and spend the months of December through February in transhumance.

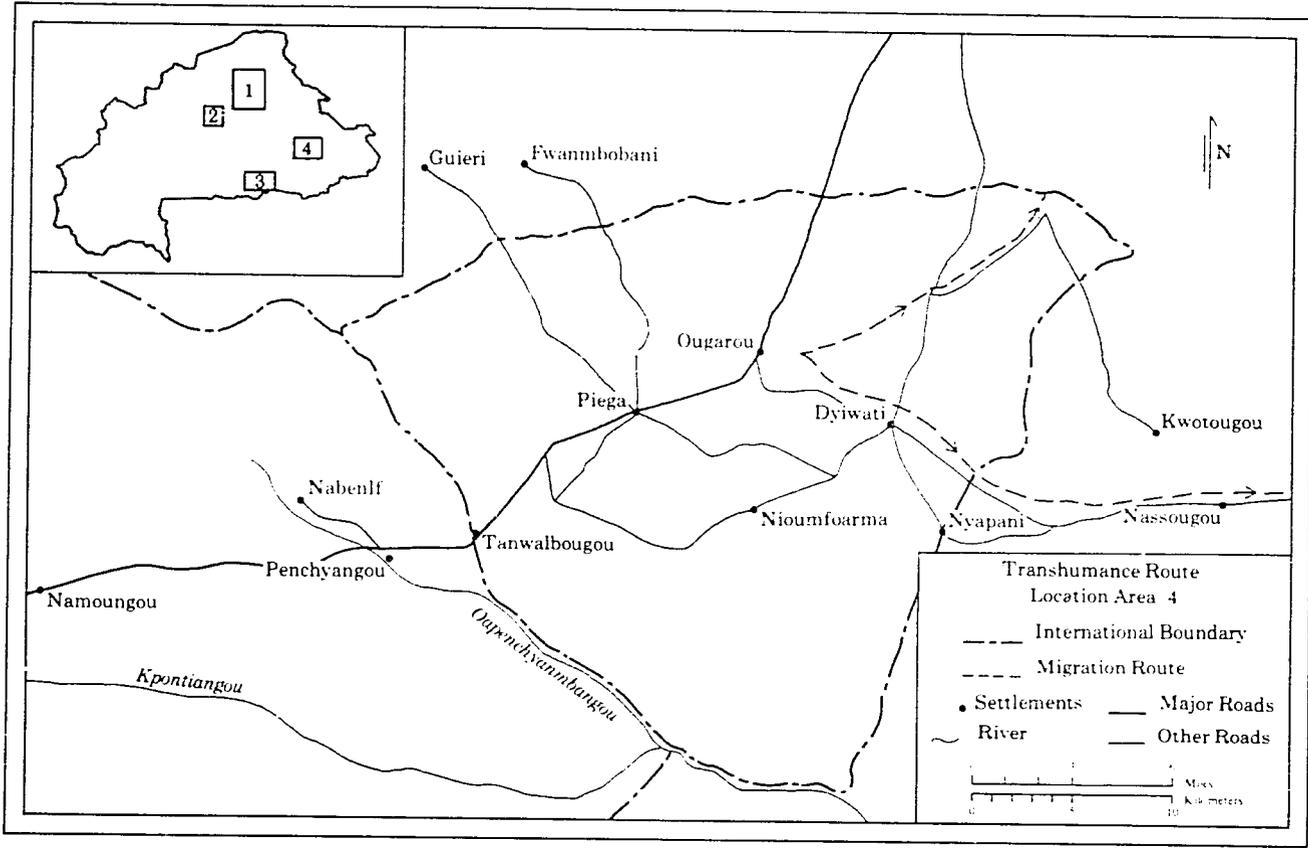
Most cattle owners in the Ougarou site who practice transhumance choose between two pasture areas, the Tapao river (25 km northeast) and the region around the village of Nassongou (40 km east). There does not appear to be a strong preference for one over the other, and several herders indicated that they switch from one to the other from one year to the next.

6.3.5

From the examples given it can be seen that transhumance routes in Upper Volta tend to be relatively short. Communication between the owners and the herders of cattle is not a major problem. The length of time the herds spend away from their home villages and the direction in which they go is highly variable. Both are largely a function of environmental conditions, particularly the availability of water, especially surface water. The duration and timing of the stay in transhumance are



Map 6-3. Transhumance Route—Gnanguedin Site



Map 6-4. Transhumance Route—Ougarou Site

crucial factors to be considered in evaluating and planning prospective interventions in the areas of health, feeding and range management.

6.4 Range Management

Very little is known by local livestockmen about the broad general concept of range management. Most livestockmen have an excellent knowledge of the grasses and bushes which are preferred by their cattle (this is substantiated by Swift, 1979). Similarly they are aware of the process whereby pasture is regenerated or degraded by overgrazing and/or burning. Problems do not result from a lack of knowledge of the environment and the interrelationships which govern it. Instead, they result from the inability of the individual livestockman to manage these resources. Without the generation or imposition of effective management procedures and enforcement mechanisms, there is little that can be done.

Currently, pasture land in Soudanian Upper Volta is completely open. There are no restrictions on who can use it, for how long, during what seasons, or how many head can be kept there. The rational strategy for the individual is to maximize his own utility function without regard for the long term environmental impact. The potential result is the classic "tragedy of the commons" (Hardin, 1968).

Most livestockmen say that they leave their cattle in a pasture area until they have consumed all, or almost all the available grasses and leaves. The key factor is water. If water is available all the forage in the area will be used. If not, the length of time spent in an area will be considerably less, and more pasture resources will survive the season. There is no real conception of a system of pasture rotation (99.4% said they did not leave any pasture areas at rest), and many livestockmen laughed at the suggestion. Some elderly Fulani told this author that at one time they employed such practices. Now, however, with increasing population pressure and more intensive agricultural development, such a system is impossible. Any good pasture, if left to regenerate for a period of time, will merely serve to feed other people's herds. Not only will no long-term saving or protection result from an individual livestockman undertaking a rest rotation system, but such an effort will merely result in the sacrifice of some of the pasture he regularly utilizes to others.

6.5 Burning

The burning of pasture areas is a very controversial issue among both livestockmen and technical experts. Livestockmen surveyed are roughly evenly split regarding the advantages and disadvantages of this practice. Of the 52.3 percent who feel that there are benefits to be obtained from

TABLE 6-10
Percent of Livestockmen Who Feel That Burning Is Useful by Ethnicity

	Mossi	Fulani (Peulh)	Gourmantche	Bissa	Total
Percent	21.5	67.2	91.1	80.0	52.3
N	65	58	17	15	155
		$\chi^2 = 16.37$	$p < .0001$		
		Cramer's V = .55			

burning, the most common benefit cited was that new, fresh grasses will grow quickly after burning.

There is considerable regional variation in the propensity to burn. In the north the practice is not common and is opposed by a significant majority of livestockmen. In the east and south, burning has much more favorable connotations for livestockmen. Ethnically, only the Mossi are very reluctant to burn pasture areas. The Fulani, Gourmantche and Bissa regard burning in a more positive light.

It must be noted that the burning being discussed here is not indiscriminant. It is carefully controlled, both in terms of area and season. The most common times for burning by livestockmen are October-November and May. In October-November livestockmen explain that the grasses are still moist. Therefore fire will not destroy everything and there will be enough moisture left so that new grasses can spring up. Similarly in May they suggest that by burning just before the rains come, a good quick growth of grasses will be insured with the first rain. In very few cases, however, did livestockmen seem to examine the long term impact of these actions.

There remains a great deal of conflict in the minds of livestockmen regarding the issue of burning. While they find their own motivations for burning justified, they are strongly opposed to much of the burning done by nonlivestockmen. For example, burning designed to clear bush areas for planting often destroys significant areas of pasture. It also comes in the wrong season to be of use in regenerating grasses. Fires lit by hunters in search of small game also cause considerable damage to pasture areas. For their part, farmers say that if the herders can burn for their purposes, farmers should be able to burn when it suits them.

Unfortunately, those charged with regulating burning, the Water and Forestry Service, is understaffed in the field and often issues contradictory directives to its field personnel regarding enforcement procedures. Until a firm national policy is established for burning and adequate enforcement procedures are instituted, little change can be expected in this practice. Successful demonstrations can be instituted only within the context of a broader national policy.

TABLE 6-11
Months When Livestockmen Say It Is Useful to Burn the Pasture.

Month	Percent of Livestockmen
January	1.3
February	—
March	—
April	2.6
May	11.5
June	7.7
July	—
August	—
September	7.7
October	46.2
November	19.2
December	2.6

6.6 Supplementary Feeding

Supplementary feeding is a very complex issue which has been the subject of much discussion, research, and experimentation. Little is known, however, about what the average livestockman actually does in this regard. Among those livestockmen interviewed, 64.9 percent said that they use certain supplements for at least some of their animals. Normally, however, supplementary feed is provided only to traction animals, milk cows, calves, and animals too sick to graze.

The owners of the largest proportion of the livestock, the Fulani, are least likely to provide supplementary feed for their animals. Only 28.1 percent of the Fulani said they feed any cattle at all. The Mossi (87.7%), Gourmanche (82.1%), and Bissa (86.7%) are fairly uniform in the high degree to which they provide supplementary feeds to at least some of their cattle. Much of this feeding is accounted for by the ownership of traction animals. Furthermore, it must be stressed that much feeding is only seasonal. Even traction animals are often sent out to pasture around the village when they are not needed for plowing or weeding.

The most common forms of feed provided are millet stalks, peanut hay, and, to a lesser extent, bean hay. All of these are by-products of the normal agricultural processes. Most livestockmen, 77.2 percent, who use such supplements, produce them in their own fields. The remaining 22.8 percent either buy them (5.0%) or both buy and grow them (22.8%). There is considerable variation from year to year. After a good harvest a livestockman may collect millet stalks, peanut hay, and/or bean hay. He will store these items on the top of a small shed or lean-to for later use. In a bad year there may be little if anything which can be used as supplementary feed.

TABLE 6-12
Supplementary Cattle Feeding by Ethnic Group

	Mossi	Fulani (Peulh)	Gourmantche	Bissa	Total
Percent Yes	87.7	29.3	82.4	86.7	64.9
N	65	58	17	15	155

The Fulani, whose crop production is more limited than that of the other ethnic groups, tend to buy feed supplements rather than grow them. Only a small minority of Fulani use such supplements. Their traditional concentration on utilization of pasture land also militates against the use of such supplements.

Most livestockmen are currently using all the surplus crop materials they produce. The idea of planting forage crops for their animals is a totally foreign concept. Given the existing labor intensive agricultural system and the fact that forage crops must be grown at about the same time as food crops, there is not adequate labor available for such an effort. Furthermore, in many areas there is not adequate surplus land on which forage crops can be grown. No one is willing to convert grain-producing crop land to forage use. If forage could be grown on fields at rest in the crop rotation system without eroding the soil, some livestockmen might be convinced to undertake such an effort. The Fulani, who generally do not produce enough grain to feed themselves, can hardly be expected to plant forage crops. It should be noted that many livestockmen who use supplements clearly state that they prefer to have their animals feed on local grasses and leaves. Outside of traction animals, forage will not be furnished to the herd as a whole. In sum, supplementary feeding does not appear to be a strategy with a high chance of success.

An additional supplement to the diet of many animals is salt. Traditionally this was obtained by taking the cattle to an area with salty earth. The animals would eat the earth until they were satiated with salt. This is presumed to help improve their appetites as well as their general health. Presently salt is more commonly supplied in the form of sea salt, rock salt, and/or manufactured salt and mineral blocks. The latter, the preferred form, is currently utilized by 62.4 percent of the livestockmen surveyed.

Once again, these supplements are not provided for the whole herd, but generally for traction animals, milk cows and certain prized animals only. The average cow receives very little, if any of this supplement, except where areas of salty earth are still available (e.g., the transhumance route from Tafogo).

6.7 Milk Production

A look at local livestock management would not be complete without at least a brief discussion of milk production. Of the ethnic groups being considered here, milk is most important to the Fulani. It is both an important dietary supplement and a source of disposable income for women. Among the Fulani, every married woman expects her husband to provide her with milk cows. The women regularly do the milking, milk processing, and marketing of the surplus. Fulani women regularly use milk to make yogurt, butter, and soap. Formerly, they also produced cheese, but this is an art which has been largely lost by the Fulani of Upper Volta. It has been reported that at the approach of the dry season some Fulani women are mixing imported powdered milk (and water) with fresh milk to increase their supply and hence maintain their sales volume (see Helen Henderson, 1979).

When the herds are in transhumance some milk cows are generally left at the more permanent Fulani settlement. If there are women accompanying their husbands in transhumance they take care of the milking of those cows in the herd. If there are no women in transhumance, it is the herders themselves who do the milking and consume the milk.

Among the other ethnic groups, it is the males, usually the herders, who take care of the milking. Milk is generally consumed by young children, and, if in sufficient quantity, by the family as a whole. Milk is only consumed, but not processed by non-Fulani. Often additional milk is purchased from Fulani women to supplement the family diet.

Normally milking is done twice a day during the rainy season, and only once a day, or not at all, during the dry season. First the calf is allowed to drink. Then the cow's hind legs are tied together and the calf is tied to a nearby tree or stake. Most of the milk is then taken from the cow, but some is left for the calves to finish off. The volume of milk obtained from a cow, even in the rainy season, is relatively low (about 1.5 litres per milking).

Often the question is raised about the tradeoff between milk offtake and the growth and survival of calves. During the rainy season, when milk production is highest, livestockmen say they wait on the average 25 days after the birth of the calf before starting to take the milk themselves. However, the median livestockman waits only 15 days. There is considerable variation by ethnic group. The more milk-dependent Fulani average a wait of about 22 days before milking while the average for the Mossi is 35 days. Surprisingly, the Gourmantche and Bissa wait an average of only about 12 days. Some argue that early milking leads to high rates of mortality and slower growth and development of calves.

In the dry season milk production tapers off considerably, if not completely. Forty-five percent of the livestockmen do no milking at all dur-

ing the dry season. Those who do milk average a wait of 44 days. Both the median and modal time periods are one month. Differences between ethnic groups in the delay before milking are not significant during the dry season.

One important problem concerning current local milk production is health, both animal and human. Sanitary measures are rare. There is no refrigeration. Containers are not sterilized. Perhaps most important and dangerous is the fact that even sick cows, those with tuberculosis for example, are milked, and the milk used for human consumption. The risk of transmitting the disease from animals to humans is thus quite high. Given the fact that there is no cure available for tuberculosis in cattle and the recommended procedure is to destroy sick animals and burn the carcasses, little change can be expected in these practices.

VII. LIVESTOCK MARKETING

7.1 Introduction

In any effort to ameliorate the conditions of animal production it is necessary to have an understanding of the likely outcome of increased production. The issue of cattle marketing in Upper Volta has been carefully and insightfully examined by Larry Herman (1977). Herman's data present a picture of behavior in and around some of Upper Volta's major cattle markets, Djibo, Kaya, Pouytenga, and Ouagadougou. The individual level data he presents are restricted to the Fulani of Djibo.

In order to round out the picture, this author has examined the marketing issue for four ethnic groups (Mossi, Fulani, Gourmantche, and Bissa) and for four areas in three ORDs (Kaya, Koupela, Fada N'Gouma). In none of the four sites is there a large cattle market in the immediate vicinity. The site nearest to a large cattle market is over 70 km distant. In most of Upper Volta livestockmen do not have access to one of the large cattle markets. Therefore these data probably reflect the marketing behavior of the more typical Voltaic cattle owner.

7.2 Marketing Motivation

Since livestock are viewed by both the Fulani and their more sedentarized neighbors as a repository of wealth, the decision to sell is quite serious. In general, livestockmen, regardless of ethnic group, are target vendors. Livestock are sold only to meet specific needs or to pay for very specific goods. Market conditions, although important, seem to be a secondary consideration.

Our survey of 157 livestockmen reveals what they regard as important reasons for selling livestock (see Table 7-1) and *the* most important reason for selling livestock (see Table 7-2). The responses are reasonably uniform from one ethnic group to the other. The purchase of grain, millet, and/or sorghum, is both the most frequent and most important reason cited for selling animals. It is the most important among the Fulani, regardless of region. Among the more sedentary groups the importance attached to the purchase of grain as a motivation for selling livestock varies inversely with the quality of the last harvest. In two of the four survey sites, the previous year's harvest (November 1978) was quite good. In the other two the failure of the rains resulted in a very poor harvest. Only 30 percent of the Mossi in the two sites experiencing a good harvest (Koukoundi and Gnanguedin) identified the purchase of millet as the most important reason for selling livestock. In the Tafogo site, an area which had a very poor harvest, 93.1 percent of the Mossi identified the purchase of grain as the main motivation for marketing cattle. In Ougarou, another area having a poor harvest in 1978, 93.8

TABLE 7-1
Reasons for Selling Livestock

	Percent	N
To buy grain	73.5	151
To buy clothing	17.0	151
To pay taxes	39.1	151
To buy medicine	9.9	151
They are old	6.0	151
They (animals) are sick	5.3	151

percent of the Gourmantche ranked grain purchases as the number one reason for selling livestock.

Other important reasons for sales are to purchase cloth or finished clothing and to pay the annual head tax and cattle tax. Cash for the purchase of medicines, both for humans and animals (vaccines) is another important immediate need. Additional reasons center around the condition of the animals. When an animal is regarded as too old and is either unproductive or unable to follow the rest of the herd to pasture, it is likely to be sold. Similarly, when an animal is sick, the owner may try to sell it before its condition becomes apparent to potential buyers. More frequently, when an animal is very weak and judged not likely to survive its sickness, it will be slaughtered (have its throat cut) and the meat will be sold to local butchers. The meat from animals which die a natural death may also be sold, but only non-Muslims eat it under these conditions.

It is remarkable that the results of this survey among Fulani, Mossi, Gourmantche, and Bissa cattle owners in the Soudanian regions of Upper Volta should produce results very similar to those obtained by Herma (1977, p. 18) among a Fulani sample in the Sahelian region of Upper Volta. The purchase of grain was listed as the prime marketing motivation by 69 percent of his sample and 73 percent of our sample (a statistically insignificant difference). The second most important reason, the purchase of clothing, was cited by 12 percent and 11.5 percent of those interviewed by the C.R.E.D. (Herma) and this author's surveys respectively. The third most important reason, the payment of taxes was named by 9 and 8.8 percent of the respective samples.

Small ruminants, goats and sheep, are generally sold locally. The purchasers are local butchers in need of meat, or villagers looking to increase their own small ruminant stock. These animals are sold in order to meet small immediate expenses. They are also sold in response to the high demand and high prices which accompany the arrival of both Islamic and Animist holidays.

TABLE 7-2
Most Important Reason for Selling Livestock

	N	Percent
To buy grain	108	73.0
To buy clothing	17	11.5
To pay taxes	13	8.8
Animals are old	4	2.7
To get a wife	3	2.0
To buy medicine	2	1.4
The animals are sick	1	0.7
Total	148	100.0

There is one clear and important difference in the marketing motivation of one of the four ethnic groups examined, the Bissa. Among the Bissa the payment of the bride price is an enduring tradition. Normally the bride price consists of four to eight head of cattle, a number of sheep and goats, a guinea hen (pintad), a rooster, and perhaps some cash. The Bissa have a long tradition of owning livestock, which are retained primarily for payment of the bride price and for religious purposes (sacrifices).

Bissa livestock owners are even more secretive about their ownership of cattle and the size of their holdings than are members of the other ethnic groups. A known cattle owner may be put under constant pressure from young male relatives to loan them the animals required to formally obtain a bride. The possibility of repayment is somewhat remote. Furthermore, the owner may want to retain the cattle for his own use in obtaining additional wives, or for the use of his sons when they reach the age of maturity. Thus, livestock sales among the Bissa are very limited (see Table 7-11). Cattle are retained as a form of wealth which can be converted into the most highly valued items, brides and hence children.

Among the Fulani the ownership of cows is a necessity. Every Fulani male is expected to provide cows for his wife, or wives, to milk. Women engage in milking, processing, and marketing of milk and milk products. As this provides the primary source of disposable income for Fulani women, a husband who does not place an adequate number of cows at the disposal of his wife will run the risk of losing her. Fulani males state quite clearly that a man who has no cows will have no wives. The Fulani are therefore very reluctant to sell cows, except when they have proven to be dry and unproductive.

7.3 Where Animals Are Sold

One major difference between the data presented here and that

TABLE 7-3
Where Livestock Were Sold

	N	Percent
Cattle Market	11	7.6
To Buyers Who Come to the Village	70	48.6
In the Village	55	38.2
Village Market	8	5.6
Total	144	100.0

gathered by Herman is the nature of the locale in which cattle are sold. In his Djibo survey, livestockmen had ready access to a large nearby cattle market, but this is unusual among livestockmen in Upper Volta. Since most livestock owners sell only one or two head of cattle in a given year, it is not economic for them to walk these animals to one of the larger markets. The cost in labor (herders) and the risks of weight loss, accident, or disease along the route can not be justified for such a small transaction.

Only 7.6 percent of those interviewed by this author sell their cattle in one of the larger, or even middle size, cattle markets. For Herman's data from Djibo the figure is 81 percent sold in the large livestock market (p. 26). In our sample the largest single group, 48.6 percent, sell their livestock to cattle buyers who come to their home villages or to local businessmen who act as middlemen.

Visiting buyers generally go directly to the homes of potential sellers, past clients, or to the local village market. These merchants then take responsibility for getting the cattle to the larger regional or even international markets, and garner a good profit for their time and investment.

A surprisingly large number of livestockmen, 38.2 percent, sell their animals in their own or nearby villages to other local livestockmen. This is especially the case during the rainy season when commercial buyers rarely come to the village.

Table 7-3 shows that most livestock sales take place in or very close to the home villages of the producers. Only 7.6 percent of sales took place outside the local area. Both large and small ruminants are sold by the producers in the area in which they are produced.

7.4 Animals Sold

The largest number of animals sold are, as expected, males. The percentage of all reported livestock sold which are males is 80.1 percent for cattle, 75.3 percent for goats, and 58.9 percent for sheep. The average age at which all cattle are sold is 5.71 years ($N=330$), 3.99 years for male and 7.33 years for females. The mean age for the sale of sheep is 2.49 years

TABLE 7-4
Average Age of Animals Sold by Ethnic Group

	Males	Females	Males + Females
Cattle			
All ethnic groups	4.99 (N= 267)	7.33 (N= 63)	5.71 (N= 330)
Fulani	4.06 (N= 151)	7.38 (N= 37)	4.81 (N= 201)
Mossi	6.48 (N= 75)	7.62 (N= 13)	6.65 (N= 88)
Bissa	• (N= 4)	• (N= 1)	• (N= 5)
Gourmantche	5.17 (N= 31)	• (N= 2)	5.67 (N= 36)
Goats			
All ethnic groups	1.95 (N= 61)	1.75 (N= 20)	1.90 (N= 81)
Fulani	1.30 (N= 23)	1.66 (N= 12)	1.43 (N= 35)
Mossi	2.29 (N= 35)	1.90 (N= 7)	2.21 (N= 42)
Bissa	•	•	•
Gourmantche	•	•	•
Sheep			
All ethnic groups	2.32 (N= 56)	2.74 (N= 39)	2.49 (N= 95)
Fulani	2.15 (N= 27)	3.20 (N= 15)	2.52 (N= 42)
Mossi	2.41 (N= 27)	2.33 (N= 18)	2.40 (N= 45)
Bissa	•	•	•
Gourmantche	•	•	•

• The sample is too small, but the results are included in the totals.

(N=95), 2.32 years and 2.74 years respectively for males and females. Comparable figures for goats (\bar{X} =1.90 years at the time of sale) are surprising in that the average for males (1.95 years) is greater than the average age at which females are sold (1.75 years).

There are some differences between ethnic groups regarding the age at which cattle are sold. The Fulani, for example, sell male animals which are much younger (\bar{X} =4.06 years) than those sold by the Mossi (\bar{X} =6.48 years) and the Gourmantche (\bar{X} =5.17 years). There is no significant difference between ethnic groups for the age at which females are sold. The relative difference between ethnic groups regarding the age at which sheep and goats are sold are much smaller than those for cattle.

It is quite interesting to note the differences in the distribution by age and sex of cattle sales reported here (N=330) and those reported by Herman (1977, p. 30) for the Djibo area. These figures are presented in Table 7-8. Since virtually all of the animals sold in the Djibo sample are owned by Fulani, figures for our sample are presented as a whole, as well as for the Fulani sub-sample. The distributions of animals sold on the basis of sex are very similar.

Several differences between the two samples are immediately evident. The Djibo cattlemen are apparently selling off young males to a much greater extent than are the livestockmen in the Soudanian areas of the

TABLE 7-5
Age and Sex of Cattle Sold (Percent) by Each Ethnic Group—Four Sites*

Age	Fulani			Mossi			Bissa			Gourmantche			All ethnic groups		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
1-1.9	7.14	4.26	6.77	—	—								4.12	3.17	3.94
2-2.9	25.32	29.79	27.60	1.33		1.14				5.88		5.56	15.73	22.22	16.97
3-3.9	14.94	2.13	12.50	00		3.41				20.59		19.14	12.36	1.59	10.30
4-4.9	11.69	6.38	10.94	6.67	7.69	6.82				14.71	50.00	16.67	10.49	7.94	10.00
5-5.9	11.69	4.26	10.42	21.33	7.69	19.32		100.00	20.00	11.76		11.41	14.23	6.35	12.73
6-6.9	16.23	6.38	14.58	17.	—	14.77	25.00		20.00	20.59		19.44	17.23	4.76	14.85
7-7.9	5.84	2.13	5.21	25	61.54	30.68	—			5.88	50.00	8.33	11.24	15.87	12.12
8-8.9	4.55	2.13	4.17	4.00	—	3.41	25.00		20.00	5.88		5.56	4.87	1.59	4.24
9-9.9	1.95	6.38	3.13	13.33	15.38	13.64	25.00		20.00	8.82		8.33	6.37	7.94	6.67
10-10.9	0.65	2.13	1.04	6.67		5.68	25.00		20.00				2.62	1.59	2.42
11-11.9	—									5.88		5.56	0.75	—	0.61
12-12.9		4.26	0.52											3.17	0.61
13-13.9		4.26	0.52											3.17	0.61
14-14.9		19.15	3.13											14.29	2.73
15-15.9		4.26	0.52											3.17	0.61
≥16.0		2.13	0.26		7.69	1.14								3.17	0.61
N =	154	47	201	75	13	88	4	2	5	34	2	36	267	63	330

*Koukoundi, Gnanguedin, Ougarou, Talogo

TABLE 7-6
Age and Sex of Sheep Sold (Percent) by Each Ethnic Group—Four Sites

Age	Fulani			Mossi			Bissa			Gourmantche			All ethnic groups		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
1-1.9	10.71	20.00	33.33	3.70	16.67	8.89							21.43	15.38	18.95
2-2.9	29.63	20.00	26.20	18.15	33.33	42.22	20.00	20.00			100.00	33.33	37.50	28.21	33.68
3-3.9	3.70	13.33	7.11	18.15	50.00	48.89	60.00	60.00	100.00			66.67	28.57	25.90	31.58
4-4.9	25.93	13.33	21.43				20.00	20.00					12.50	7.69	10.53
≥5.0		33.33	11.90											12.85	5.26
N=															
Total=100%	27	15	42	27	18	45	0	5	5	2	1	3	56	39	95

*Koukoundi, Gnanguedim, Ougarou, Talogo

TABLE 7-7
Age and Sex of Goats Sold (Percent) by Each Ethnic Group—Four Sites

Age	Fulani			Mossi			Bissa			Gourmantche			All ethnic groups		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
1-1.9	73.91	58.33	68.57	11.30	42.86	19.05							36.07	50.00	59.51
2-2.9	21.71	33.33	25.71	42.86	28.57	40.48		100.00	50.00				32.79	35.00	33.33
3-3.9	4.35		2.86	42.86	28.57	40.48	100.00		50.00	100.00	0.00	100.00	31.15	10.00	25.93
4-4.9															
5-5.9		8.33	2.86											5.00	1.23
N=															
Total=100%	23	12	35	35	7	42	1	1	2	2	0	2	61	20	81

*Koukoundi, Gnanguedim, Ougarou, Talogo

TABLE 7-8
Comparison of Age and Sex of Cattle Sold (Percent) in
Djibo and Village Livestock Research Sites

Age & Sex of Cattle Sold	Village Livestock Proj.	Village L. P.	Djibo (Herman)
	(All ethnic groups) N=330	(Fulani only) N=201	N=311
Males \leq 4 yrs.	34.5	45.3	62
Males \geq 5 yrs.	46.4	31.3	13
Females \leq 4 yrs.	6.7	10.0	7
Females \geq 5 yrs.	12.4	13.4	18
	100	100	100
All Males	80.9	76.6	75
All Females	19.1	23.4	25

village livestock project. Sixty-two percent of the cattle sold in the Djibo market are young males (\leq 4 years of age). Only 34.5 percent of the cattle sold in our sample are young males. When one compares the data for only those cattle sold by the Fulani in our sample with the Djibo data, the differences are not as great (45.3 percent of all sales are young males) but still considerable. For older male animals (\geq 5 years of age), the situation is reversed. Only 13 percent of the sales in the Djibo market are accounted for by older males, while 46.4 percent of the village livestock project sample are so composed. The exact reasons for this difference between the age of cattle sold between the two samples remains unclear.

The existence of this difference is especially surprising since, as will be seen later, there is a strong positive correlation between age and the sale price of male cattle. It is possible that the difference results from the fact that the majority of Herman's sample livestock were sold in a large market, while those in our sample were predominantly sold in the local village. Young males may be preferred in larger markets, while more mature males may find a more ready market at the local level. Ethnic differences between cattle owners in the two samples provides at least a partial explanation. Non-Fulani clearly prefer to hold their cattle until they are older before selling them. Fulani prefer to sell young males.

When the data are broken down by site and ethnic group, cattle sales by the Fulani of Tafogo are markedly different from those found elsewhere. For the Fulani in the other three areas, young male cattle account for over half of all cattle sales. For the Fulani of Tafogo, the figure is only 13.6 percent. Poor rainfall in the Tafogo area during the last few years may have severely hindered the production of calves. If this is the case, the few calves born might be held in reserve to protect the future of the herd.

There are also significant differences between the Village Livestock

TABLE 7-9

Percent of Total Cattle Sold by Each Ethnic Group in Each Site by Sex and Age Category

Site (ethnic group)		≤ 4 Year	≥ 5 Years
Koukoundi			
Fulani	Male	50.0	38.9
	Female	5.6	5.6
Mossi	Male	6.3	78.7
	Female	0.0	14.9
Ougarou			
Fulani	Male	51.5	12.1
	Female	21.2	15.1
Goumantche	Male	38.9	55.5
	Female	2.8	2.8
Gnanguedin			
Fulani	Male	57.5	19.2
	Female	5.5	17.8
Mossi	Male	33.3	22.2
	Female	11.1	33.3
Bissa	Male	0.0	80.0
	Female	0.0	20.0
Tafogo			
Fulani	Male	13.6	77.3
	Female	2.3	6.8
Mossi	Male	7.9	84.2
	Female	2.6	5.3

Project sample and the CRED sample in Djibo regarding the age at which small ruminants are marketed. The average ages at which sheep and goats are sold in Djibo are 1.40 and 1.65 years respectively. For the village livestock survey the average age at the time of the sale is considerably older (sheep $\bar{X}=2.49$ years, goats $\bar{X}=1.90$ years). The difference for goats is not very great and can be adequately accounted for by ethnicity. The average age of goats sold by the Fulani in our sample is 1.43 years, slightly younger than those in the Djibo sample.

In the case of sheep, region appears to be an important factor. Soudanian zone livestock owners do not sell young ovines to as great an extent as is the case in Djibo. The smaller size of the Soudanian sheep and goats, compared with the varieties found in the Sahel is also a contributing factor.

7.5 Animal Sales Per Livestockman

To what extent is the average livestockman involved in the livestock marketing system? Within the Soudanian zone in which our sample is drawn, the average cattle owner sold 2.3 head of cattle, 1.0 sheep, and 0.6

TABLE 7-10
 Sheep Sold by Site, Ethnicity of Owner, Age and Sex (Percent)

Site (Ethnicity)		Age					Total
		1-1.9	2-2.9	3-3.9	4-4.9	5-5.9	
Ougarou (N=9)							
Fulani	Males	33.33	—	—	—	—	33.33
	Females	33.33	—	—	—	—	33.33
Goumaratche	Males	—	—	22.23	—	—	22.23
	Females	—	11.11	—	—	—	11.11
Total		66.66	11.11	22.23	—	—	100.00
Koukoundi (N=36)							
Fulani	Males	19.44	5.56	—	—	—	25.00
	Females	—	—	—	2.78	13.89	16.17
Mossi	Males	8.33	19.44	11.11	—	—	38.88
	Females	8.33	8.33	2.78	—	—	19.44
Total		36.11	33.33	13.89	2.78	13.89	100.00
Gnanguedin (N=20)							
Fulani	Males	5.00	—	5.00	—	—	10.00
	Females	—	5.00	10.00	5.00	—	20.00
Mossi	Males	—	15.00	15.00	—	—	30.00
	Females	—	15.00	—	—	—	15.00
Bissa	Males	—	—	—	—	—	—
	Females	—	5.00	15.00	5.00	—	25.00
Total		5.00	40.00	45.00	10.00	—	100.00
Tafogo (N=32)							
Fulani	Males	—	18.75	—	21.88	—	40.63
	Females	—	6.25	—	—	—	6.25
Mossi	Males	—	9.38	18.75	—	—	28.13
	Females	—	—	25.00	—	—	25.00
Total		—	34.38	43.75	21.88	—	100.00

goats in a one-year period. These figures are low when compared to the comparable figures of 3.5, 1.3, and 2.5 obtained in the Sahelian area (Djibo) by Herman.

These differences in the number of animals sold largely disappear when we control for ethnicity. Since the Djibo sample is almost 100 percent Fulani, it makes sense to compare only the Fulani in our sample with the Fulani in Herman's sample. By so doing, the differences between the samples diminish considerably. The Fulani in our sample actually sell more cattle on the average than do those of Djibo ($\bar{X}=3.93$ and 3.56 respectively). The Djibo Fulani sell many more small ruminants, particularly goats, than the Soudanian zone Fulani.

The differences regarding goats can be at least partially explained by

TABLE 7-11
Goats Sold by Site, Ethnicity of Owner, Age and Sex (Percent)

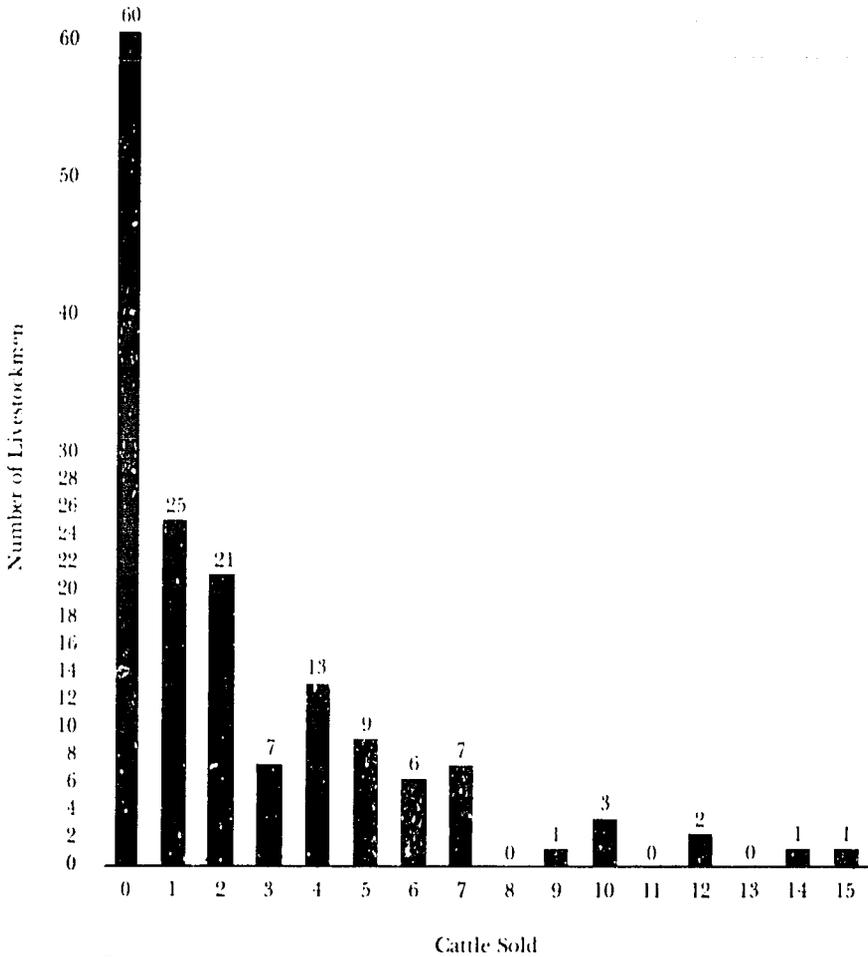
Site (Ethnicity)		Age					Total
		1-1.9	2-2.9	3-3.9	4-4.9	5-5.9	
Koukoundi (N=19)							
Fulani	Males	10.53	—	—	—	—	10.53
	Females	5.26	—	—	—	5.26	10.52
Mossi	Males	15.79	10.53	26.32	—	—	52.64
	Females	15.79	10.53	—	—	—	26.32
Total		47.37	21.06	26.32	—	5.26	100.00
Gnanguedim (N=7)							
Fulani	Males	14.29	14.29	—	—	—	28.57
	Females	—	14.29	—	—	—	14.29
Mossi	Males	28.57	—	—	—	—	28.57
	Females	—	—	—	—	—	—
Bissa	Males	—	—	14.29	—	—	14.29
	Females	—	14.29	—	—	—	14.29
Total		42.86	42.86	14.29	—	—	100.00
Tafogo (N=50)							
Fulani	Males	26.00	8.00	2.00	—	—	36.00
	Females	16.00	6.00	—	—	—	16.00
Mossi	Males	—	24.00	20.00	—	—	44.00
	Females	—	—	4.00	—	—	4.00
Total		36.00	38.00	26.00	—	—	100.00
Ougarcou (N=4)							
Fulani	Males	25.00	—	—	—	—	25.00
	Females	25.00	—	—	—	—	25.00
Gourmantche	Males	—	—	50.00	—	—	50.00
	Females	—	—	—	—	—	—
Total		50.00	—	50.00	—	—	100.00

the fact that they do better in the drier Sahelian climate and therefore goat herds in the north tend to be larger and more frequently commercialized. This can be seen when one looks at the breakdown of sales per livestockmen by site. Average goat sales in Tafogo, an area bordering on the Sahel, are double those for the other, more southerly sites.

The Fulani, the group most dependent on livestock for the purchase of vital grains, and the group with the largest herds, sell more cattle ($\bar{X}=3.85$) than all the other ethnic groups regardless of location. They also sell more goats and sheep, on the average, than all other groups except for the Bissa.

Gourmantche cattle owners, on the average, sell more cattle per livestockman than either the Mossi or Bissa. In fact, they surpass the mean

CHART 7-1
Cattle sold per livestockman



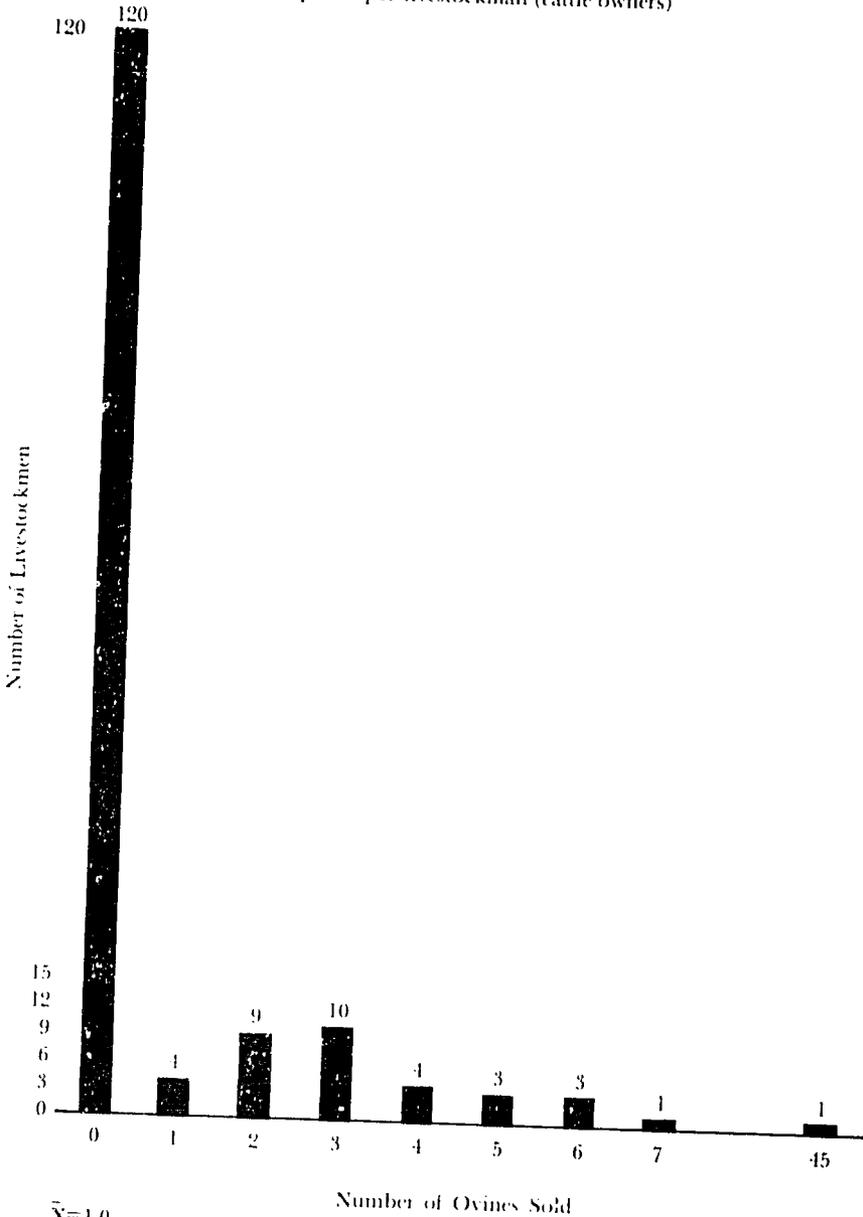
$\bar{X}=2.32$
med=1.00
mode=0.0

96 sellers

cattle sales of the Fulani in both Koukoundi and Tafogo. Gourmantche cattlemen tend to specialize in cattle production. They, unlike their noncattle-owning fellow tribesmen, sell few, if any, goats and sheep.

The Mossi average sales of 1.32 head of cattle and a little over one small ruminant (sheep and goats combined) per year. The Bissa, who generally do not commercialize their cattle, and have very small herds, average sales of only about one-third of a head of cattle per year. They also sell relatively few small ruminants.

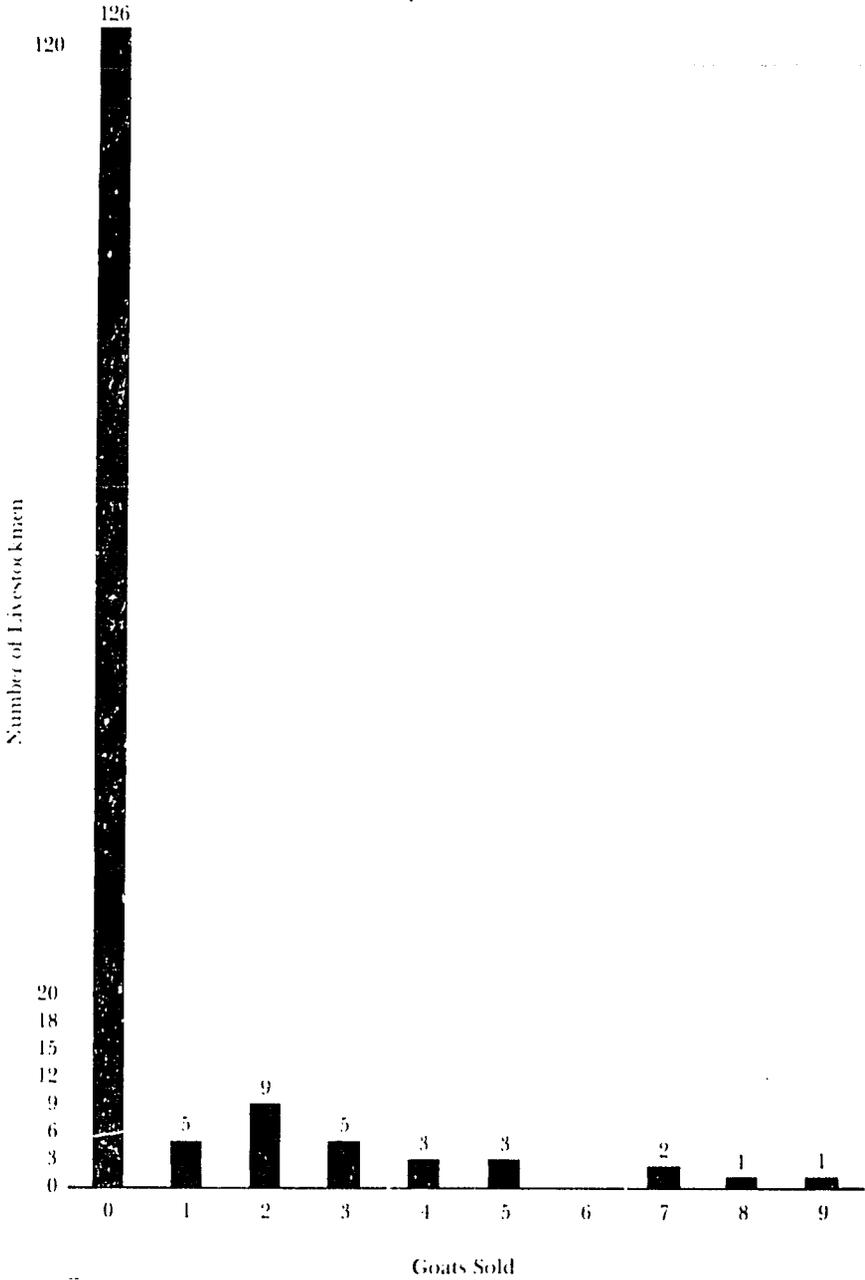
CHART 7-2
Sheep sold per livestockman (cattle owners)



$\bar{X}=1.0$
med=0.0
mode=0.0

35 sellers

CHART 7-3
Goats sold per livestockman



$\bar{X}=0.62$
med=0.0
mode=0.0

29 sellers

TABLE 7-12
Average Number of Animals Sold by Ethnicity and Area

Village	Ethnic group	(N)		(N)		(N)	
		Cattle	Livestockmen	Sheep	Livestockmen	Goats	Livestockmen
Koukoundi	Mossi	1.51	(27)	0.52	(27)	0.37	(27)
	Fulani (Peulh)	2.33	(9)	2.00	(9)	0.44	(9)
Tafogo	Mossi	1.23	(30)	0.59	(29)	0.83	(29)
	Fulani (Peulh)	2.37	(19)	1.05	(19)	1.74	(19)
Gnanguedin	Mossi	1.00	(8)	1.13	(8)	0.25	(8)
	Bissa	0.33	(15)	3.73	(15)	0.47	(15)
	Fulani (Peulh)	5.21	(14)	0.64	(14)	0.43	(14)
Ougarou	Gor mantche	2.76	(17)	0.18	(17)	0.29	(17)
	Fulani (Peulh)	5.40	(15)	0.47	(15)	0.33	(15)
Ethnicity only	Mossi	1.32	(65)	0.63	(64)	0.56	(64)
	Gourmantche	2.76	(17)	0.18	(17)	0.29	(17)
	Bissa	0.33	(15)	3.73	(15)	0.47	(15)
	Fulani (Peulh)	3.86	(57)	0.95	(57)	0.84	(57)

The sample examined here is composed only of cattle owners. Thus, the picture obtained of small ruminant sales may not be an accurate representation of the extent of their commercialization, or importance to the average farmer. Cattle owners tend to rely on sales of a few cattle to meet most of their cash needs. Small ruminants are sold to meet immediate needs for small amounts of cash. There are livestock owners who concentrate on small ruminants and own no cattle. These individuals rely on sales of these animals to meet any grain deficit. Sales of sheep and goats by small ruminant specialists can be expected to be considerably higher than those for cattle owners.

7.6 Income from Livestock Sales

The yearly cash income earned by livestock owners is considerable. This holds true not only for the Fulani, who place more emphasis on livestock than on crop production, but also for the more sedentarized agriculturalists. The average livestockman in our sample, for whom there was no missing data on the sales price of any of the three types of animals ($N=150$), earns 65,341 FCFA (\$297 U.S.) in a year (1977-78) from the sale of his stock.

The Fulani, as expected, show the highest annual earnings 91,685 FCFA (\$417 U.S.), the largest share of it from the sale of cattle. The most surprising group is the Gourmantche. Gourmantche cattle owners reported annual sales averaging 83,953 FCFA (\$382 U.S.), a remarkable figure for a group that is generally regarded as composed of sedentary farmers. These results are not an artifact of distortions introduced in the mean of a small sample ($N=16$) by a few livestockmen who made very large sales. The median income for Gourmantche cattle owners is 74,750 FCFA (\$340 U.S.). The sale of goats and sheep accounts for a very small portion of their total income from livestock.

The Mossi, who on the average sell fewer cattle than either the Gourmantche or the Fulani, still obtain a substantial sum from their livestock sales. The average yearly earnings of 48,207 FCFA (\$219 U.S.) from livestock sales is enough to provide sufficient income to offset grain deficits in a bad year. These earnings can also be used to meet many additional family needs in better times.

Only the Bissa, among the ethnic groups sampled, showed relatively small cash earnings from livestock sales. The average earnings of 19,329 FCFA (\$88 U.S.) is certainly a useful addition to annual income, but it cannot meet other than very short-term family needs for grain or other items. These low earnings are the result of generally small herds and the tendency to save livestock for social (marriage) rather than commercial purposes. Sheep seem to be the most common animal sold by this ethnic group. The sale of sheep accounts for 41 percent of their income from

TABLE 7-13
Average Yearly Earnings Per Livestockman for the Sale of Livestock*

Village	Ethnic group	(N)			(N)			Total**
		Cattle	Livestockmen	Sheep	Livestockmen	Goats	Livestockmen	
Koukoundi	Mossi	55269	(26)	1191	(27)	1315	(27)	57614 (26)
	Fulani (Peulho)	58111	(9)	1333	(9)	583	(9)	63028 (9)
Fafogo	Mossi	41690	(30)	1908	(30)	2017	(30)	45645 (30)
	Fulani	68000	(19)	3579	(19)	2882	(19)	74160 (19)
Gnanguedin	Mossi	23812	(8)	3000	(8)	331	(8)	27144 (8)
	Bissa	13117	(15)	7973	(15)	313	(16)	21997 (15)
	Fulani	123660	(14)	1489	(14)	682	(14)	125832 (14)
Ougarou	Gourmantche	78279	(17)	411	(17)	907	(15)	83953 (15)
	Fulani	116986	(14)	1133	(15)	286	(14)	99923 (13)
Ethnicity only	Mossi	41972	(64)	1746	(65)	1532	(65)	48207 (64)
	Fulani	92572	(56)	2541	(57)	1313	(56)	91681 (55)
	Bissa	13117	(15)	7973	(15)	313	(16)	21997 (15)
	Gourmantche	78279	(17)	411	(17)	907	(15)	83953 (15)

*All Prices are in Franc CFA (220CFA= \$1.00 U.S.)

**The total does not equal the sum of columns 1-3 because the N. are different.

livestock sales. This is extremely high, both as a percent and a total, when compared with that for other ethnic groups.

The income figures reported by livestockmen in our sample are not very different from those reported by Herman for Djibo. The average livestockman in our Soudanian area sample earns 65,341 FCFA (\$297 U.S.) while the average Sahelian livestockman earns 77,784 FCFA (\$354 U.S.) per year (calculated from Herman 1977, p. 20). However, when we control for ethnicity the order is reversed. Soudanian Fulani earned an average of 13,901 FCFA more than their Sahelian brothers. The Gourmauche also earned more on the average than the Djibo Fulani by 6,169 FCFA a year. The Mossi and Bissa have, as expected, lower average earnings from livestock sales than the Sahelian Fulani.

The difference in earnings between Fulani in Djibo and Fulani in the Soudanian areas cannot be accounted for solely by the differences in the number of animals sold (3.93 vs. 3.56 head of cattle). It is the average sale price, particularly for cattle, which seems to be the most important factor. The average sale price for all cattle in the Djibo market is 24,233 FCFA (\$110 U.S.) (calculated from Herman, 1977, p. 65). The comparable figure for our sample is 29,169 FCFA (\$133 U.S.). The difference in average sale price, however, is not so much a function of better markets and higher prices in the south, but of the type of animal sold. The major difference between the two areas being that in Djibo there is a tendency to sell young males while in the more southerly areas the more sedentary ethnic groups sell many more older males. The overall difference may therefore be a function of the higher prices paid for more mature males.

7.7 Seasonal Variations in Cattle Sales

There is considerable seasonal variation in the sale of cattle and in the price obtained for them. The important questions to be examined here center around times when cattle are sold, price differences from month to month, what livestockmen's perceptions of the best times to sell their cattle are, and the relationship between these three. By examining the relationship among these three variables we can determine to what degree livestockmen are aware of seasonal market variations in price and the extent to which they are able to take advantage of these variations.

Livestockmen were asked to identify the season or month when they felt it was "best" to sell cattle. As can be seen from Figure 7-1, most livestockmen feel that the time to sell cattle is between August and December. When questioned further, an overwhelming number said that at that time their cattle have eaten well, both on grasses and on crop stubble. The cattle are fat and generally in good condition. It should be noted, however, that better than one in five (22.7%) said there was no best time to sell cattle, other than when money was needed. An additional 9.3

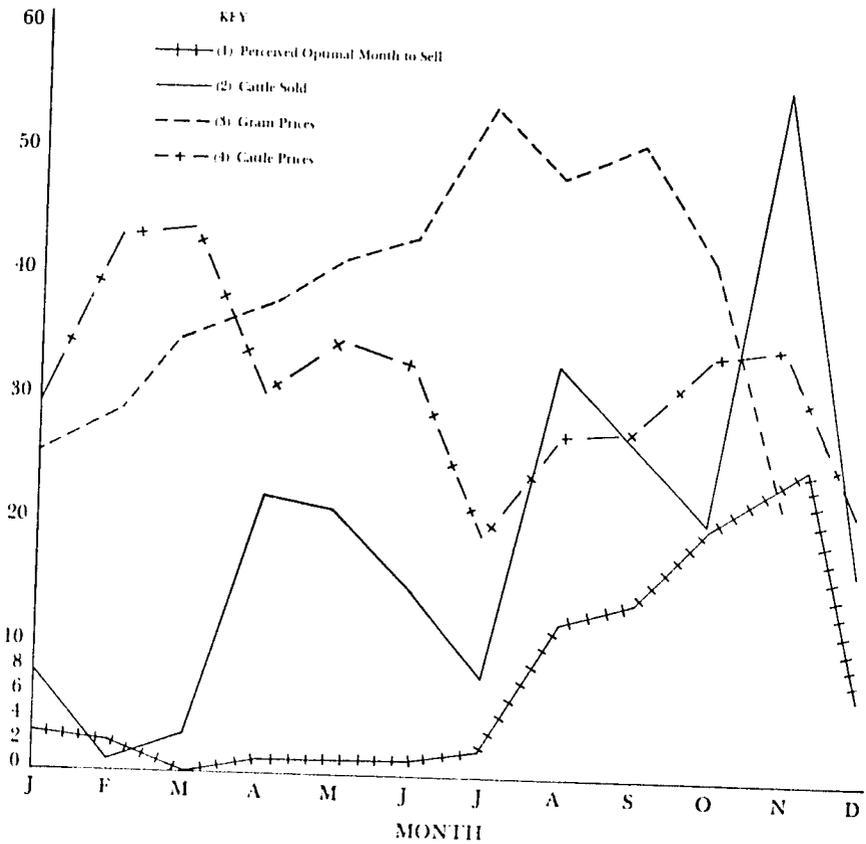


FIGURE 7-1
Seasonal Variations in Cattle Sales, Prices, Perceived Optimal Marketing
Periods and Grain Prices

percent gave the dry season (undifferentiated) as a response. This season runs roughly from November through May.

Most cattle are sold between August and November (see Figure 7-1). November is the modal month identified by livestockmen as the best season to sell cattle and the month when they are actually sold. The rank correlation between the best months to sell and actual months of the sales is .56 (Spearman's Rho). This might be even stronger if we could successfully divide up those who gave the relatively undifferentiated responses e.g., dry season, wet season, as the time of the sale.

How are these two distributions, perceived optimal selling time and actual time of sales, related to reported sales prices by the same livestockmen? Cattle prices seem to be at their highest in February and March (this is partially substantiated by Herman, 1977, pp. 102 and 104 for February; he has no data for March). This is also the period when

TABLE 7-14
Average Price Paid for All Cattle by Month (FCFA)*

	\bar{X}	N
January	29,000	8
February	42,500	1
March	43,166	3
April	30,204	22
May	34,447	21
June	32,333	15
July	18,875	8
August	27,401	33
September	27,662	27
October	33,710	19
November	34,050	58
December	21,470	17
Rainy season (Month not stated)	28,085	24
Dry season (Month not stated)	29,908	60
Total	30,155	341
Dry season	31,271	205
Rainy season	28,238	111

*Approximately 220 FCFA = \$1.00 U.S.

livestockmen report their lowest volume of sales. Quite clearly prices are adjusted in relation to the supply. Since few animals are marketed in February-March, prices are quite high. Prices decline from March through July and begin to rise again between August and late November. It is during this latter period that the largest volume of cattle sales takes place.

In general, the marketing situation seems to be based on easily understood economic factors. Both the supply and the price per animal increase between August and November because at this time cattle are in their best condition. Cattle merchants who buy at the village level also find this to be the best season to trek cattle from the village to the larger markets with minimal weight loss. Thus, livestockmen are marketing their cattle during what they regard as the optimal marketing period.

The price per head between March and July declines because the condition of the cattle during these extremely hot dry months rapidly deteriorates. Not only is there little available feed in the way of grasses, but the cattle also become very lethargic in the heat, often only eating at night or in the early morning.

The major anomaly in the marketing year appears to be the months of February and March. In February the condition (weight) of most animals has not yet significantly deteriorated. Disease becomes an important factor in the cold period of January and February, but not to as great an extent as during later months when the cattle are weak and undernour-

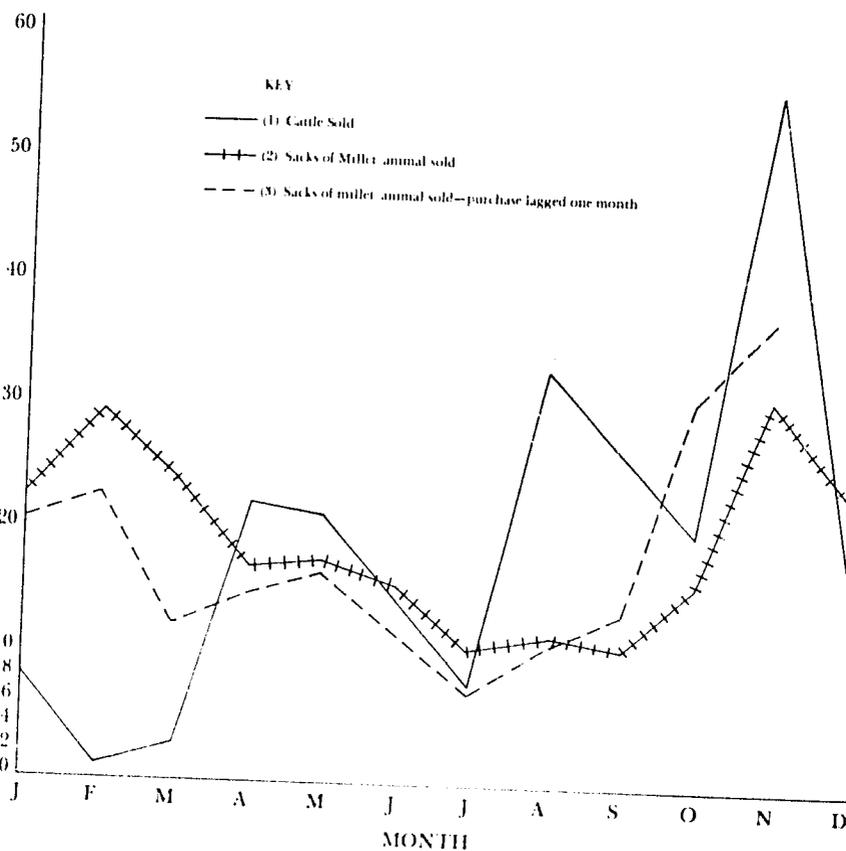


FIGURE 7-2
Seasonal Variations in Cattle Sales and Average Number of Sacks of Millet
Obtained Per Head of Cattle Sold

ished. Why then do more livestockmen not take advantage of this period to sell their stock? The explanation probably lies outside the livestock sector.

Since the principal reason for selling livestock is to purchase grain, seasonal variations in grain prices must also be examined. In general, grain prices in Upper Volta are at their lowest in January. Prices gradually rise from January to a peak in July (see Figure 7-1). In August grain prices begin to decline until they bottom out again in January (monthly grain prices presented here are figures averaged over six markets in Upper Volta). (CISS-1977, V. 2, Upper Volta, p. 33). Monthly livestock sales vary inversely with the price of grain and directly with the condition of the cattle. Since grain prices are at a minimum in January and livestock are in their best condition between August and November, livestockmen prefer to sell their animals during this period. Sales reach a

peak with the approach of the harvest in October and November, when the exact size of an individual's grain deficit becomes clear. Thus, livestockmen are seeking cash to buy enough grain to make up their own deficit at the time when grain prices are lowest.

Under these conditions the individual livestockman can very rationally maximize his own utility function by examining the relationship between the sales price of livestock and the purchase price of grain. This maximal strategy is apparently being followed by many livestockmen. February, although bringing some of the highest cattle prices, also is in the period of rising grain prices. Figure 7-2 indicates the best return in sacks of grain (millet and sorghum) per animal sold occurs in November. If the purchase of grain is lagged one month after the sale of livestock, the purchase price of grain in head of cattle is even further minimized in November. It is the period that produces the highest cattle sales.

Those who have overestimated their own grain production and/or underestimated usage, and those who experience other pressing needs for cash must sell during other, less desirable periods. It is clear, however, that many livestockmen correctly perceive the seasonal market situation. These data from the village level are supported by monthly sales figures from the large cattle markets of Djibo, Kaya, Pouytenga, and Ouagadougou (Herman, 1977, pp. 89-92). Presumably if an adequate credit system could be developed, livestockmen could purchase grain in December when prices are lowest, while withholding some of their cattle for sale in February and March when cattle prices are highest.

7.8 Factors Influencing the Sale Price of Cattle

Numerous factors exert an influence on the sale price of cattle. The independent variables to be examined here are age, sex, health, season of sale (see previous section), and the location (site) at which cattle are sold. It would be useful to first examine the distribution of the independent variables in our sample. Overall, the sample includes 341 cattle sold during 1978-79. More male than female cattle are sold (80.1% male). Most of the animals reported sold (94%) were healthy at the time of the sale. The average age of cattle sold is 5.15 years, with a range of 1 to 16 years. The average price obtained is 29,169 FCFA (\$133 U.S.), with a range of 2,500 to 67,500 FCFA.

The bivariate relationships between the independent variables and our dependent variable, price, present an interesting picture. The effect of the health of an animal on price is clear and significant. Many sick animals are sold directly to local butchers at relatively low prices. They are either slaughtered by the owner or the butcher almost immediately. Since the meat can not pass government inspection it must be sold in the

TABLE 7-15
 Independant Variables Related to Price of Cattle Sold

Independent Variable		X Price (FCFA)	N	F	p<
Health	Healthy	30,612	315	66.77	.0001
	Sick	6,105	19		
Sex (Healthy Animals)	Male	31,085	267	2.28	.14 N.S.
	Female	28,035	49		
Season (Healthy Animals)	Dry season	31,645	202	1.96	.17 N.S.
	Rainy season	29,434	104		
Site (Healthy Animals)	Koukoundi	35,139	61	4.14	.01
	Falogo	30,867	81		
	Gnangnedin	27,177	77		
	Ougadou	30,011	97		
Age (Healthy Animals)	1-4 years	22,909	134	54.76	.0001
	5-8 years	36,012	140		
	9-17 years	37,190	42		

village. The meat is sold to Animists and Christians but generally not to Muslims. The health of an animal (when it is obvious) is, before all else, a prime determinant of price. It is necessary to take this factor into consideration when examining all other relationships.

Among healthy animals, males generally bring more money than females. The margin of difference is about 3,000 FCFA on the average. This can be partially accounted for by the fact that females weigh less than males and are usually sold only when they are unproductive. This relationship is examined in depth below.

As previously discussed, season is an important factor in determining price. Since the amount of grasses and forage available to cattle varies greatly between seasons, this is a partial measure of weight. Cattle sold just after the rainy season and/or the harvest (October, November, December) are in their best condition. Those sold during the early rainy season (June, July) have not yet recovered from the hungry period (March, April, May). The average sale price for healthy animals sold in the dry season is 2200 FCFA higher than for those sold in the rainy season.

The influence of location (site) is of some importance. Only in Koukoundi are prices significantly higher than in the other sites. This is probably a function of the Koukoundi area being closer to the abattoir in Ouagadougou, about 100 km away, than the other sites.

Age is generally regarded as a proxy for weight and an important predictor of price. We will, therefore, examine this relationship in some depth. Age is our only independent variable which is continuous. The

impact of additional independent variables will be considered at the same time in the form of controls. The Pearson product moment correlation (4) between age and price for all cattle (N=330) is a rather low .27 ($P<.0001$). This explains only about 7.6 percent of the variance in price. When a control is introduced for health, the relationship between age and price for healthy animals (N=316) jumps to .42 ($p<.0001$). When a second control is introduced for sex, the relationship becomes an extremely strong .76 ($p<.0001$, N=267) for males. For females, surprisingly, a negative relationship exists ($r=-.29$, $p<.1$, N=49).

An examination of the scattergram (Figure 7-3) of age by price for healthy male animals reveals that the relationship is truly linear and not merely the result of several outliers. The equation used to predict price from age for healthy males is:

$$Y = 4116.7 (X) + 10329$$

(Price (Age in
in FCFA) years)

This simple equation explains almost 58 percent of the variance in price for male animals ($r^2=.58$). It is clear that although scales are rarely, if ever, used, cattle are sold on the basis of good estimates of weight.

When one examines the same relationship for females, it becomes obvious that there are factors other than age involved. The main factor in the relationship between age and price for males is the production of meat (weight). This increases with age. There are other intervening factors for female animals, most notable among them, productivity. For young females the average sales price increases with age for the first four years. It is at this point that the productivity of the animal in terms of both calves and milk becomes important. Very few cows aged five or six years are sold. Those few which are sold have generally proven to be sterile. The price is thus very low. Cows in the age category 7-9 years are sold at relatively high average prices. There is considerable internal variation in price in this group, depending on relative productivity. After the age of nine years there is a rapid decline in the price of cows. This follows from the decline in potential and real productivity of these animals.

The findings reported here are corroborated by the findings of Herman in his Djibo sample. This applies to both male and female animals (Herman, 1977, pp. 53-55). Thus this author has a great deal of confidence in the validity of the results of both studies. The same factors which enter into the determination of price in the Sahelian regions of Upper Volta, also affect prices in the Soudanian zone in approximately the same way.

At this point let us examine the combined impact of age, sex, and

FIGURE 7-3
Scattergram—Age and Price of Healthy Male Cattle Sold

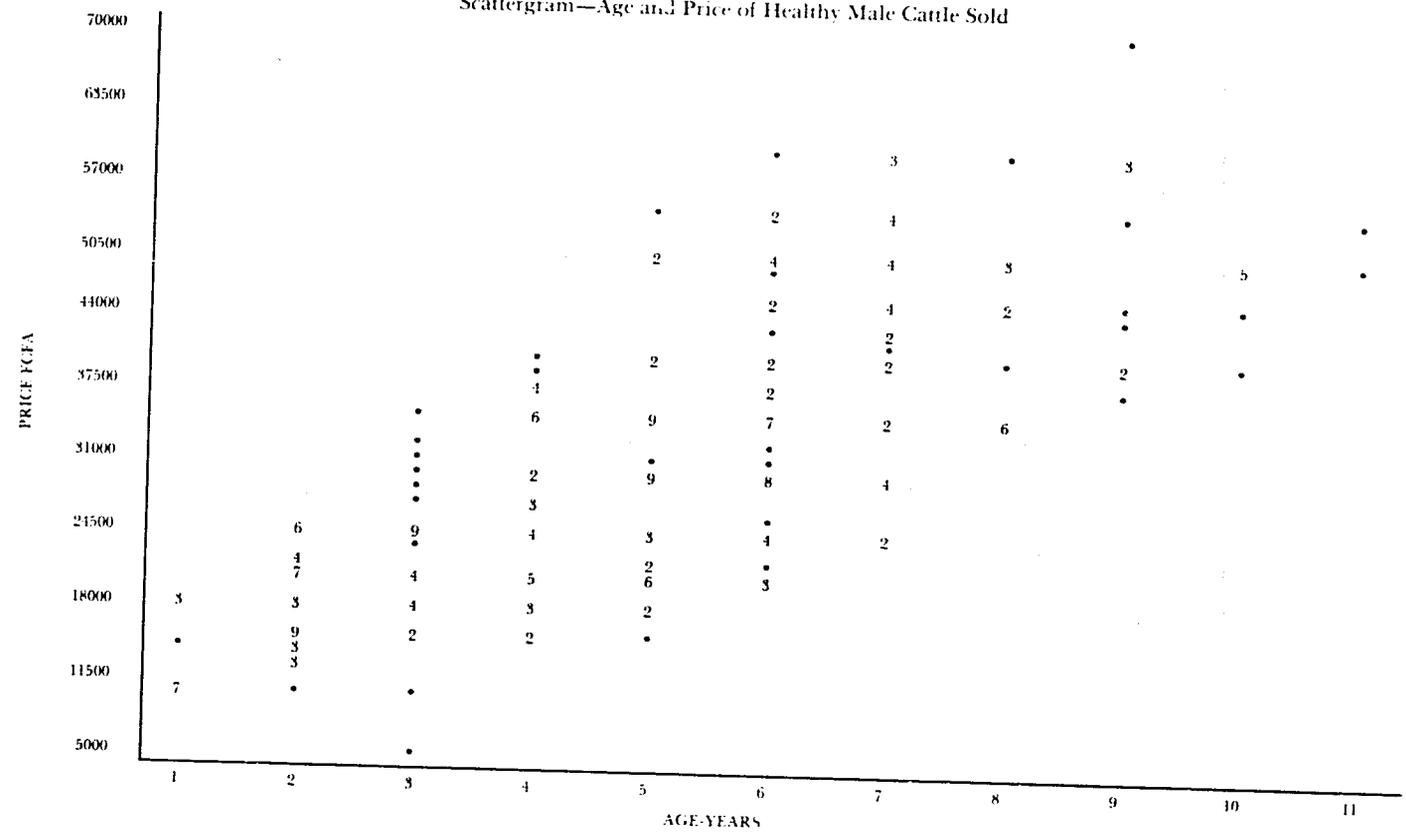


FIGURE 7-4

Scattergram—Age and Price of Healthy Female Cattle Sold

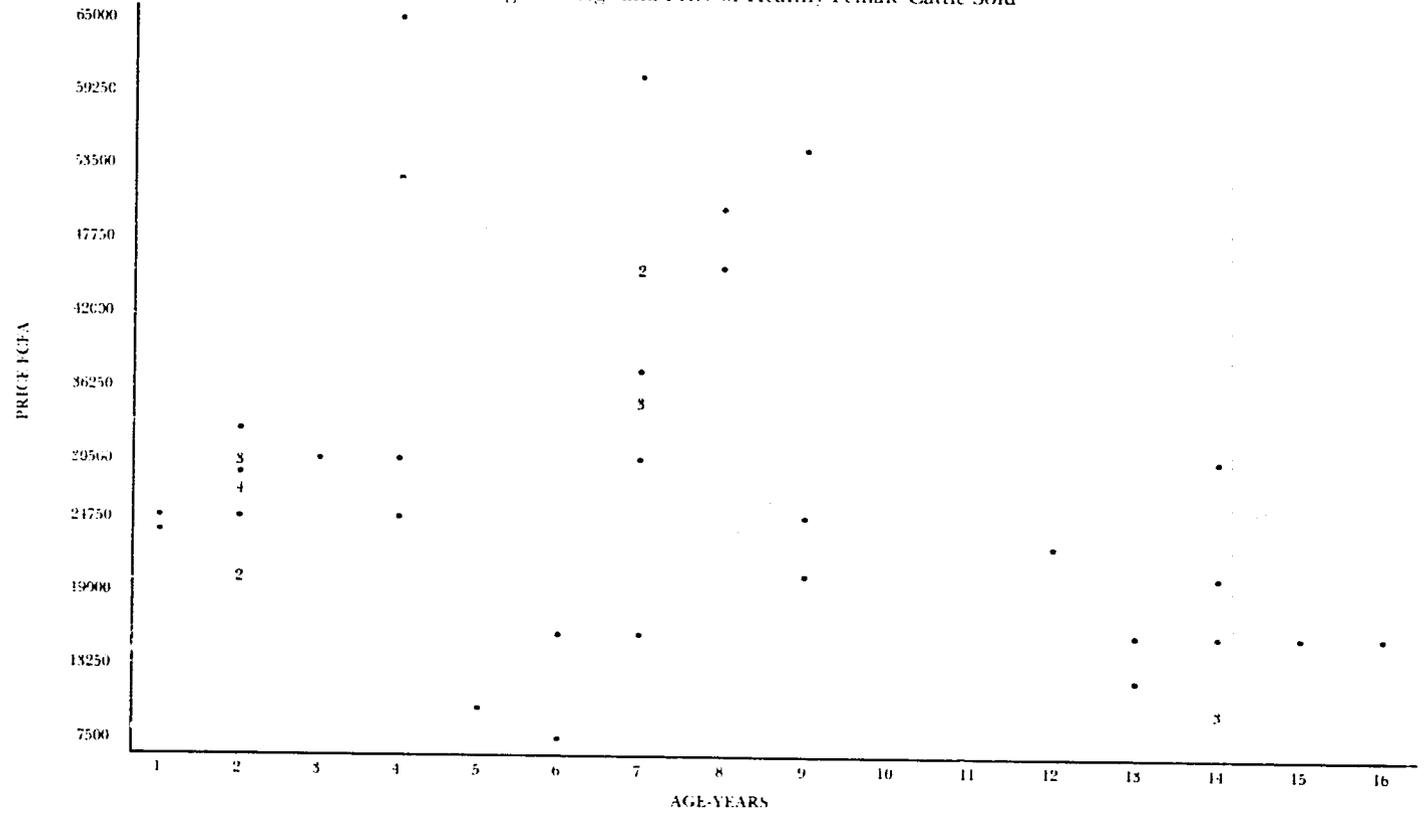


TABLE 7-16
Price of Cattle by Age, Season Sold, and Sex (Healthy Animals Only)

Age	Season	Sex	X Price (FCFA)	N
Age 1-4 yrs.	Dry	F	31,211	13
	Dry	M	21,911	70
	Wet	F	28,750	4
	Wet	M	21,174	41
Age 5-8 yrs.	Dry	F	41,333	6
	Dry	M	36,181	81
	Wet	F	22,916	6
	Wet	M	36,858	46
Age 9-17 yrs.	Dry	F	22,500	8
	Dry	M	15,500	24
	Wet	F	25,500	5
	Wet	M	58,750	2

F=58.00 p<.0001

season on cattle prices when we control for health. That is, we will look at the simultaneous impact of all these variables, but only on healthy animals.

As can be seen from Table 7-16 average sale prices differ by sex. For males, the sale price increases with age and is generally higher in the dry than the rainy season. For females prices are generally highest during the dry season and for cows in the age category 5-8 years.

7.9 Factors Associated with the Sale Price of Small Ruminants

The marketing of small ruminants, goats and sheep, is of less importance in the Soudanian areas than in the Sahel. In general, both sheep and goats in the Soudanian zone are much smaller and bring a significantly lower price than those raised and sold in the Sahel.

Among the livestockmen in our sample, the prime motivation for the sale of small ruminants is to meet small, often unpredictable needs for cash. When asked to identify the optimal months or periods in which to sell goats and sheep, 28.9 percent said there is no optimal time. One sells these animals when one has a need for cash, regardless of season.

Among those who identified a particular period, the vast majority (73.0%) felt it was best to sell small ruminants during the dry season. During the wet season goats and sheep are often tethered close to home or carefully herded in order to avoid the potential destruction of crops. During the dry season, however, they are allowed to roam free to eat as they will, and consequently their diet is better. They are also less plagued by parasites during the dry than wet seasons. Livestockmen clearly state that as a result goats and sheep are in the best condition

TABLE 7-17
Correlations—Age and Price—Small Ruminants*

	r	r ²	N	p<
Sheep	.28	.08	95	.005
Sheep—male	.51	.29	59	.0001
Sheep—female	.20	.04	33	.13 N.S.
Goats	.41	.17	82	.0001
Goats—male	.49	.24	58	.0001
Goats—female	.28	.08	17	.14 N.S.

*Pearson Product Moment Correlation.

during the dry season. Their identification of this period as the best time to sell seems logical given these considerations.

When we examine the actual time period during which livestockmen sell their sheep and goats a clear anomaly appears. While 73 percent say it is best to sell during the dry season, only 43.1 percent of the small stock they sold in 1978-79 was sold during the dry season. The distortion is greater for goats than for sheep (37.8% and 47.6% respectively of goats and sheep were sold in the dry season). The majority of all small stock sold (56.9%) is sold during the relatively short rainy season (July-October).

Apparently the Soudanian zone livestockmen sell their sheep and goats when both their cash and food reserves are at their lowest. However, when sale prices are examined the seasonal differences in prices for sheep are not statistically significant. Seasonal differences in goat prices approach the .05 level of significance. The greatest anomaly appears in the marketing of goats (see Tables 7-18 and 7-19). The strictly economic calculations that enter into the decision to market cattle do not seem to be carried over to animals whose cash value is considerably lower, most notably goats.

Next we consider the degree to which weight determines the sale price of small ruminants. In the case of the large ruminants, cattle, it has been noted that there is a strong positive relationship between age (a proxy for weight) and the market price of males, but not of females. Other criteria, most notably actual or potential productivity determine the market value of females. The same pattern holds for small ruminants.

In the case of sheep the overall relationship between age and price is a low .28 (Pearson's r). However, when a control is introduced for sex, the relationship for males is a strong .51 ($p < .0001$). For females the same relationship is only a weak .20.

For goats the relationship parallels that for sheep. Age and sale price are strongly correlated for males ($r = .49$, $p < .0001$) and weak and not significant for females ($r = .28$, $p < .14$). Females are sold on the basis of pro-

TABLE 7-18
Independent Variables Related to Price of Sheep Sold

		\bar{X} (FCFA)	N	F	P<
Sex	Male	3341	64	29.05	.0001
	Female	1861	38		
Season	Dry Season	2725	50	0.20	.7 N.S.
	Rainy Season	2867	55		
Site	Koukoundi	2212	33	6.87	.001
	Tafogo	3742	34		
	Gnanguedin	2450	10		
	Ougarou	2437	29		
Age (years)	1	1944	18	5.57	.001
	2	2371	29		
	3	3496	38		
	4	4166	6		
	5	1750	4		

ductivity rather than weight. Within any given age category for females one finds a wide range of prices. Low prices reflect unproductive and high prices productive females.

An additional significant independent variable examined here is the region or site. The sale price of sheep in Tafogo ($\bar{X}=3742$ FCFA), located on the edge of the Sahel, is significantly higher than for the other areas ($\bar{X}=2336$ FCFA). The mean age of male sheep sold in Tafogo is 2.88, while the age for sheep sold in the other sites is only 2.00 years. This age difference, possibly brought on by the drought conditions in the Tafogo area, accounts for the regional variation in sheep prices.

A significant regional distinction also exists for goats. In this instance, it is Koukoundi which shows markedly higher prices ($\bar{X}=3018$ for Koukoundi and $\bar{X}=1962$ FCFA elsewhere). Male goats sold in Koukoundi are older than those sold in the other sites ($\bar{X}=2.2$ and 1.9 yrs, respectively). This alone does not explain the average price difference. There are some of the larger Sahelian goats in the Koukoundi herds. Since the sample for this site is relatively small, the inclusion of only a few high priced Sahelian goats would serve to account for these differences.

7.10 Commercialization Strategies

It is now clear that livestock production is a very important part of the subsistence strategy of many Voltaiacs. It serves the interests of both those who emphasize livestock over agriculture (Fulani) and those who emphasize crop production, but also engage in livestock production (Mossi, Gourmantche, Bissa).

TABLE 7-19
Independent Variables Related to Price of Goats Sold

		X (FCFA)	N	F	p<
Sex	Male	2528	58	11.66	.001
	Female	1555	20		
Season	Dry Season	2132	31	3.91	.051
	Rainy Season	1910	56		
Site	Koukoundi	3018	11	3.92	.02
	Lalogo	2005	57		
	Gnangnedin	2250	1		
	Ougarou	1720	15		
Age (Years)	1	1759	28	9.46	.0001
	2	1818	32		
	3	3221	21		
	5	2250	1		

A mixed farming system can serve as a form of insurance against short term or localized drought conditions. The question being raised here is whether existing governmental programs are designed to serve these ends. Basically, the only assistance provided by the livestock service is vaccinations. Other efforts are neither well developed nor at this writing especially effective. Programs, especially animal health programs designed to serve the needs of existing livestockmen do not satisfactorily address themselves to the problem of commercialization.

Since producers are target vendors, indications are that an increase in herd size resulting from improved health measures will have only a minimum impact on increasing the offtake. A program could be implemented to assist small scale livestockmen, those with fewer than 20 head of cattle, to increase their livestock holdings. When these individuals' herds are large enough to maintain themselves, they could afford to sell more cattle annually to meet grain deficits and other needs.

VIII. THE ROLE OF WOMEN IN LIVESTOCK PRODUCTION: SOME PRELIMINARY FINDINGS

by Helen Henderson*

INTRODUCTION

The aim of this essay is to provide some preliminary descriptive data on women's role in livestock production in a rural village setting in Upper Volta. Women's involvement in crop production, handicrafts, and domestic tasks are also considered in order to provide a picture of the seasonal and daily time constraints which may affect their roles in animal production.

The research site selected was the village of Koukoundi (see Chapter 2). The estimated population of 504 (including an adjacent settlement at Sorgho) includes about 150 adult females. The village of Koukoundi is composed of two major ethnic groups and is approximately two-thirds Mossi and one-third Fulani-Rimalbe.

METHODOLOGY

Fieldwork was conducted during a period beginning October 1978 and extending through January 1979. The study entailed two major procedures: 1) systematic observation of women's daily economic activities among each of the major ethnic groups; 2) development, administration and analysis of a survey instrument. The author resided in a hut in the compound of the Fulani village chief and thus was continually involved in village life.

Included in the observational phase were a variety of research techniques such as open-ended interviews, participant observation, daily record keeping of women's work activities, and discussions with groups of neighborhood women about their problems. Numerous women from each ethnic group were interviewed, and frequently whole days were spent by the author observing and participating in agricultural and domestic tasks.

The survey instrument drew both on existing data on the village (including a household census and extensive interviews with local cattle-owning men, see Chapter 3 this book) and on information obtained dur-

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ing the observational phase. Although the women's sample was relatively small ($N=71$), the findings provide preliminary background information on ethnic differences among women in regard to their livestock holdings and work and consumption patterns.

Sample Characteristics

Using a census list of 64 household heads and the adult males and females living with them, a stratified random sample was drawn from the total population on the basis of ethnicity, and within the Mossi group, religion, (i.e., animist and Muslim). Of the total sample of 71 women, 34 were Mossi, 11 Rimalbe, and 24 Fulani; an additional two who identified themselves as Setba and Harga were classed as "other."

The majority of our sample was Muslim (73.2%, $N=71$) including all 24 Fulani, all but one of the 11 Rimalbe, and 16 of the 34 Mossi women. Eighteen Mossi women identified themselves as "Animists" and one Rimalbe woman said she was a "Catholic". None of the women had attended a western-type school. Although almost all of the Fulani and Rimalbe females had received some formal religious training, less than half of the Muslim Mossi had done so.

Fifty-eight out of the 71 women interviewed were between the ages of 20 and 50 years. Most women interviewed were either first or only wives (71.8%, $N=71$), while 20 were second or additional wives (28.2%). Almost half of all women interviewed (46.5%) said they lived in single-wife households. Rimalbe and Fulani had the highest proportions of such single-wife households, 63.6% and 54.2% respectively.

These village women had very little first-hand contact with government agencies or extra-village influences. Women said that although government agents visited the village occasionally, these officials "only spoke to the men". Only one woman in our sample said she had talked with a government agent during the past year, and one felt that she had received some help.

Very few Koukoundi women have lived outside Upper Volta; one woman said she had lived in the Ivory Coast, another in Ghana. A slightly larger number, eight, have spent some time in a large city such as Ouagadougou, Bobo-Dioulasso or Abidjan. However, nearly half (48.5%) of the women reported that it was not uncommon for their husbands to work in large cities in Upper Volta or abroad.

THE SOCIAL SETTING

Fulani Women

The Fulani are highly individualistic and tend not to think in terms of community efforts. According to Riesman (1977), cooperation for the common good hardly exists, though reciprocal exchange of help on a

one-to-one basis is frequent. If one turns to the patrilineage as a possible organizational base for women's community efforts, one finds there are not many routine occasions that call the lineage together. Male members of the same patrilineage have in common certain vaguely defined territories, herd their cattle together at times, and tend to live in minimal clusters near closely related members.

Within the compounds or groupings of compounds, there is no female head of women as defined by kinship or marriage relations. Even among the wives of one man, none can tell another what to do. Riesman, writing of the Fulani of Djibo (1977), notes that the influence a woman can have on the community cannot be related to her social structural position (her birth order or prestige of her family), but depends entirely on her personality. Although women help each other, each woman works primarily by herself with the aid of her children. This is not to say, however, that Fulani women are uninterested in social activities. Within Koukoundi, there is a high degree of kin based interaction among the women. Visits are frequent, especially to the compounds of parents. Visiting does not appear to be strongly work-oriented.

The neighborhood is the major communication network for the Fulani women. Even when several Fulani compounds are located relatively close to one another it is hard to mobilize these women on the basis of common interest. Most neighborhoods also include Mossi women, with whom the Fulani appear to have little in common socially.

Religion might be viewed as a possible organizational link. Islamic rites, especially a child's baptism, bring women together—in particular those women of the mother's patrilineage. Marriage, funerals, and the "Doğa" ceremony (which celebrates a youth's new ability to read and write the Koran), can mobilize almost all the Fulani women in Koukoundi. Such ceremonies, however, occur only occasionally. Women pray daily, but individually, rather than in prayer groups (even at festival times).

The market, though it attracts Fulani women as sellers and buyers, does not provide an organizational basis for them. Women come individually and sporadically although, they do often sit in clusters of related women.

Rimalbe Women

Possibly because of their memories of past oppression by the Fulani, Rimalbe women appear to be a rather close-knit group. The patrilineage does not have the same meaning for the Rimalbe as it does for the Fulani, even though they take the same family name as their former masters and are, to some extent, attached to their patrilineal segments. Fulani men do not marry Rimalbe women, and many of the resident women have come from Rimalbe communities outside Koukoundi.

These women participate in the same patrilineage-wide activities as do Fulani women. They interact daily with Fulani women on a friendly basis, pounding millet together for example. Some of the older women appear to perform certain menial tasks for Fulani women, presumably for pay. The neighborhood network of the Rimalbe women overlaps with that of the Fulani patrilineage segments, but also includes somewhat rare interaction with Mossi women. Islamic religious ceremonies bring together the Rimalbe and Fulani women. Neither group participates in mixed prayer groups. Some Rimalbe women attend the market on a fairly regular basis. Although Fulani women told us they could easily work with Rimalbe women, the Rimalbe women expressed concern that, in any community-wide plan for women, the Fulani women would try to exert undue influence by virtue of their high status vis-a-vis their former slaves.

Mossi Women

Among the Mossi, the patrilineage forms a closely-knit group, perhaps more so among the Animists than among the Muslims. The patrilineal extended family with some members residing together tends to be larger than that among the Fulani or the Rimalbe. Agricultural activities are extremely important. Mossi wives within a compound and neighboring patrilineally related compounds form an especially tight communications network. The wives' collective activities can be organized by the "Paquiema" (Skinner, 1961, refers to the "Pughtiema") or head of the lineage wives. This leader does not act without the authorization of the males of the patrilineage, but her influence is considerable.

Neighborhoods often consist of patrilineal segments. Where neighboring groups are not patrilineally related, the communication network is less effective, unless religion (specifically Islam) provides the linkage. With the Mossi Muslims, religion unites women from unrelated compounds. It does not, however, unite Fulani Muslim women with Mossi Muslims. While both Animist and Muslim women participate primarily in their own group's religious activities, some ceremonies, especially funerals of patrilineally related individuals of different religions, bring the two groups together. Muslim Mossi women's mutual ties are further strengthened by joint prayer activities. The market is an additional link between Mossi women. Women from large extended families tend to sit together, selling similar merchandise. This common activity also strengthens their communication network.

WOMEN'S ACTIVITIES IN THE LIVESTOCK SECTOR

Cattle

An important task of this research has been to ascertain to what degree Mossi, Fulani, and Rimalbe women "have" livestock and what rights

they have in livestock. The rights of women in such property are frequently closely related with those of other family members and involve problems of acquisition, inheritance, divorce, sales, and general maintenance of the animals. Of the ethnic groups under consideration, Fulani women have the greatest interest in cattle.

Fulani women in Koukoundi are in general reluctant to talk about ownership of cattle, especially when they are being interviewed in the presence of other village women. Frequently they deny that they have any cattle. When questioned further, in private, they sometimes admit that they have animals with their husband's, father's or sons' herds. Others claim that once a woman has sons, her cattle belong to them. These reports are consistent with data gathered on the Fulani in other regions where women are said to hold cattle for their children, especially their sons (Hopen, 1958). In our sample, only seven Fulani women and one Rimalbe said that they currently own cattle (Table 8-1). Some said they had been given cattle in their youth or at marriage, but had left them in the herds of male relatives or sold them in order to buy jewelry. A woman is considered relatively rich if she has six head of cattle. There appears to be no clear relation between being married to a man with large family herds and having cattle oneself. Wives of the largest cattle owners in Koukoundi reported having few if any cattle. Three-fourths of the cattle-owning women said that the source of their cattle was relatives, while one-fourth listed their husbands. None of the women interviewed said they had purchased cattle themselves, although a number of women from the village as a whole (15.5%, N=71) and half of the Fulani women said they would be interested in buying cattle as an investment if they had sufficient money.

Gifts of cattle are usually given to women at the time of Muslim baptism and marriage. Such gifts are not mandatory. Many Fulani women apparently do not receive cattle at either of these ceremonies, probably because their parent's herds are not large enough to afford the loss. In our sample, nine Fulani and one Rimalbe said they had received gifts of cattle in their youth, but only three Fulani claimed to have received them at marriage.

Gifts of cattle at marriage appear to be less frequent here than in other Fulani areas (Stenning, 1959; Dupire, 1963). It is also much more likely for a male child to receive gifts of cattle at baptism than it is for a female, though in accord with Islamic law both sexes should receive animals. Our survey indicates that cattle which have been given initially to a daughter may later be taken away from her and given to a newborn son at the latter's baptism.

Rules governing disposition of cattle through sale, at divorce, and at the death of the owner shed some light on the question of the limitations

TABLE 8-1
The Ownership and Sale of Livestock by Women (Percent)

	Mossi N=34	Fulani N=24	Rimalbe N=11	Other N=2	Total N=74	X ²	p<	Cramer's V.
Have livestock yourself	58.8	66.7	90.9	100.0	67.6		N.S.	
Own goats	35.3	20.8	45.5	50.0	32.4		N.S.	
Sold goats last year	23.5	1.2	9.1	50.0	15.5		N.S.	
Own cattle	0.0	29.2	9.1	0.0	11.3	12.31	.0064	.416
Sold cattle last year	0.0	8.3	0.0	0.0	2.8		N.S.	
Own sheep	5.9	4.2	18.2	0.0	7.0		N.S.	
Sold sheep last year	2.9	0.0	9.1	0.0	2.8		N.S.	
Own poultry	58.8	41.0	81.8	100.0	57.7	6.63	.0845	.305
Sold poultry last 2 years	38.2	33.3	45.5	50.0	38.0		N.S.	

on women's ownership of cattle. A woman wishing to sell cattle must ask permission from her husband or the man in whose herd the animal is kept. No one in the village, however, could remember a case of a Fulani man denying his wife or female relative the right to sell her cow. A woman cannot sell the animal directly, but only through a man. She is not thereby committed to paying anything to the seller, though she may give him a gift. The money from the sale is hers to spend as she wishes, but she will probably discuss its use with her husband.

At the time of their marriage many women sell their baptismal cow and use the proceeds to purchase personal jewelry. After marriage, a woman rarely sells her cattle except to purchase medicines for illness, or millet for her family in times of famine. Only two women interviewed said they had sold cattle during the previous year, and only one other woman indicated that she had sold cattle in the past during a famine period.

Men claim that they can, on occasion, sell one of their wife's or daughter's cows for the good of the family. They should, under these circumstances, inform the woman. Apparently, cases have appeared in the courts of Kongoussi (the nearest administrative center) of women accusing their husbands of selling their cattle for private purposes without obtaining the woman's permission. The chief of Koukoundi, however, knew of no such cases in his village.

Women sometimes prefer not to bring all their cattle with them when first married, but rather to wait until their marriage bond is made more secure by the birth of children. When a woman with children divorces, she leaves most of her cattle with her husband's herd for the children's future use. If a woman has no children, at the time of a divorce she takes with her all cattle that she brought into the marriage or obtained by purchase or through gifts from her natal family. Cattle given to her by her husband, however, must remain with the husband's herd unless the husband forces the woman to leave against her will and without justification. Allocation of the offspring of the woman's cows is governed by the same rules (Delgado, 1978; Dupire, 1963).

When a childless woman dies, any cattle she owned are divided among her father, brothers and possibly her sisters. If children survive her, they inherit their mother's cattle, the greater number going to the sons. Theoretically, women may also inherit cattle from their fathers. Women's inheritance rights are to some extent governed by Islamic law, but from a Fulani woman's point of view, it often seems that *only* sons inherit cattle. (For another Fulani area, Hopen (1958) has discussed measures men take to avoid leaving many cattle to their daughters). Childless widows may be given cattle from their deceased husband's herd.

The chief of Koukoundi said that since women did not take care of

cattle, they could not be the clear owners of them. All of the cattle-owning women interviewed said their animals had been left in the herds of husbands or male relatives. When questioned on the breeding and marketing of cattle, women did not appear to be as well informed as their husbands. Women are, however, familiar with many general facts about cattle. Three-fourths of the Fulani women interviewed said they went with their husbands in transhumance each year.

Women do not pay much attention to the diet of their cattle leaving this matter to the youths guarding the animals. A woman may, however, give her milk cows millet stalks and salt. She will carefully tend to a sick animal, even to the point of giving it millet from her husband's granery.

Six of the seven Fulani women interviewed who admitted owning cattle said that their animals were vaccinated each year. Vaccinations, medicines, and feed supplements are, however, paid for by the men. Half of the cattle-owning women in our sample reported losses of cattle during the past year.

For the Rimalbe and Mossi ethnic groups in the village, little need be said concerning women and the ownership of cattle. A few Rimalbe have cattle, usually received as gifts from parents. The rules of inheritance and allocation in case of divorce are similar to those for the Fulani. For the Mossi women in the village, there are no known cases of women owning cattle. Although it is rare in Koukoundi for non-Fulani women to own cattle, 38.2% of the Mossi women and 51.5% of the Rimalbe said that the best animals for women to purchase were cows since they gave milk.

Goats and Sheep

The majority of the women interviewed keep livestock (Table 8-1). Livestock owners make up over 50% of the women of each ethnic group. Proportionately the Rimalbe are the most heavily represented. Taking ownership of small ruminants first, more women own goats than sheep. A larger percentage of Rimalbe women own goats than do Mossi or Fulani women. Women between the ages of 20-49 made up the largest age category of livestock owners. Half (N=18) of the women between the ages of 40-49 owned goats compared to approximately a fifth (N=23) of those between 20-29. This difference occurs because that middle-aged women have had more time to establish themselves financially, than have younger women. No women indicated that they owned animals other than cattle, sheep, goats, and poultry.

Although some goats and sheep are acquired by women as gifts from parents and spouses, many are purchased by the women themselves. Of the six women who said they owned sheep, four purchased the animals themselves. Of the 23 women sampled who own goats, nine said they

TABLE 8-2
 Animal Health
 Animal Losses and Vaccination* (Percent)
 (Women Owners)

	Mossi N=34	Fulani N=24	Rimalbe N=11	Other N=2	Total N=71	P<
Lost animals past year	44.1	50.0 N=18	15.5 N=11	50.0	N=71 46.5	N.S.
Lost cattle last year	0.0	22.3 N=24	9.1 N=11	0.0	N=63 7.9	N.S.
Vaccinated cattle each year	0.0	25.0	9.1	0.0	N=69 10.1	N.S.
Lost sheep last year	N=32 9.4	N=18 5.6	N=11 18.2	0.0	N=63 9.6	N.S.
Lost goats last year	N=32 28.1	N=18 22.3	N=11 36.4	N=2 50.0	N=63 28.4	N.S.
Vaccinated small ruminants	N=33 6.1	N=24 4.2	N=11 9.1	0.0	N=70 5.7	N.S.
Lost chickens last year	N=32 37.5	N=20 35.0	N=11 18.2	N=2 50.0	N=65 33.8	N.S.

*The number of respondents, where different from the total N, is listed above the percent.

bought them themselves. The majority of the others received them as gifts from their husbands.

Animal purchases by Fulani women are frequently financed by the sale of milk. Rimalbe and Mossi women finance livestock purchases by the sale of agricultural produce and cotton thread. In fact the purchase of livestock, especially goats and sheep, is infrequent. Nonetheless, almost half of the sample (47.1%, N = 68) recommended the purchase of livestock for a woman who wants to invest her money.

All groups of women indicated that they consider small ruminants a good investment against a time of famine. Mossi women emphasize the importance of being able to sell animals to purchase millet during the difficult time at the beginning of the rainy season. Over half of those interviewed, however, said they did not know when was the best time to sell animals, and only 34% specified the dry-season months as the best time for animal sales. Women stress that although they might sell an animal to buy millet in a time of famine, the grain obtained would be used by the entire family including co-wives and their children. This at least is the cultural ideal.

The most commonly sold small ruminants are goats. Mossi women are the most common sellers. Few sheep are sold by women. Only one Mossi and one Rimalbe woman said they had sold sheep during the past year.

Major items purchased through the sale of animals are clothing, condiments, and millet (Table 8-3). None of the women interviewed said that they used the money earned from the sale of goats and sheep to finance their business, pay taxes, or sacrifices. None said they had sold the animals because their husbands had asked them to.

Almost all of the women interviewed said that their husband's permission was necessary for them to sell livestock. Men rarely refused, however. Only one woman said that she had sold animals herself, while 24 said their husbands had sold the animals for them. In about half of the cases money from the sales is primarily reserved for the owner. In most other cases the money is shared by the owner and the actual seller (usually the husband). Contrasting the women from different ethnic groups, the Rimalbe had the largest percentage of women saying they kept the money themselves (80%), followed by the Mossi (41.2%) and Fulani (33.3).

Inheritance rules for sheep and goats vary among the different ethnic groups. For the Fulani, the same rules apply to small ruminants as to cattle. Although a childless woman's goats are more likely to remain with her husband than are her cattle, she may distribute some to her brothers if she wishes to. If a woman has children, all the goats and sheep go to them. A boy who inherits animals may decide to sell them and purchase a more prestigious cow with the money. Rimalbe appear

TABLE 8-3
For What Reasons Have You Sold Animals? (Cattle, Sheep, Goats) (Percent)*

	Mossi N=34	Fulani N=24	Rimalbe N=11	Other N=2	Total N=71	χ^2	p<	Fisher's V.
Sold to buy clothing	23.5	0.0	9.1	50.0	14.1	8.79	.0321	.352
Sold to buy condiments	17.6	0.0	0.0	50.0	9.9	9.77	.0206	.371
Sold to buy millet	8.8	8.3	0.0	0.0	7.0		N.S.	
Sold because animal sick	2.9	8.3	0.0	0.0	4.2		N.S.	
Sold to buy jewelry	2.9	0.0	9.1	0.0	2.8		N.S.	
Sold for gifts	2.9	0.0	0.0	0.0	1.4		N.S.	
Sold to buy medicines	0.0	8.3	0.0	0.0	2.8		N.S.	
Sold to get money to visit relatives	0.0	0.0	18.2	0.0	2.8		N.S.	
Sold to buy pois	5.8	0.0	0.0	0.0	2.8		N.S.	
Buy meat	0.0	0.0	0.0	50.0	1.4		N.S.	

*Multiple responses were possible to this question.

to follow the same inheritance rules as the Fulani. In both cases, female children inherit fewer animals than do male children. At divorce, if a woman has children, she leaves the animals for them. If childless, she takes the animals with her, or sells them.

Among the Mossi, if a man has animals but no children, the family of the deceased gives some to the widow, and keeps the remainder. If a widow wishes to leave the concession of her deceased husband, she receives no animals. If a woman with no living children dies leaving animals, they are distributed between her own family and her husband, the latter taking the larger share. If a woman has children who survive her, they divide the livestock, the larger portion going to males. Some may also be given to the family of the father. In case of divorce, a woman is expected to leave her animals for her children.

Women devote little time to the care of goats and sheep. Approximately three-fourths of the women who have animals leave them in the care of their sons (76.9%, N = 26). When their animals are located in the concession, however, women feed them millet stalks, millet, and bean and peanut hay which they have grown themselves. Sheep graze mostly in the bush. Goats more often than sheep are kept near the compound since they are thought to get lost more easily than sheep. During the rainy season, small ruminants, especially goats, must be constantly herded to protect the growing crops. A lactating goat will be staked in the grass near to a woman's house and cared for by her (especially among the Fulani).

All groups of women expressed concern at the loss of considerable numbers of small ruminants through disease. Of those women interviewed, six said they had lost sheep, while (28.6%) had lost goats (Table 8-2). Ten of the women who lost goats were Mossi. One Setha woman living in Sorgo claimed to have lost 19 goats from diarrhea (a symptom actually associated with a number of diseases). Excluding this woman, the average loss cited was between three and four animals with a mode of three.

Vaccination of small ruminants was not common. Only four women said that they had done so in the last year (Table 8-2). Ethnically, two of the women who vaccinated were Muslim Mossi, one Rimalbe, and one Fulani. When asked why they had not vaccinated their animals, almost half of the 23 women responding said that their animals had been given pills (anti-parasite treatments), slightly less than one-fourth thought the vaccine was unnecessary, and a few said they simply did not know about a vaccine. Frequently women believed that pills and vaccine would have the same protective value.

Vaccines and other veterinary medicines are most often paid for by the husband. Seventy-one percent of those responding said their husbands

should pay for the vaccine and only 15.7 percent (N=70) said they would pay for it themselves. Some ethnic variations appear here. Only one Fulani woman was inclined to pay for the vaccine herself, but seven of the Mossi and three of the Rimalbe said they would do so themselves.

Village women indicated interest in acquiring more small ruminants, but when asked the best animal for women to purchase, 45.1 percent of the women cited cattle, as opposed to 26.7 percent mentioning goats and sheep. Possibly these figures relate to women's greater familiarity with the health problems of small ruminants and their fears that such animals will not survive. Because of their cost, even small animals cannot be easily replaced.

Poultry

Over half of the women interviewed said they owned chickens (Table 8-1). Ethnic differences are of interest here since the percentage of Rimalbe women owning poultry is almost twice as high as that of the Fulani. Mossi women ranked in the middle in regard to chicken ownership. Of the women who said they owned poultry, 66.8 percent (N=41) were between the ages of 20-49. Somewhat more Muslim Mossi (75%, N=16) than Animist Mossi (41.4%, N=18) owned poultry. Approximately three-fourths of the female poultry owners bought the animals themselves. Inheritance rules and rules governing allocation of chickens at divorce follow those described for goats and sheep. No women owned guinea fowl.

The majority of the women poultry owners keep their chickens themselves, though many (41.5%, N=41) said their husbands kept them. Somewhat higher percentages of Fulani and Rimalbe entrusted their chickens to their husbands than did the Mossi.

Although chickens are not a major sale item, 58 percent of the women said they had sold some during the last two years (Table 8-1). Almost half of the respondents claimed to have sold chickens at earlier times. Somewhat more Muslim Mossi had sold chickens in the past two years than had Animist Mossi (56.3% vs. 22.2% respectively). Women between the age of 30 and 49 made up 62.9 percent of the total number of women selling poultry. Reasons given for selling poultry did not vary significantly among the different ethnic groups. Common purchases made with the proceeds are condiments (24.5%, N=71), clothing 7%, N=71), kola (12.7%, N=71), and tobacco (9.8%, N=71).

Most women feel that it is necessary to obtain the permission of one's husband prior to selling poultry. However, more than a third of the Mossi respondents (36%, N=25) qualified their responses by indicating that while such permission was desirable, it was not mandatory.

Unlike the situation with cattle and small ruminants, the majority of

women who own poultry said they had personally sold chickens. Women as sellers are especially common among the Fulani and Rimalbe. Eight out of nine Fulani and five out of six Rimalbe women said they had sold poultry themselves. For the Mossi, husbands and sons made up half of the sellers.

Money from the sale of poultry is most commonly kept by the woman herself. Mossi, more than women of the other ethnic groups, report that they keep the money themselves, even though they usually do not participate in the sale of poultry. One-third of the Fulani respondents and one-half of the Rimalbe say they share the money with their husbands. If these data accurately represent the wider population, it appears that Mossi husbands are asked to sell their wives' poultry more often than are Fulani or Rimalbe men, but share less in the proceeds. Men in all ethnic groups state that they can sell a wife's chickens (like her other animals) without her permission, but must inform her soon afterwards.

Chickens rank below cattle but above goats and sheep as an investment a woman would suggest to a female friend with some extra money. Despite the high mortality rate for chickens, women often speak of their desire to buy poultry to give to their children as gifts. Clearly, they are the most affordable type of animal investment. Although men raise guinea fowl, women are ritually prohibited from doing so.

Animal By-products

Cows' Milk—Virtually all Fulani women, some Rimalbe women, and only a few Mossi women milk cows (Table 8-4). Male Mossi cattle owners either do the milking themselves, or, if they have Fulani herdsmen, the latter's wives do the milking. If it is in sufficient quantity, part of the milk may be sent to the owner; this is uncommon, however.

Most Fulani women sell milk, but few if any women from the other ethnic groups considered here do so. (Table 8-4). Milk is clearly the major source of a Fulani woman's disposable income. The source of this milk is primarily the men's cows, which are allocated to the wives, each wife having her own allotment. The first wife may have a few more cows to milk than the others, but not necessarily. If one woman's cows multiply while another's do not, this is simply regarded as the latter's misfortune. Re-allocation of cows is not favored, but clearly a man must see that each wife has a reasonable supply of lactating cows. If one wife has many cows and another wife has many children but few cows, men say that the female children of the latter woman can help milk the cows of the former.

Women may also milk cows belonging to their children until the time of the latter's marriage. If a daughter leaves her cow in the herd of her father, her mother will continue to milk it, setting aside a portion of the

TABLE 8-1
The Use and Sale of Animal By-Products by Women (Percent)

	Mossi N=34	Fulani N=24	Rimalbe N=11	Other N=2	Total N=71	N ²	p<	Cramer's V
Milk cows	0.0	100.0	27.3	0.0	38.0	61.741	.000	.932
Sell milk	0.0	95.8	0.0	0.0	32.4	66.624	.000	.968
Make soap	0.0	100.0	27.3	0.0	38.0	61.741	.000	.932
Usually sell soap	0.0	8.3	0.0	0.0	2.8		N.S.	
Make butter	0.0	95.8	18.2	0.0	35.2	59.62	.000	.916
Usually sell butter	0.0	0.0	0.0	0.0	0.0		N.S.	
Make yogurt	0.0	20.8	18.2	0.0	9.9	8.04	.0450	.336
Usually sell yogurt	0.0	33.3	0.0	0.0	11.3	17.65	.0005	.498
Milk goats	2.9	4.2	72.7	50.0	15.5	35.78	.000	.709
Eat chicken eggs	14.5	0.0	0.0	0.0	7.0		N.S.	
Eat guinea fowl eggs	97.1	95.8	100	100.0	97.2		N.S.	
Sell eggs	5.9	0.0	0.0	0.0	2.8		N.S.	

TABLE 8-5
 What Have You Done With Money Earned from Sale of Milk?
 (Fulani Women Only) (Percent)

	Fulani N=24
Purchase condiments	29.2
Purchase jewelry	79.2
Purchase cloth	20.8
Purchase millet	8.3
Purchase other	12.5

earnings for her daughter's use. A liter of milk sells for about 65 FCFA (35 to 40 cents U.S.) in the rural market.

Fulani and Rimalbe women who milk cows allocate part of each day's milk to their own nuclear families. In the rainy season when milk is plentiful, more milk is sold than is retained for the household. For example, if a woman gets six liters of milk, she may sell four during the rainy season, keeping two liters for a "small" family of six persons. During this season a woman may hope to get one and one-half liters per lactating cow per milking (morning and evening). Beginning in December and January (early dry season), she can expect less than a liter from three cows together, milking only once in the morning.

When asked of uses for milk other than family consumption, almost all of the Fulani women (but none of the Rimalbe women) say that they sell it (Table 8-4). Again, almost all the women who milk say that they also make soap and butter. A few also make yogurt. Soap and butter do not appear from our observations to be sold in great quantities, but are made primarily for home use (Table 8-4). Yogurt is sold by one-third of the Fulani women sampled.

With the money from the sale of milk and milk by-products, Fulani women frequently purchase jewelry, condiments, cloth, and millet (Table 8-5). No cases were noted of a Fulani husband refusing to permit his wife to spend her earnings from the sale of milk as she wished. Men say, "The cows are mine, but the milk is hers."

Since most Mossi men do not have cattle, their wives are almost entirely dependent for fresh milk on purchases from the Fulani. Fresh milk is usually bought in small amounts, primarily for consumption by children (41.7%, N=48) and other family members (47.9%, N=48).

Fulani women go on daily rounds through the Mossi and Rimalbe compounds in order to sell their milk. Better than four-fifths of the Rimalbe and half of the Mossi said they purchased fresh milk with some frequency. A considerable number of women use money from the sale of agricultural produce and crafts to purchase milk from the Fulani.

During the past year women in Koukoundi have begun purchasing dry milk and some have been reselling it in the form of yogurt and fresh milk. Nearly half of the overall sample said they had purchased dry milk. Differences were not marked between ethnic groups, but it may be noted that Rimalbe women constitute the largest number of purchasers, followed by Fulani and Mossi. When women were questioned about the frequency of their purchases of dry milk, however, only one Fulani woman said that she purchased it often. A little over 17 percent of the 69 respondents said they bought it "sometimes", while 26.1 percent said "rarely" and 55.1 percent said they never bought it. Dry milk is purchased primarily for children and family members, not for resale. Only two Fulani women admitted selling it, mixed with whole milk, as yogurt.

Dry milk is being given away as part of a well-baby clinic effort in the nearby village of Sabse. It is being sold in the Sabse market by local merchants. Most Mossi women prefer to buy small quantities of Fulani cow's milk since the larger dry milk supplies are more expensive in the short term. To what extent Mossi and Rimalbe women will bypass Fulani vendors by direct purchase of this new commodity remains uncertain at this time.

Although Rimalbe women (like Fulani women) milk the cattle assigned to them by their husbands, the fact that 81.8 percent (N=11) of them purchased fresh milk suggests that often Rimalbe husbands may not have sufficient cows to supply milk for their families. Rimalbe women in Koukoundi do not sell milk, explaining that they do not have sufficient quantity. They do make soap and butter from milk, but rarely sell it.

Goat Milk—Rimalbe women milk goats and give the milk to their children and families more often than do the Fulani or the Mossi (Table 8-4). It is likely that more Fulani women milk goats than were willing to admit it. For example one Fulani woman who denied milking goats was later observed doing so. Goat milking by the Mossi appears to be very rare.

Eggs—Most women in the village do not eat chicken eggs for fear that the eggs cause difficult childbirth (Table 8-4). Apparently this prohibition is not rigidly enforced. The few women interviewed who ate eggs in their natal households have continued to do so after marriage. Although women are prohibited from raising guinea fowl, almost all of the women in our sample eat guinea fowl eggs (Table 8-4).

Only two women in the sample (both of whom are Mossi Muslims) sell eggs either directly or through a male relative (husband or son). Both women indicated that part of the sale money remained with the seller. Mossi women seem to be more likely to sell guinea fowl eggs, in

season, than are women from the other two ethnic groups. Some village men argued that selling eggs was inappropriate work for Fulani women.

Other Products—Only men in Koukoundi butcher animals and they generally do the smoking of meat. Some women claim they could do this if they wished. Fulani, Rimalbe and Mossi women do not sell meat, skins or manure. Mossi women however may smoke and sell fish. Manure from penned goats is taken by men and often used on maize fields. Women may also use it in their small gardens.

DAILY AND SEASONAL TIME CONSTRAINTS ON THE ROLE OF WOMEN IN LIVESTOCK PRODUCTION

Fulani Women

Agriculture—Unlike the women in the other two ethnic groups, Fulani women are not heavily involved in crop production. Only a third of the Fulani sample said they did any farming on their own. These few women said they grew sorghum, maize, cotton, or beans (Tables 8-6, 8-7). None mentioned peanuts or sesame. No Fulani women hired laborers to work on their land. Fulani women reported they may plant garden crops such as okra, okelles, and pepper. These crops, grown in small gardens near the home are exclusively for local consumption.

It is very rare for a Fulani woman to sell agricultural produce. None of those sampled reported doing so. They agreed with Mossi and Rimalbe women that a husband should give his permission before his wife sells her agricultural produce, or spends the money from the sale.

Most agricultural resources and work is controlled by men. Of four women who had garden land, three said they obtained it from their husbands, one from the village chief. No Fulani woman had her own millet granary, all granaries belonging to the males of the household. Usually women do not cut millet or do much labor in their husbands' fields. Fulani women married to wealthy men do not help in the harvest at all. Most women do, however, help in harvesting (79.2%, N=24), primarily by carrying already-cut millet heads to the compound. In general, Fulani women assist only their husbands, not members of the extended family. A few women, however, reported helping their neighbors.

Crafts—Among all ethnic groups, the major craft activity for women is the spinning of cotton during the dry season after the harvest. Twenty-one of the 24 Fulani women interviewed said they made cotton thread each year, especially during the time of low milk production. A woman may give the cotton thread to a weaver to make into cloth for her family and herself. Generally Fulani women do not sell cotton. Women obtain cotton for making thread either from their husbands who grow it, from purchase, or from barter for milk.

When there is sufficient milk, women make butter, soap and yogurt,

TABLE 8-6
Crops You Cultivate on Communal Land of Your Compound (Percent)

	Mossi N=54	Fulani N=24	Rimalbe N=11	Other N=2	Total N=71	χ^2	p<	Cramer's V.
Millet	14.7	0.0	27.3	50.0	12.7	8.24	.0412	.340
Sorghum (red)	14.7	0.0	0.0	0.0	7.0		N.S.	
Sorghum (white)	100.0	4.2	81.8	100.0	64.8	59.62	.000	.916
Corn	82.4	4.2	72.7	100.0	54.9	38.35	.000	.735
Peanuts	32.4	0.0	9.1	50.0	18.3	11.82	.008	.408
Cotton	73.5	4.2	72.7	50.0	49.3	29.96	.000	.619
Manioc	2.9	0.0	0.0	0.0	1.4		N.S.	
Okra	5.9	25.0	18.2	50.0	15.5		N.S.	
Sesame	8.8	0.0	0.0	0.0	4.2		N.S.	
Beans	92.1	4.2	90.9	100.0	62.0	51.46	.000	.851
Oseilles	2.9	0.0	0.0	0.0	1.4		N.S.	

TABLE 8-7
Crops Grown on Your Own Land (Fields + Gardens) (Percent)

	Mossi N=34	Fulam N=24	Rimalbe N=11	Other N=2	Total N=71	X ²	P<	Cramer's V.
Millet	5.9	0.0	0.0	0.0	2.8		N.S.	
Sorghum (red)	5.9	0.0	0.0	0.0	2.8		N.S.	
Sorghum (white)	64.7	0.0	36.4	0.0	36.6	26.57	.000	.614
Corn garden	0.0	0.0	9.1	0.0	1.4		N.S.	
Okra garden	91.2	16.7	72.7	50.0	62.0	33.86	.000	.690
Bean garden	47.1	0.0	27.1	0.0	26.8	16.64	.0008	.484
Peanut garden	91.2	0.0	54.5	50.0	53.5	47.03	.000	.813
Sesame garden	64.7	0.0	27.3	50.0	36.3	25.99	.000	.605
Small peas garden	26.5	0.0	9.1	50.0	15.5	9.69	.0214	.369
Oscilles	5.9	0.0	9.1	0.0	4.2		N.S.	

some of which is marketed (Table 8-4). Several women make large quantities of soap for sale outside of the village.

A small number of women interviewed sold millet cakes, fritters and shea butter. Although it is part of the general ideology in Koukoundi that Fulani women do not sell flour or millet flour balls (*dourah*), three women reported that they did. Approximately 70 percent of the women reported making mats, but few said that they sold them.

With the money from the sale of handicrafts, Fulani women buy clothing, jewelry, kola, tobacco, condiments, animals, and millet. By comparing the data in Table 8-8 with those in Table 8-5 it can be seen that money from milk sales is considered more important in purchasing expensive items such as jewelry than is money from the relatively minor craft sales. No Fulani woman said she used craft-sale money to finance business ventures, buy meat, medicine, or give to her husband.

Domestic Activities—Meal preparation, including pounding, sifting and repounding millet, is the most time-consuming daily activity. If there are several wives in a compound they take turns preparing the evening and morning meals. Each woman will thereby have several days in a week free from this heavy time expenditure. In some compounds, several wives prepare meals at the same time, giving the food to the entire household. Not uncommonly, however, (due to illness in the family or co-wives' visits to parents) one wife or daughter-in-law may be left to prepare all the meals for the entire family for an extended period of time. On the average a Fulani woman prepares the main meal four to seven times a week.

It is difficult to estimate the amount of time any Fulani woman spends processing millet, since she is frequently assisted by children, visitors, or other members of the compound. For a family of eight persons, a woman may average over two hours daily in millet processing. The cooking of the millet will take somewhat over an hour. The sauce which accompanies the porridge is prepared more quickly.

Women are also responsible for collecting wood and water. Most of the Fulani women sampled said they gathered the wood. Of these the average women had done so two to four times during an eight-day period. The modal number of times was four. These trips in search of firewood may take close to an hour depending on the distance travelled. More wood is used during the cold periods of the dry season for heating the hut as well as for cooking. When soap is being made, extra supplies of wood must also be brought in.

Women are responsible for obtaining the family's daily water supply. When asked how many trips for water they had made on the previous day, most (79.1%) reported having gone either two or three times. The remainder use children, usually girls, to perform this chore. Laundry is usually done at the water source rather than in the compound.

TABLE 8-8
What Do You Buy with the Money Earned from the Sale of Hand-made Products (Percent)

	Mossi N=34	Fulani N=24	Rimalbe N=11	Other N=2	Total N=71	N ²	p<	Cramer's V <sub1< sub=""></sub1<>
Buy condiments	17.6	8.3	36.4	0.0	16.9		N.S.	
Buy clothing	14.7	20.8	18.2	0.0	16.9		N.S.	
Buy cloth	2.9	0.0	9.1	0.0	2.8		N.S.	
Buy jewelry	8.8	20.8	45.5	0.0	18.3	8.01	.0547	.335
Buy tobacco	29.4	8.3	9.1	0.0	18.3		N.S.	
Buy kola	26.5	12.5	27.3	50.0	22.5		N.S.	
Buy animals	2.9	4.2	18.2	0.0	5.6		N.S.	
Buy milk	23.5	4.2	27.3	50.0	18.3		N.S.	
Buy millet	2.9	4.2	9.1	0.0	4.2		N.S.	
Buy meat	2.9	0.0	0.0	0.0	1.4		N.S.	
Buy medicine	2.9	0.0	0.0	0.0	1.4		N.S.	
Money for husband	0.0	0.0	9.1	0.0	1.4		N.S.	

Women also spend time collecting wild fruits and leaves for family consumption. Almost twice as many Mossi and Rimalbe women reported doing so as did Fulani.

During the rainy season until shortly after the harvest, a Fulani woman spends a considerable portion of her mornings walking around the village selling milk. A three hour period (e.g., 7:00-10:00 am) is considered to be a brief expenditure of time for this activity. On some days it is necessary to continue until the late afternoon in order to sell all the milk. Milk is also sold by Fulani women in the village market held once a week.

Possible Expansion of Livestock Activities—Fulani women have considerable free time during the middle of the day. This is especially so on days when a woman does not have to cook. Fulani women become involved in leisurely chatting in the late morning and early afternoon, particularly during the dry season when milk sales are low. It is theoretically possible for women in a compound to participate in expanded livestock activities, e.g., poultry raising (which requires morning and evening feedings and waterings and weekly cleaning) or expanded soap production. If such an effort were undertaken cooperatively, women could schedule turns to assure tasks were performed.

The fact that women have leisure time does not mean that they wish to take up new economic activities, however. One group of Fulani women said they did not work very hard at present, felt their current needs were being adequately met, and did not want to take on further tasks. Not all Fulani are so contented. Some complain of long hours spent pounding millet, carrying water, and vending milk. Others worry about the lack of health facilities for their children and themselves. The latter group may be interested in new income-generating activities.

Rimalbe Women

Agriculture—Like the Fulani, Rimalbe women milk cows, but they also plant, cultivate and harvest as do the Mossi. Rimalbe women grow sorghum, maize, cotton, and beans (Table 8-6) on compound land. Although most claimed to have farm land of their own, none of those interviewed have their own millet and or sorghum fields. A few said they have their own millet granaries, however. On land allotted to them by their husbands they raise okra, peanuts, sorghum, beans, and sesame (Table 8-7).

For those who plant millet, the majority (81.8%) are assisted in the harvest by their husbands. Often co-wives, men of the compound and, to a lesser extent, children also assist with the harvest. All Rimalbe interviewees said they help other people, especially their husbands, with their millet harvests. Only one woman said she had paid workers to help in her fields during the past year.

About half of the Rimalbe women said that they usually sell some of their farm produce. The most frequently sold crop is peanuts. Rimalbe women, though they farm, sell very little unprocessed farm produce, but conserve it for family use. For example, only one woman sold white sorghum and one beans, but none said they sold cotton, okra or corn.

Women use the money from the sale of agricultural produce to buy clothing, jewelry, and kola. All but one of the Rimalbe women said that her husband's permission was necessary to sell agricultural produce.

Crafts—As with the other ethnic groups, the most common craft activity for the Rimalbe is the making of cotton thread. Five women said they make butter and the same number make soap each year. Many women make and sell flour. Indeed, the selling of flour and millet flour balls is a speciality of the Rimalbe ethnic group and the primary marketing activity for women. Thus, although women do not sell the millet harvest directly, they use millet to make flour for sale. About half of those interviewed make mats and a few make yogurt. Mats and millet cakes are the only other craft items regularly sold. With the money from the sale of handicrafts, women buy jewelry, condiments, milk, and kola (Table 8-8).

Domestic Activities—Rimalbe women prepare food in a manner similar to that of the Fulani. Millet is pounded, not ground. Four of the women responding cook three to four times a week, while six cook daily. In terms of percentages, these numbers are similar to those for the Fulani.

Rimalbe women are responsible for collecting water and wood. Most carry the family water themselves while some have their children do it. Women make two or three trips to the well or pond daily. Wood for the family is gathered twice to four times weekly. In many ways, the domestic routine of the Rimalbe is similar to that of the Mossi. During the dry season, they have considerable periods of leisure time.

Mossi Women

Agriculture—Unlike the Fulani, Mossi women are heavily engaged in farming during the rainy season and up through the time of the harvest in late November. All of the 34 Mossi women interviewed farm. On the communal compound fields, all Mossi women sampled grow white sorghum. Unlike the women in other ethnic groups, some Mossi women also grow red sorghum and millet. Almost all women grow maize and beans. Cotton and peanuts are grown on compound-family land (Table 8-6).

Far more Mossi women said that they had fields of their own to farm (aside from compound fields) than did those from the other two groups. Thirty-three of 34 Mossi women had such land, compared to eight of 11 for the Rimalbe and only four of 24 for the Fulani ($\chi^2=40.37$, $p<.001$, Cramers $V=.754$). On these fields and garden land women grow a variety

TABLE 8-9
 What Do You Usually Buy with the Money Earned from the Sale of Agricultural Products? (Percent)

	Mossi N=34	Fulani N=24	Rimalbe N=11	Other N=2	Total N=71	X ²	P<	Cramer's V.
Condiments	47.1	0.0	9.1	0.0	23.9	19.49	.0002	.523
Clothing	44.1	0.0	27.3	50.0	26.8	14.54	.0022	.452
Cloth	5.9	0.0	0.0	0.0	2.8		N.S.	
Jewelry	11.8	0.0	36.4	0.0	11.3	10.23	.0166	.379
Milk	61.8	0.0	9.1	50.0	32.4	27.90	.000	.626
Given to husband	2.9	0.0	0.0	0.0	1.4		N.S.	
Tobacco	44.1	0.0	9.1	0.0	22.5	17.77	.0005	.500
Kola	52.9	0.0	18.2	50.0	29.6	20.07	.0002	.531
Animals	11.8	0.0	9.1	0.0	7.0		N.S.	
Other (pots, calabashes etc.)	14.7	0.0	0.0	50.0	8.5	9.41	.0243	.364

of crops (Table 8-7) such as white sorghum, peanuts, okra, sesame, beans, and peas. The agricultural produce from these fields not only helps support their families, but also gives them, through its sale, some disposable income.

The majority of the Mossi women said that their husbands had allotted them their millet fields and their garden lands. A woman who has her own millet fields often has her own granary. The majority of the Mossi sample had granaries. This is in sharp contrast to the other ethnic groups (X = 29.54, $p < .001$, *Cramer's V* = .615).

Mossi women assist men in the planting and cultivation of most crops, including tobacco, which is considered a man's crop. At harvest time, women of the same compound work together with the men to harvest each family member's fields. Almost all of the women said that their husbands and children assisted in the millet harvest and about half said that other wives and other males in the compound also help. Very few cited neighbors, villagers or other relatives as helping with their harvest.

When asked whom they helped during the millet (millet and sorghum) harvest, almost all named their husbands, while about two-thirds help other women in the household and half help neighbors. A few others worked with the village chief or village relatives. Only two Muslim Mossi women had paid workers to help in their fields during the past year. If a larger work party is needed for the harvest, the help of women living outside the immediate compound, but who are part of the extended patrilineal group, can be requested. The head wife of the patrilineal segment informs all the neighboring households of the need.

In sharp contrast to other groups, the major source of disposable income for Mossi women is the sale of agricultural products. While most Mossi women sell farm produce, few Rimalbe and none of the Fulani do so (X = 35.68, $p < .001$, *Cramer's V* = .708).

Mossi women frequently sell peanuts, white sorghum, and beans. Less often cited as products sold are red sorghum, millet, okra, and sesame. Before selling agricultural produce, a woman must obtain the permission of her husband or head of her compound. This is done to insure that there will be a sufficient crop reserve against possible future famine. However, about a fourth of the women sampled said that such permission was not necessary.

The vast majority of the Mossi women sell their agricultural produce in the village market. Only a few women sold to a village trader, traveling merchants, and to the National Cereals Board (OFNACER). A few sell at markets outside the village. None of the women of other ethnic groups in the village sold produce outside the village market and most do not even sell there.

Proceeds from the sale of agricultural products are used to buy milk, kola, clothing, tobacco, jewelry, and animals (Table 8-9). The four women who said they used money from the sale of produce for the purchase of livestock are all Muslims.

None of the Mossi women say they use their money to buy millet, meat, or medicines. Mossi women considered milk and condiments to be the most important purchases. The majority of women believe it is necessary to obtain their husbands' permission prior to spending money earned through the sale of agricultural produce.

Crafts—Virtually all the Mossi women spin cotton thread. Other important craft or food processing activities are the making of shea butter, soap-making, and the brewing of sorghum beer. A few other women process millet into flour, weave mats, and make pots. Some women report that they make other items, particularly prepared foods, such as millet cakes, for sale.

The major sale items are all processed foods. Many women sell millet cakes and fritters, while a smaller number sell beer, flour, shea butter, peanut oil, and soubballa. Money earned from the sale of processed foods and crafts is used primarily to buy tobacco, kola, milk, condiments and clothing (Table 8-8).

Domestic Activities—A significant portion of a woman's work day is devoted to the collection of water and wood. About two-thirds of the Mossi women (64.7%) carry the family water themselves, and a third have their children do it. Most women (82.4%) make two to three trips a day for water. Mossi women collect the family wood, usually between two and four times during a week. Female children often assist.

Mossi women process millet by grinding it, generally in the evening around a communal, waist-high circular adobe platform, equipped with embedded grinding stones. The daily grinding of millet for a large family may take over an hour. If a man's wives have friendly relations with one another, they take turns accepting the major responsibility for preparing the evening meal for the family of co-wives and children. Other wives often assist in grinding the millet. Approximately one-fourth of the sample, especially those women without co-wives, cook the main meal every day. The majority, however, cook three to four times a week (see Hammond, 1966 for details of Mossi domestic life).

A typical day during the rainy season begins when a woman prepares a morning meal of millet and sauce (often left over from the previous night), makes a trip to get water, and completes her other domestic tasks. She usually engages in farm work until the late afternoon. During the harvest, a woman returns home in the late afternoon, often to make yet another trip for water or wood and then to begin preparing dinner which is served around 8:00 p.m. While men can relax after a day of

farm work, women, except for those with daughters old enough to help, have little time for relaxation.

During the dry season, Mossi women have somewhat more leisure time. Much of this time, however, is devoted to spinning cotton with other women under a shed or inside a hut. As the dry season progresses, women must spend more and more of their leisure time walking to the more distant sources of water.

Possible Expansion of Livestock Activities—The Mossi women of Koukoundi are extremely industrious. In spite of their generally very busy days, they often say that they are willing to take on even more work if they can see a benefit in it for their families and themselves. Difficulties concerning the water supply appear to pose one significant obstacle in Koukoundi regarding the development of livestock projects involving women.

CONCLUSIONS

Economic activities of women in Koukoundi are quite varied, as are their social interaction patterns. It is apparent that any program intending to improve the economic condition of rural women in this area must take into account the women's differing social orientations, work patterns, sources of disposable income, and consumption habits. At present there are few strong communication links between two of the ethnic groups (Mossi and Fulani), and the Rimalbe (though they are in close contact with the Fulani) appear to have strong reservations about working with Fulani on cooperative development programs.

Initially, it would be advisable for officials planning development programs to encourage the formation of village women's committees, composed of representatives from neighborhood or patrilineal groupings from the different ethnic segments. (In Koukoundi a male livestock committee has been formed). Traditional and innovative community leaders should be identified, including a significant number of middle-aged women (the major female livestock holders). Cooperation between women can develop from interests growing out of service on a women's committee. The committee could work with planners on the type of programs suggested below, or on others which the women might initiate themselves.

As shown by the survey data, government agents from livestock and agricultural agencies have practically no contact with the women of the community, despite the fact that women have significant interests in both of these areas. For example, women are concerned about acquiring more animals and keeping healthy those they have. Livestock is often seen as a form of savings, but a rather uncertain one at present due to the prevalence of disease. Women are also interested in participating in

communal gardening projects they are beginning to learn about from neighboring areas.

Most women from the three ethnic groups in the village want to increase their personal income and improve their very difficult lives. Planners must, however, take great care that they do not initiate projects which will only add to the daily burdens that women already bear.

IX. SUMMARY AND POLICY EVALUATION

In this section an effort will be made to clarify the existing situation of livestock development in the Soudanian zone of Upper Volta and to assess, from a sociological perspective, the feasibility of certain often discussed technical interventions. In the following paragraphs some of the many proposed technical interventions will be reviewed and evaluated.

In order to examine these propositions it is necessary to first understand the goals and assumptions from which this analysis will proceed. According to a joint statement issued by the National Livestock Service and an important donor, technical interventions should be

“specifically designed to address the needs of the small rural livestock producer and to allow him or her to participate in the process of economic development. An additional goal at the national level is to increase government revenues and export earnings as a result of development of Upper Volta's livestock sector (G.O.U.V.—U.S.A.I.D., 1976, p. 3).

Based on an examination of the existing system of livestock production in Upper Volta several conclusions directly relevant to these goals can be stated.

As should be clear from the preceding examination of the status of livestock production, the existing system is both rational and efficient. The overriding characteristic of this system is the integration of livestock production by local peoples into their overall strategy for dealing with environmental uncertainty. We have noted the convergence of traditional agriculturalists and pastoralists in the acceptance and implementation of this strategy. In brief this approach has as its goal the maintenance of an insurance system: a system whereby the individual farmer-livestockman can maximize his chances of being able to make up for environmentally induced grain deficits which long experience has taught him could come in any given year.

It cannot be overemphasized that this strategy:

- 1) is an effective means of coping with a capricious environment;
- 2) provides for real increases in the income security and well being of rural farmer-livestockmen;
- 3) unlike many other livestock programs (e.g. feedlots) is oriented toward those at the bottom of the socio-economic ladder rather than solely toward the well being of the urban elite;
- 4) will not have a host of unintended negative consequences)
- 5) is a socially acceptable and desirable strategy from the perspective of the rural masses.

It is proposed here that the goals of donor efforts in the area of livestock development be geared to the support of this system. Efforts aimed

at large scale commercialization should be given a lower priority. Such commercial efforts, aimed at the development of ranches, feedlots, etc., are generally supportive of existing income inequalities or promote greater inequality, while providing few, if any, benefits for the rural poor.

Unfortunately, the orientation of some donors, including U.S.A.I.D., Ouagadougou, is toward the construction of "concrete" show places rather than toward the provision of long-term support and assistance for local livestockmen. Heavy equipment for use on a modern American ranch was purchased at great expense. Most of this equipment was subsequently sold or bartered for more appropriate items. Local level participation, difficult to show to an ambassador or other visitors, has been given a very low priority. Similarly, recently established range study plots, a necessity before creation of a range management program, are being dropped, even though widely supported by local livestockmen. Local livestockmen's organizations are being abandoned by a narrow, shortsighted donor mentality which places greater emphasis on book-keeping and administrative (office) efficiency than on long-term socio-economic change.

The existing system is well organized, and, given the constraints under which it operates, highly rational. There are certain important elements of the production system for which livestock owners require technical and organizational support. These areas should provide the foci for development assistance efforts.

In the context of existing socio-cultural norms and practices, there is an additional assumption which must be accepted and dealt with if any technical interventions are to succeed. Ownership of livestock has been in the past, is now, and must in the future rest in individual, rather than communal hands. No change in this fundamental axiom will produce satisfactory results in terms of generating participation and acceptance of new ideas by livestockmen and hence improved production. The concept of individual ownership is deeply ingrained and not likely to change.

Finally, it is the view of this author that individual, isolated technical interventions should not be undertaken, and will not succeed if they are attempted. All interventions should be part of a broader package that deals with the entire livestock production system. The introduction of new techniques without a thorough consideration of the impact of these interventions on other aspects of production is futile. The failure of several small scale poultry projects undertaken jointly by U.S.A.I.D. and the Livestock Service are a case in point. Only part of the production side was considered. The failure to develop feeds from locally available materials, the lack of a marketing plan, the non-existence of follow-up

services and technical advice to and training programs for local producers, all point to the inadequacy of isolated purely technical interventions. Similarly the provision of improved animal health services without an accompanying program of natural resource management is likely to result in increasing environmental degradation, rather than improved herds.

In the view of this author the key to livestock development rests with the creation of integrated regional livestock production zones. These integrated livestock production units would include the following:

- 1) Representative committees of livestockmen and farmers to provide a *two-way* communication link between the rural populace and the technical services. These committees must include chiefs and other traditional authorities (land priests) as integral members and full participants (see Vengroff, 1980A). There is some indication that such committees could also be effectively established for women, especially where they already exist for men.
- 2) The site or area livestock committees will also serve a key management role in any programs which *they* deem both acceptable and desirable. No efforts should be undertaken until they are fully explained to, and agreed upon by these committees.
- 3) A local land use planning agreement must be worked out between local people, local elites, regional development authorities (ORD) and their technical services (especially agriculture and livestock services), and central government administrative authorities at the prefecture (Department) level.
- 4) A natural resource management scheme, including a program of range management, water resource development, forestry, and control of burning should be developed. Experience with the creation of demonstration range plots in the Tafogo area indicate that such a program is feasible and acceptable to both local authorities and livestockmen.
- 5) A comprehensive animal health program, including an education program for livestockmen, should be designed within the context of the natural resource management scheme. Health services should be provided free to all participants in the overall scheme. Included here is also the need for a scientifically sound program of diagnostics, through the national livestock service.
- 6) Major interventions in the area of marketing do not appear to be called for. In general, livestockmen are marketing their cattle at the most rational times. Small scale cooperative marketing or credit arrangements may be possible for livestockmen to delay the sale of some livestock until peak price periods (February-March) while purchasing grain at minimum prices in December.

- 7) Local extension agents need additional training and training materials for both the technical and social (community organization) aspects of their work. There is a need to develop such materials and to provide increased technical back-up in the form of university-trained, experienced personnel at the regional (ORD) level. Technical back-up including pharmaceutical supplies, laboratory equipment, and transportation should be developed for each region. Furthermore, a performance-related reward structure for local level personnel needs to be built into this system. Female extension agents, trained in livestock production, are needed to establish, work with, and support the efforts of women in livestock production.

Several interventions proposed by certain donors do not appear, given the data on the existing system, to be justified.

- 1) Supplementary feeding—prospects for developing a successful program in this area do not seem bright. Farmers, who barely produce enough grain for their own consumption, are not interested in, or likely to become interested in, growing forage crops for their animals. Currently, crop residue is being eaten by livestock. Certain crop materials including peanut hay, millet stalks, and bean hay are being stored, but usually only for the use of traction animals, milk cows, or sick animals. The existing surplus is not sufficient for long-term or large-scale feeding, and the prospects for increasing that surplus are limited. Land, labor and appropriate motivation are all lacking. There is also a preference on the part of many livestockmen, especially the Fulani, for the use of existing grazing and browsing resources, rather than for the human production of such resources. Perhaps successful forage crops could be introduced if they could be produced with low labor input, on land at rest in the crop rotation system. Farmers can not be expected to take prime land such as lowland areas (bastonds) out of crop production in order to produce forage. The negative experience of several forage producing projects in Upper Volta adds weight to this conclusion.
- 2) Milk production—Any effort to intervene in the area of milk production, such as the development of a systematic collection system for use by modern dairies, will have serious negative consequences. First, such a system would very likely redirect milk supplies from the rural peasants to the urban elite. In essence, a subsidy in the form of cheaper domestic, as opposed to imported milk supplies, would be provided to government and foreign bureaucrats and technicians. Easy access to an important dietary supplement by local farmers might come to an end. It is also possible that com-

mercialization would result in increasing dependence by Fulani women on the urban economy. An additional possibility is that males might become the middlemen in this marketing operation, thus siphoning off a portion of one of the few income sources for women.

A final note of caution is in order to the prospective donor. All the positive programs discussed above are long term. One can not hope to develop a successful, integrated local livestock production scheme in a period of only two or three years. The crucial factor is the perception, in the long term, by village level producers that the new system provides adequate insurance for the grain needs, and hence well being, of their families. Only when this is accepted can the off-take rates be increased. Without increased off-take, the health and environmental management portions of the program will work at cross purposes. It is at the time when livestockmen recognize increased animal survival rates and the success of range management that they will begin to sell off the additional animals which can produce the much needed foreign exchange for the country as a whole.

The priority goal must be to develop a management system which will insure the well being of the rural livestock producer while protecting the environment. As an offshoot of this system real individual incomes and national income may be augmented.

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