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PRELIMINARY STUDY OF THE LIVESTOCK
MARKET IN THE WESTERN ZONE OF THE
NIGER RANGE AND LIVESTOCK
PROJECT

Contract No. AID/afr-c-1681

Project No. 683-0202

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I. INTRODUCTION

This report is based upon a preliminary tour of the animal markets in the western zone of the project area. The tour commenced in Arlit, August 12, 1980 and ended in Maradi, August 29, 1980.

The purpose of the trip was to gain background information concerning the movement and marketing of cattle in the project zone. Of particular interest was the potential for a reorientation towards the Arlit market upon the completion of an all-weather road from Tahoua to Arlit.

The report is organized as follows: in the following section is presented my itinerary and a log of activities since leaving Madison, August 4. This is followed by a chronologically ordered report of discussions and observations. In Section III I present a preliminary analysis of the economics of the livestock markets. Section IV contains more-or-less random observations concerning project activities. This section should be viewed as an effort to initiate dialogue rather than as a presentation of fact or strongly-held opinion. In Section V I set out a plan for further investigation. Finally, Section VI contains an appendix of data collected in the field.

II. ITINERARY, ACTIVITIES AND OBSERVATIONS

A. Itinerary and Activities.

The following is an itinerary covering the entire contract period. Section B contains the substantial observations over this period.

Monday August 4, 1980

1. Flew to Washington from Madison, Wisconsin.
2. Started work on Visa and Nigerian Consulate.
3. Worked on contract with Contract Officer.
4. Received and reviewed project paper.

Tuesday, August 5, 1980

1. Worked on contract.
2. Arranged flights and tickets with A.I.D.
3. Reviewed Visa.
4. Flew out of Washington DC at 8 P.M.

Wednesday, August 6, 1980

1. Arrived Paris 3 A.M.
2. Obtained room in SOFITEL for 1/2 day.
3. Read project paper.
4. Checked out of hotel for 10:55 P.M. Paris Niamey flight. My ticket turned out to be waitlisted and I did not get a seat.
5. Checked back into SOFITEL.

Thursday, August 7, 1980

1. Found a connection to Niamey via Abidjan with first class fare only from Paris to Abidjan. The alternative was a Paris Niamey flight the 13th.

2. Left Paris 11 A.M., arrived Abidjan in the evening.

Friday, August 8, 1980

1. Left Abidjan morning.
2. Arrived Niamey 12:30 P.M.
3. Checked into Grand Hotel.
4. Saw Sid Bliss at A.I.D. Embassy.
5. Saw Tim at A.I.D. Rivoli. Received project reports. Made appointment to see Ari, Director of Livestock Service.

Saturday, August 9, 1980.

1. Made protocol visit to Ari.
2. Read documents.

Sunday, August 10, 1980

1. Drove to Maradi.
2. Checked into Jan Gorzo.

Monday, August 11, 1980.

1. Met with Doctor Ali, Project Director. Discussed priorities and scheduling.
2. Prepared trip to Arlit and south.
3. Discussed project with Bill Fitzgerald of the socio-economic group and with Jay Owen, a Peace Corps Volunteer attached to the project.
4. Moved into project house.

Tuesday, August 12, 1980; Ran Sallah.

1. Flew to Arlit.
2. Went to house of Mr. Mahamane Mamane, Chef de poste, of elevage and introduced myself and my task.

Wednesday, August 13, 1980

1. Visited Arlit slaughter-house.
2. Made protocol visit to Sous-Prefet. Received room in Maison de'Hotes dela Somair.
3. Visited meat market, talked to butchers and got prices.
4. Visited Somair and got prices and quantities of meat deliveries from Niamey.
5. Met Mr. Zakara, the director of elevage for the Agadez Department. Went with him, Mahamane and the agent d'inspection des viandes Abdou Wache to visit the Sous-Prefet and discuss the meat market.
6. Went to live cattle market.

Thursday, August 14, 1980

1. Visited the Plaine de Talak with Mahamane and Zakara.
2. Went to Cominak and got price and quantity information concerning the meat imports from Niamey.

Friday, August 15, 1980

1. Revisited abbatoir.
2. Spent most of morning in the meat market.
3. Got, from Abdou, the price of all live cattle sold the previous day.
4. Got numbers of animals slaughtered since September 1979 from Maman.
5. Tried to get census information for Arlit but it hasn't been done since 1975. They are working on it now and promise it by January.

Saturday, August 16, 1980

1. Went to meat market and got "average" (pre-price control attempts) prices from Abdou and butchers.
2. Prepared to leave for Agadez.
3. Took truck (carry'ng empty beer bottles to Agadez).
Left at 2:30, arrived Agadez 7 P.M.
4. Went to Family House Hotel.

Sunday, August 17, 1980

1. Went to meat market
2. Went to live animal market, sampled prices.

Monday, August 18, 1980.

1. Went to meat market but meat had not arrived from abbatoir.
2. Went to abbatoir, got count of animals slaughtered, met Abdou the meat inspector.
3. Went to meat market while Abdou finished his work.
4. Went to Elevage with Abdou and got monthly totals on slaughter for a year.
5. Went to live cattle market, sampled prices.

Tuesday, August 19, 1980

1. Went to live market, talked to intermediaries, to commercants, and to herders.
2. Went to meat market.
3. Went to Elevage with Abdou to get mercurial. Was told that all price data has been sent to Niamey.

Wednesday, August 20, 1980

1. Went to markets.
2. Waited for vehicle and discussed prices.
3. Vehicle arrived in evening.

Thursday, August 21, 1980.

1. Drove to Ingal by way of Cure Salé. One flat on way.
2. Spent around three hours trying to diagnose the problem with Dr. Ali's car. It had broken down the day before between the Agadez-Abalak road and the Cure Salé.
3. Arrived in Ingal in the evening and talked with Jim Knight and Dana.

Friday, August 22, 1980.

1. Went to Ingal live animal market.
2. Went with Jim Knight to a toureg camp.

Saturday, August 23, 1980.

1. Went to Ingal live animal market.
2. Obtained numbers slaughtered from Elevage Agent.
3. Arranged to have total numbers sold recorded in future.
4. Left for Tchin-Tabaradene by way of Abalak.
5. Slept in Abalak.

Sunday, August 24, 1980.

1. Broke down between Abalak and Tchin-Tabaradene.
Rode with Sous-Prefet and came back with OFEDES truck and mechanic. Pulled Scout to Tchin Tabaradene.

2. Visited Tchín-Tabaradene market, got prices and other market information.
3. Arranged for the collection of numbers of animals sold in market.
4. Worked on fuel system to determine cause of initial engine failure.

Monday, August 25, 1980

1. Replaced starter motor bushing.
2. Copied monthly data for a year from elevage for markets in the Tchín-Tabaradene prefecture; prices, animals presented for sale, slaughters.
3. Waited for gas to arrive from Tahoua.

Tuesday, August 26, 1980.

1. Left for Kao.
2. Engine failure; diagnosed problem as intermittent fuel pump failure; syphoned gas from jerry can to reach Kao.

Wednesday, August 27, 1980

1. Went to live animal market with elevage agent.
2. Made it to Ibessetene using rumored remedy of cooling fuel pump with wet rags. Radioed for fuel pump replacement to meet us between Maradi and Ibessetene via Abalak.
3. Pump failed immediately outside Ibessetene. Syphoned to Abalak.

Thursday, August 28, 1980

1. Spent morning trying to repair pump in SATOM garage.

Problem is with valves--not diaphragm. Impossible to repair.

2. Went to animal market.
3. Left for Maradi; syphon.
4. Met repair vehicle just outside Abalak. Replaced pump.
5. Had flat. Starter refused to turn over. Push started with Fulani help.
6. Repair vehicle caught up with us in Dakoro; replaced starter.
7. Arrived in Maradi 11 P.M.

Friday, August 29, 1980

1. Went to office to report in.
2. Went to animal market with Dr. Ali but it had not yet gotten started in force.
3. Began report.
4. Returned to animal market.
5. Worked on report.

Saturday, August 30, 1980

1. Worked on report.

Sunday, August 31, 1980

1. Work on report.

Monday, September 1, 1980

1. Worked on report.
2. Talked to Tim
3. Started flight to Niamey; motor quit on plane; returned (Fokker).

Tuesday, September 2, 1980

1. Waited for decision on plane at airport. Ended up flying via Zinder, Agadez, Arlit (DC 6).

Wednesday, September 3, 1980

1. Got ticket; morning plane to Paris didn't land due to storm. At present I am scheduled to leave at 2:15 and arrive in Boston tomorrow around 5 P.M.
2. Will arrange whatever meetings possible with Richardson, Johnson, etc.

Thursday, September 4, 1980

1. Arrived Boston 5 P.M.

B. Observations

This section contains observations of a largely qualitative nature. Most of the analysis and quantifiable observations are found in Sections III and VI.

Arlit

The outstanding characteristic of the Arlit market is that it is a terminal market. Virtually all animals presented in the Arlit market are for slaughter, the possibilities for returning animals to the field for fattening being extremely limited by available pasture. This, combined with the express intention of the sous prefet to limit purchases to patented butchers, gives butchers market power unparalleled elsewhere in Niger. Furthermore the high wages in Arlit create a relatively inelastic demand for meat at the consumer level.

The net result appears to be a market in which the butchers exercise market power, depressing prices at the live animal level, and inflating them at the retail level.

At present there are 28 patented butchers (allowed to purchase animals). These range from those with the capital to purchase only one or two goats a day to those purchasing 10 or more. The apparent market power of the butchers will, in the absence of further policies eventually be broken by entry of new butchers from the outside. In the meantime the evidence appears consistent with the hypothesis that their market power is having the effect of limiting the supply of animals to the Arlit market.

Recent census data for Arlit was unavailable at the Sous-Prefecture. I was told by the adjoint that the most recent data is for 1975 but they are working on a new census and that it should be available when I return.

I obtained data for meat imported from Niamey for both COMINAK and SOMINAR. A preliminary analysis of the numbers indicates that, as a percentage of total non-specialty meats (i.e., excluding fish, duck, pork, horse, etc.) imported meat varies from 6% to 8% of the monthly totals. This portion could possibly be supplied by the local market but a heavy orientation towards choice cuts (gigot, rotie, tournedos, foie de veau, steaks) makes even this unlikely.

I did not attempt to get information concerning plans for expansion of the mining operation. This line of inquiry,

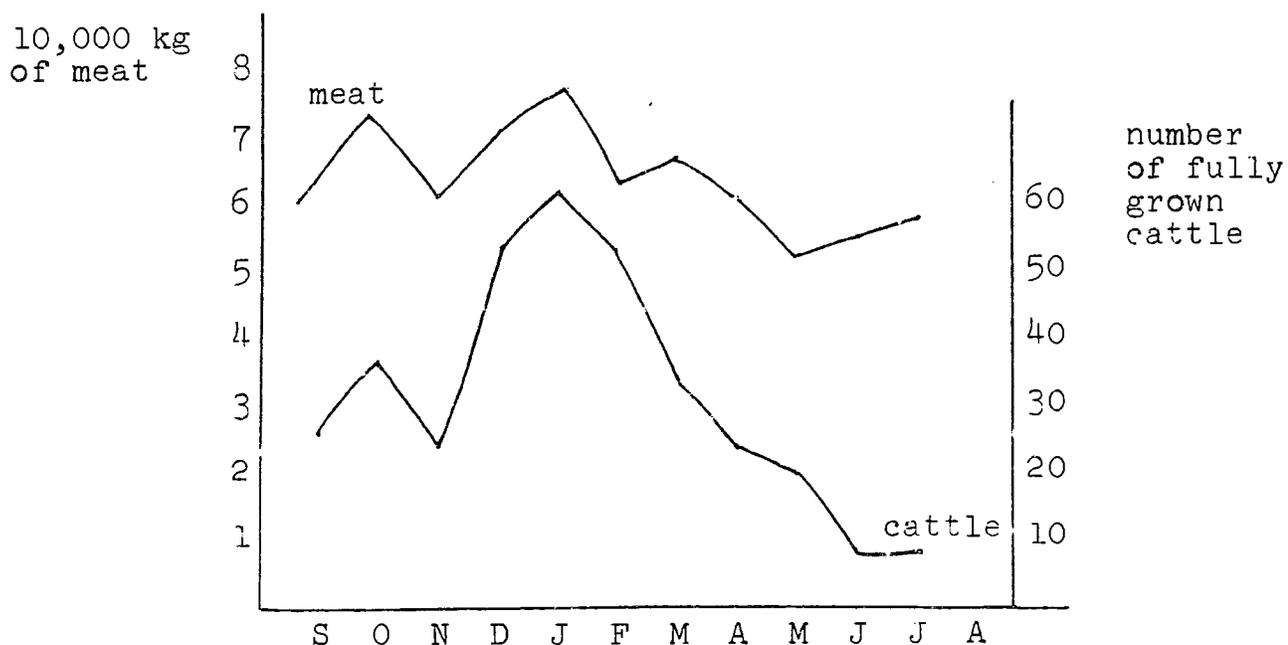
I feel, is better pursued at higher levels in Niamey. My expectation is that the recent depression in world uranium prices will lead to a reconsideration of plans to expand in the near future.

The monthly variation in numbers of animals slaughtered in 1979-1980 is, to the author at least a bit surprising. As can be seen in figure 1, the total animal weight slaughtered peaks at 77,000 kg in January and drops down to 50,000 kg in May. For fully grown cattle the variation is even wider, peaking at 61 in January and falling to 8 in June. Two hypotheses are suggested to explain this variation. One is that there are more herds grazing in the vicinity of Arlit than I had realized and that herders cull their herds and start south later than has been believed. Another hypothesis is that trucks working on the Agadez Arlit section of the road during the dry season are bringing a substantial number of animals north. In any case more information will have to be collected before this phenomenon can be adequately explained. Particularly important is the collection of adequate seasonal price data as will be elaborated later.

My preliminary impression with respect to the Arlit market is that it is unlikely to make a large impact on the marketing of cattle in the project zone. A preliminary estimate of per capita meat consumption in Arlit is between .32 and .11 lb per day. The assumptions used to make these estimates are shown in Table 1.

Figure 1.

Seasonal variation in total weight of animals slaughtered¹ and in numbers of fully grown cattle slaughtered; Arlit 1979-1980.



Source: Arlit Elevage Monthly Report

¹ Animals are converted to kg using the following animal weight carcass averages:

Fully grown cattle	80 kg
Heifer	50 kg
Sheep	20 kg
Goats (is probably an overestimate)	18 kg
Camels	80 kg

Source: Arlit Elevage Chef de Poste.

TABLE 1.

Estimated Arlit Per Capita Meat
Consumption under Varying Assumptions
Concerning the Arlit Population and the
Edible Portion of the Animal.

Edible meat as a percent of live animal.	Edible meat in Arlit (Kg)(slaughter + Imports)		Per Capita Consumption in Arlit			
	December	July	Population			
			25,000	40,000	Dec.	July
			Dec.	July	Dec.	July
45	77,380	60,820	3.1	2.4	1.9	1.5 ^b
65	109,094	86,327	4.4 ^a	3.3	2.7	2.1

^a 4.4 Kg/m = .32 lb/day = 142 g/day

^b 1.5 Kg/m = .11 lb/day = 48 g/day

Agadez

The Agadez market, like the Arlit market, is a daily market with a substantial portion of the animals going to slaughter (19 butchers in Agadez). Unlike the Arlit market not all the animals are going to slaughter; a fact which gives the seller substantially greater market power than is the case in Arlit. I was told that about half of the animals seen in the market will return to pasture without being sold. The average stay of a herder in the market was said to be four days, after which he returns with unsold and newly purchased animals. In this market I began to ask about price differentials between rainy and dry seasons - a line of questioning I unfortunately neglected in Arlit. I was told that in general an animal now (mid August) worth 6000 CFA will be worth 10,000 CFA in a month as herds begin to move south. This information seems to indicate an earlier southward movement than is indicated by the Arlit slaughter data referred to earlier. The general picture emerging from questions concerning price differentials was that for sheep the ratio of dry season prices to present prices (this refers to "rani" vs "yanzu", not to a well specified period in the future) is 1.7 for sheep, 1.8-2.1 for goats, 1.3-1.6 for cattle, and 1.1-1.5 for camels. These numbers are clearly very conditional on size of animal and the quality of pasture. The questions were posed, however, in such a way as to attempt to elicit price differences due to seasonal changes only, size and quality of the animal being held constant.

The quantity of meat slaughtered in the Agadez market is graphed in figure 2. Numbers of fully grown cattle slaughtered peaks in July as it did in Arlit and shows a similar rapid decline moving into the rainy season.

Total weight of meat in the market peaks two months later in March and shows a substantially sharper upturn (from 68,000 kg to 95,000 kg) than did the Arlit market (from 60,000 kg to 77,000). These data seem to lend support to the hypothesis that quantity changes in the Arlit market represent herd movements rather than improvements in vehicular availability. Questions posed in the Agadez truck stop (to Sarkin Tasha) produced little evidence of significant vehicular transport of animals to Arlit.

Ingal

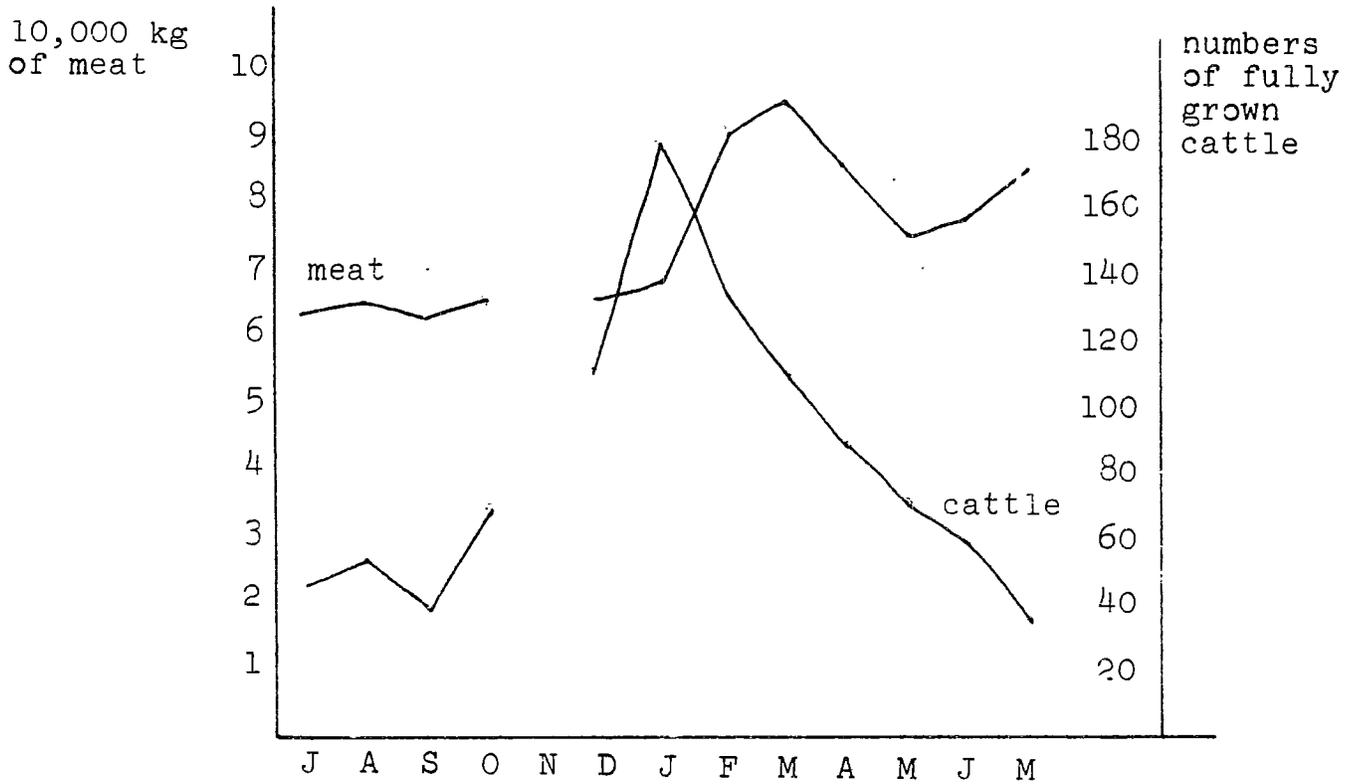
The Ingal market is a daily market that has only recently been moved outside of the village. The Ingal meat consumption is about less than one fifth that of Arlit or Agadez with 10 patented butchers providing the day's meat supply. There were very few cattle in the market. I was told that the Fulani will sell on their return south when they will stock up on millet, but that they will sell little now.

There was little interest displayed in the Arlit market although upon direct questioning I was told that a four year old ram worth 13,000 in Ingal would be worth 16,000 in Arlit. Interestingly enough I had been told by the butcher-buyers in Arlit that a sheep worth 30,000 in Arlit would be worth 18,000 in Agadez and 15,000 in Ingal. These price relationships will be compared more systematically in the next section.

As concerns animal growth and marketing decisions, I was told that a small animal (goats and sheep) will stop growing at 3-1/2 years old

Figure 2.

Seasonal variation in total weight of animals slaughtered and in numbers of fully grown cattle slaughtered Agadez 1979-1980.



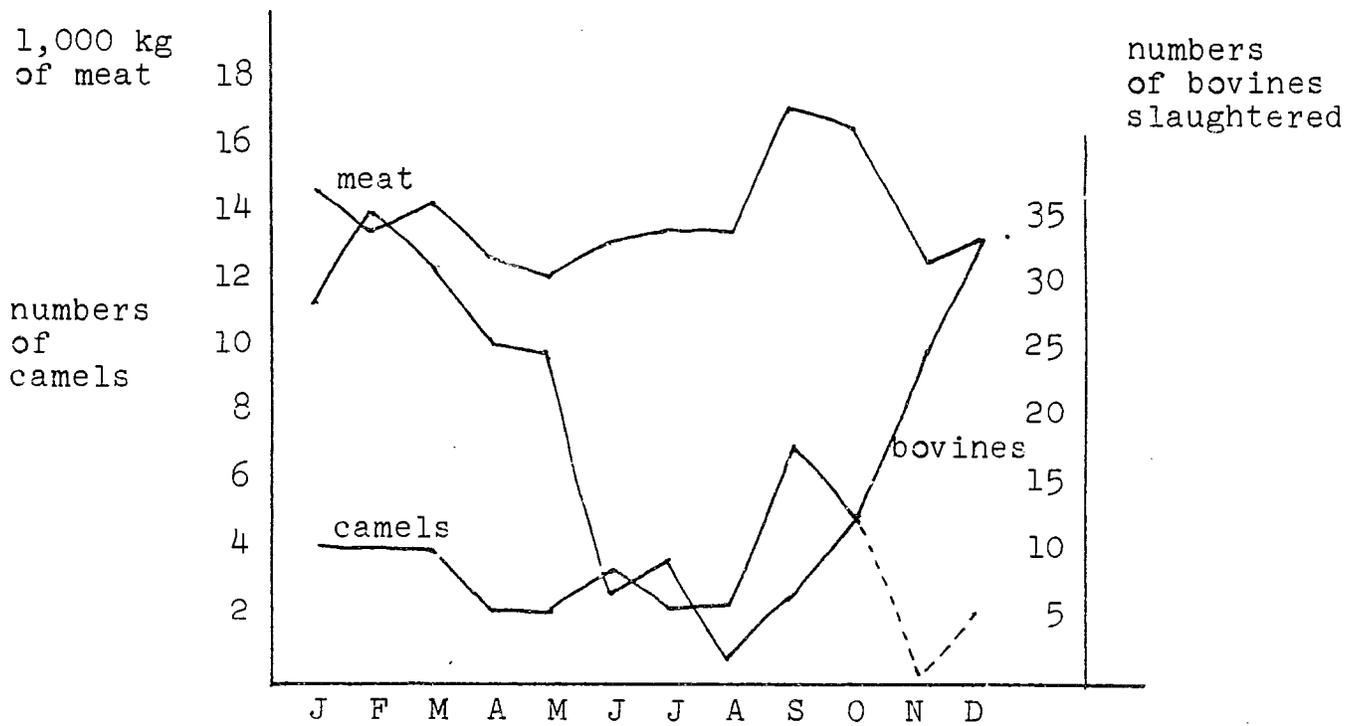
and a large animal at 7-1/2 years. The nature of the market this time of year is typified by the Taureg who brought in 3 six-year old sheep and sold them at around 12,000 CFA each and returned with 6 five-month old sheep (all males) purchased at 1,500 CFA each (plus 300 CFA commission each to the dillali).

The temporal variation in meat slaughtered in the Ingal market is shown in Figure 3. The interesting observation on this data is how the return from the cure sallé impacts animal slaughter in September and October. Goats, sheep, and camels all hit their high point in September, with bovines recovering only to six from one in August. It is noteworthy that the bovine peak that we saw in Arlit and Agadez in January appears to reach Ingal in February. Unfortunately the Ingal data is for the 1979 calendar year rather than the 79-80 period covered in Arlit and Agadez. Therefore it is possible that rainfall conditions were sufficiently different as to give a misleading picture as to normal annual patterns of herd location. The necessary data will be collected on the next trip. What is clear, however, is that with the exception of the September October return from the cure salle, meat consumption is rather constant, with beef reductions in June through October being replaced by increases in camels, sheep and goats.

Information concerning the total number of sales and/or the total number of animals brought to market are extremely difficult to collect especially in a daily market such as Ingal. Although this is required in the monthly reports sent in by elevage agents, it is often not done, and when it is it is of questionable reliability. In Ingal I

Figure 3.

Seasonal variation in total weight of animals slaughtered and in numbers of bovines slaughtered - Ingal 1979.



arranged to have the man who sells the animal tax coupons keep a record for us of the number sold per day. Whether or not this will work remains to be seen.

Tchin-Tabaradene

Tchin Tabaradene is a Sunday market of major importance as a resell market and of less importance as a slaughter market. We arrived late, (3 P.M.) having spent since 5:30 A.M. working on the Scout, riding in the Scout, pushing the Scout, working on the Scout again, and pulling the Scout, respectively. Fatigue took its toll on the quantity and quality of my observations in this market.

We arranged with the market tax collector, El Hodge Issa, to have him collect the numbers of animals taken in and out of the market and save them for us in the future. This was a task which he seemed to be doing already with considerable seriousness. He had written down the name and number of animals of all herders as they came into the market, and then checked them off as they left to see how many animals they had sold. For this market day, 8/24/80, 221 camels and cattle entered, 888 goats and sheep, and 31 donkeys. Of these, 72 cattle were sold, 24 camels, 83 sheep and 125 goats. These are animals sold for resell only, these numbers do not include animals sold for slaughter. The latter figure I neglected to get but, based upon elevage monthly slaughter records it can be estimated to be the equivalent of 14 goats, 2 sheep, and 1/2 bovine or camel.

The elevage agents in the prefecture of Tchín-Tabaradene are required to fill out their entire monthly report schedule and to do so regularly. This includes the numbers of animals slaughtered, the numbers of animals brought to the market and market prices. We copied this information for all of the markets for which it was available, Tchín Tabaradene, Abalak, Tabalak, Tofamini, Chadowanka, Tagabal, and Kao. The quality of this data remains to be seen. The numbers for August 24 we received from El Hodge Issa for animals brought to market are reasonably consistent with the monthly total reported by elevage. It is, of course possible that the elevage agent in Tchín-Tabaradene also gets his numbers from El Hodge Issa.

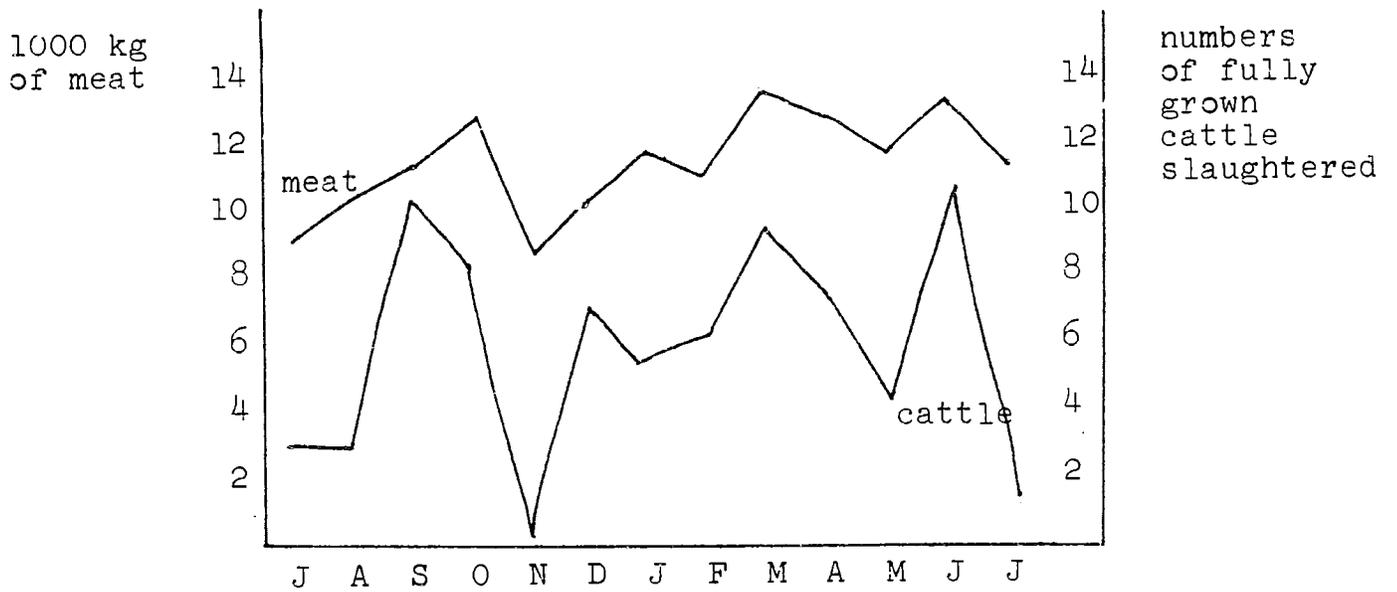
The seasonal variation in animals slaughtered in the Tchín-Tabaradene market is shown in figure 4. There are two consumption peaks, one in October and one in March. The October peak is possibly Tabaski (note that each market has shown an October peak) and the March peak may be hypothesized to be herd movements south. Unlike Ingal and Agadez, where cattle peaks a month or two earlier than camels, sheep, and goats, both classes peak together in March. The less pronounced seasonal variation in this market is probably due to a more constant year-around supply as well as many relatively approximate competing markets. The notable presence of Nigerian buyers in this market may have a stabilizing effect if they have sufficiently good market information.

Kao

The Kao market, a weekly market, holds most animal transactions on Tuesdays. It is the largest, in terms of numbers of animals

Figure 4.

Seasonal variation in total weight of animals slaughtered and in the numbers of fully grown cattle slaughtered in Tchintabaradene, 1979-1980.

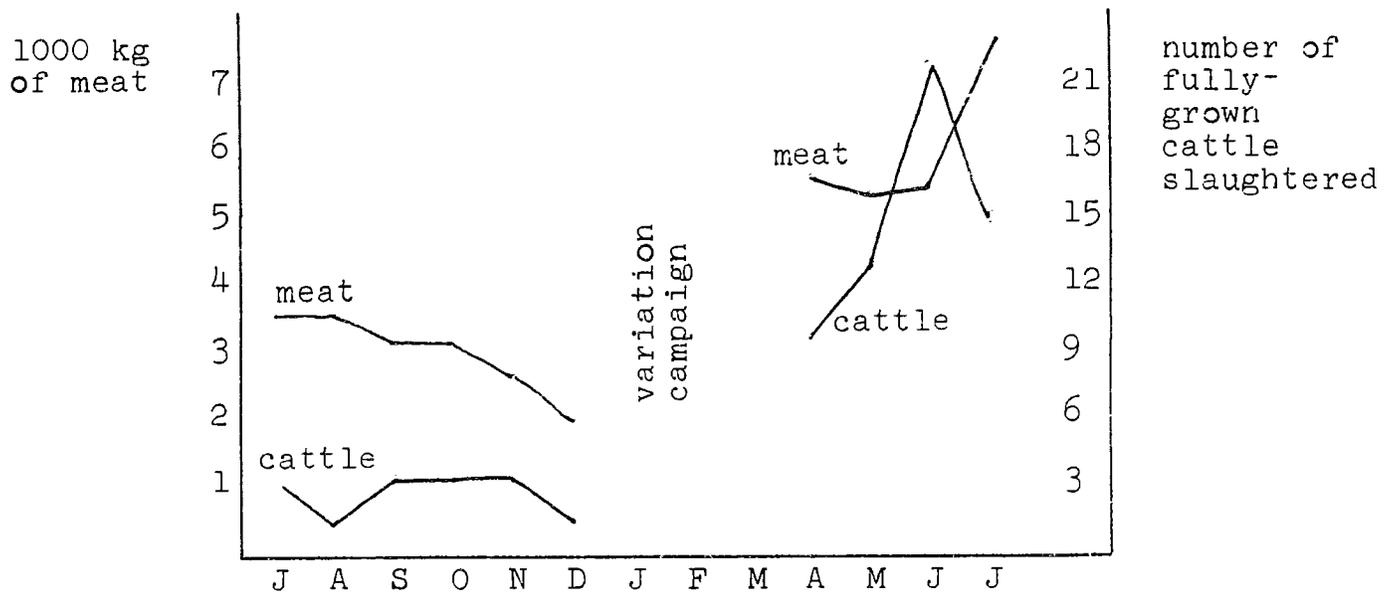


presented, of all the Tchín-Tabaradene markets. It is difficult to compare with the Agadez market for which animals presented data are not available. According to the elevage reports the following numbers of animals were presented in July 1980: cattle, 2338; sheep, 3000; goats, 3148; camels, 385. These numbers can be compared with figures for July in Tchín-Tabardene, the next largest market in the arrondissement (in July--in some months Abalak is more important): cattle, 219; sheep, 1517; goats, 1368; camels, 151. Kao is clearly a major resell market. I was told by the elevage agent that approximately 80% of the cattle, 20% of the sheep and 10% of the goats will go to the Nigerian market. Large animals are preferred for the Nigerian market, I was told, because they don't lose as much weight on the trek south and also because it is easier to manage a small herd of large animals than a large herd of small animals (in terms of both transactions costs and actual herding costs).

I was told that both Taureg and Fulani begin coming back through the region in February, March, and April. They then stay close to the region until they get the word that the fields are clear to move south into the (more intensely) agricultural zone. I was told that the water and grass typically start to give out in the cure salle region in December--a fact inconsistent with the Ingal data graphed in figure 3, which suggests that the major movements out of the cure salle zone take place in September and October. The seasonal variation graph shown in figure 5 appears to be demonstrating a secular trend of growth in the importance in the market. This hypothesis is reinforced by the data concerning the numbers of animals

Figure 5.

Seasonal variation in total weight of animals slaughtered and in the numbers of fully grown cattle slaughtered in Kao, 1979-1980.



presented -this July's total being the highest of any of the past 13 months. The numbers of animals presented (these numbers are to be viewed sceptically) in July of 1979 are given as follows: cattle, 624; sheep, 1774; goats, 2036; camels, 237. This apparent growth in both numbers presented and numbers slaughtered over the past year is a very interesting phenomena to be explored. My present inclination, based on the increase in slaughters (and assuming a constant demand for meat in Kao) is to believe that there is in fact an increase in the supply (that is a shift in the supply curve) taking place in Kao. Whether this is due to an increase in herd size, or to distress sells, or what, I don't as yet know. A remarkable observation is that the 14 fully grown cattle slaughtered from August to December were all cows. In fact of the 70 fully grown cattle recorded slaughtered over the 10 months for which I have data only 8 were male. This, I suspect, reflects the fact that most male cattle are finding a stronger market in Nigeria. Females, probably being sold as distress sales must be unloaded on the local market.

Abalak

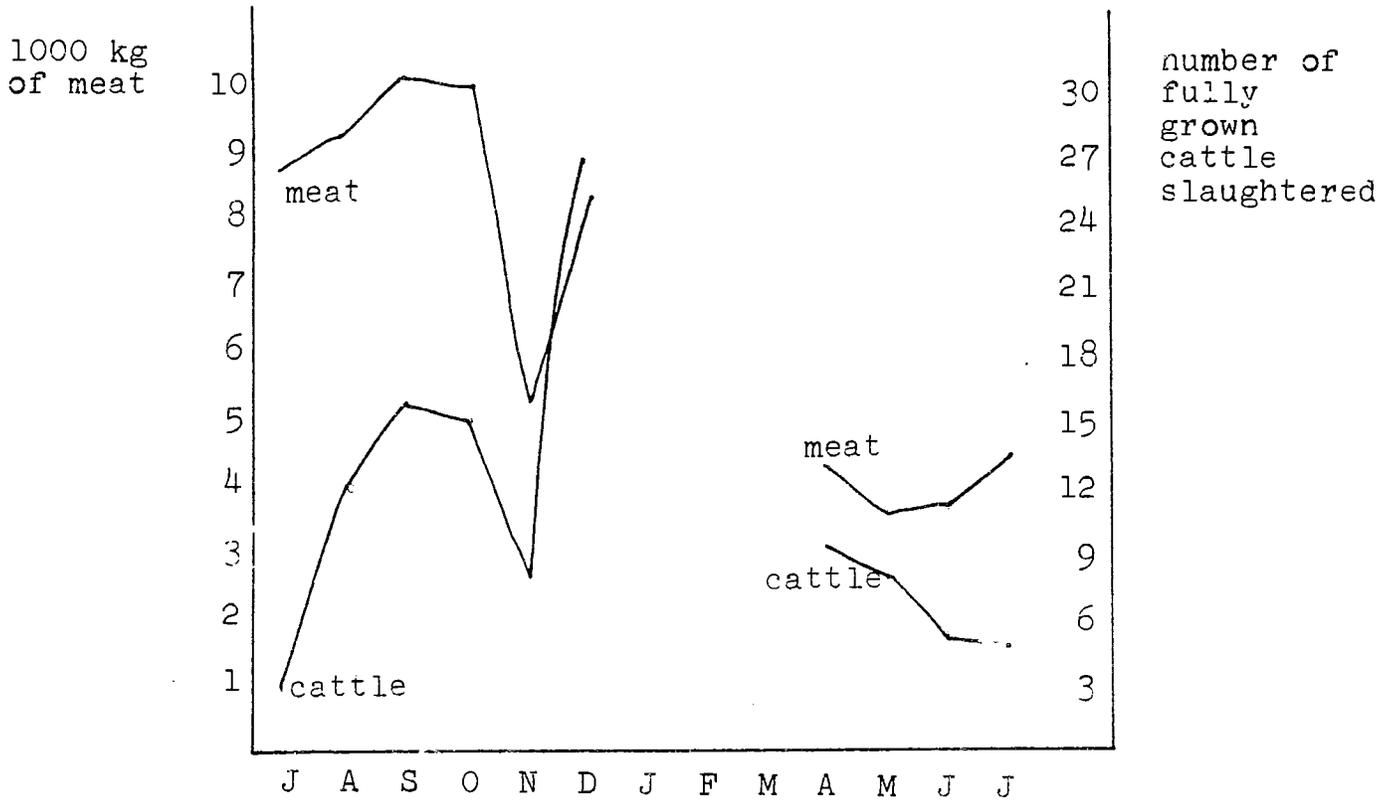
The Abalak market, a Thursday market is very similar in size to the Kao market. The day of our visit, however, 18/28/80, it had only around 50 cattle present, fewer than half the number seen in Kao. We were told by those present that 10 times this number would be present in December or January. Unfortunately elevage data for numbers of animals presented lacks these months due to the vaccination

campaign. The available data, however, does seem to indicate remarkable variability in month-to-month activity, especially with respect to cattle. For April, May, June and July the number of cattle presented are given as 1713, 1228, 368, and 44 respectively. In figure 5, is shown the seasonal variability in slaughters. This data confirms the slack period in June and July as seen in the animals presented data (this analysis will be further explored in the following section). Particularly interesting is a comparison of figure 5, the Kao slaughters and figure 6. One is tempted to conclude that Kao is taking over some of the previous importance of the Abalak market. (Note that this is not simply seasonal changes--this data goes from July 1979 through July 1980. Notice the relative positions of July 1979 and July 1980 for each market.)

Questions asked of Mai Tasha concerning shipments of animals to Arlit showed little activity. He remembered the last load to go north as being before Azumi--that is over a month ago. That event consisted of two Toyota pickup loads of approximately 40 goats and sheep each. One unloaded in Agadez and the other went up to Arlit. This was not considered to be a regular occurrence.

Figure 6.

Seasonal variation in total weight⁺ of animals slaughtered and in the numbers of fully grown cattle slaughtered in Abalak, 1979-1980.



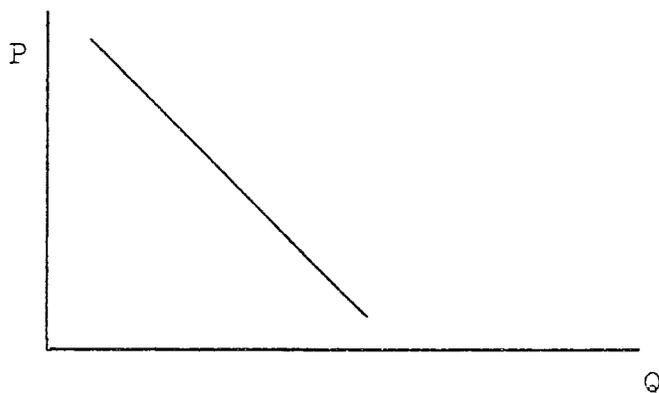
III. DISCUSSION AND ANALYSIS OF MARKET DATA

This section contains an analysis of the price data obtained in each market. We have at present the price data I collected plus the price data collected by the Elevage agents in the Tchou-Tabaradene Arrondissement. My data can be used for a very crude estimate of price differentials existing between markets in late August 1980. The Elevage data, monthly "average" prices for six markets (with many omissions) is of unknown but suspect quality. My data, an attempt to sample similar animals in each of the markets, is seriously flawed by lack of a scale or a measuring tape. This must be corrected in the future. In any case I will here attempt a preliminary analysis of this data in order to suggest hypotheses to be tested when better quality data has been collected.

The tools of this analysis consist of standard concepts of supply and demand. Despite their simplicity these tools can provide considerable insight into the nature of seasonal markets. In Figure 7 below is drawn a demand curve for animals for final consumption (slaughter).

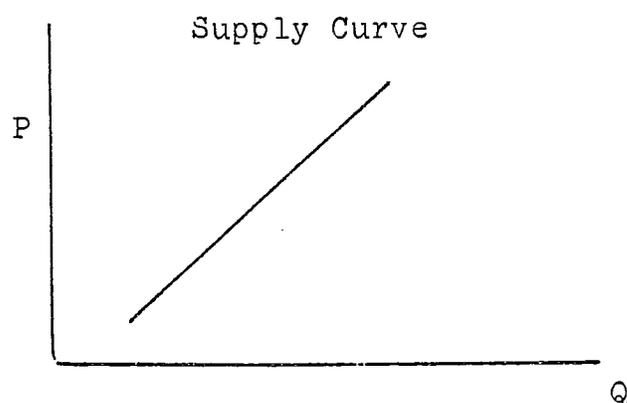
Figure 7.

Demand Curve



Considering this curve to be the demand curve for animals of defined characteristics in a given location, the slope of the curve can be taken to represent the rate at which the consumption of meat increases as price decreases. In general a very steeply sloped curve implies that demand is relatively insensitive to price while a flat curve implies that demand is very sensitive to price.

Figure 3.



In Figure 3 is drawn a supply curve. For supply, as for demand, we can think of the slope of the curve as representing the change in quantity (supplied/demanded) which results from a change in price. The responsiveness of supply and demand to changes in prices are called "elasticities" and are defined as the percent change in the quantity supplied (demanded) which results from a one percent change in price. Supply or demand is called inelastic if a given change in price evokes little change in quantity. It is elastic if the opposite is true.

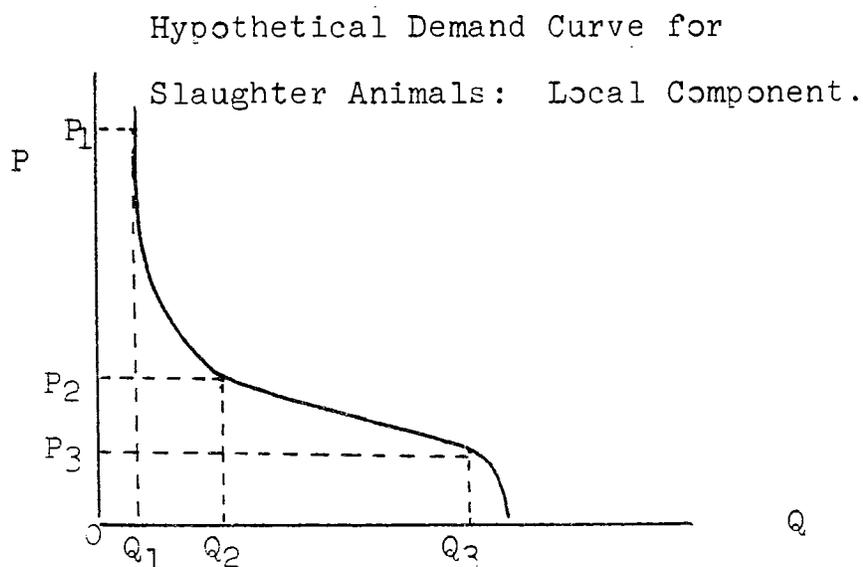
Consider now what we know, or think we know, about the animal market. We will use this a priori knowledge to attempt to develop

some hypotheses concerning the interaction of prices and quantities. We will then look at the available data to see to what extent it is consistent with the hypotheses. This exercise will also serve to focus further investigation.

Demand

Demand for animals in a Nigerian market (I confine my remarks here to the demand for animals for the slaughter market) can be thought of as being made up of two components: a local and an export component. The local market is relatively thin: that is, the elastic range of the curve is followed by a sudden downturn into an inelastic range as graphed in Figure 9.

Figure 9.

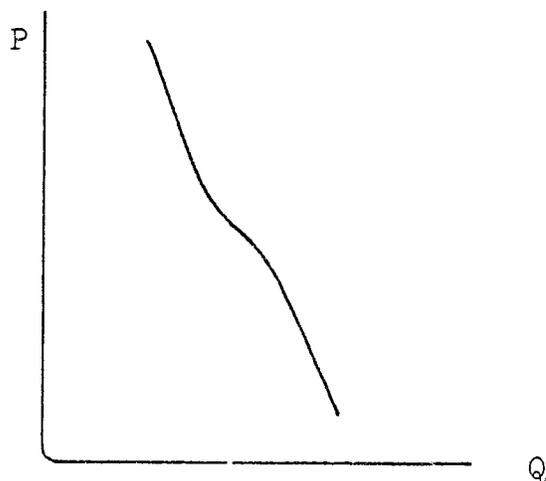


The elastic portion, from Q_1 outward reflects the luxury nature of meat consumption in the diet of the average Nigerian. A decrease in the price from P_1 to P_2 induces only a small increase

in meat consumption (Q_1 to Q_2) as there exist few consumers with sufficient discretionary income to substitute other purchases for meat in prices in that range. Those who purchase in the P_1 to P_2 range are so well-to-do that they are insensitive to price. At prices between P_2 and P_3 , however, the number of people willing to substitute other commodities for cheaper meat grows rapidly and the demand curve enters an elastic segment as price reduction from P_2 to P_3 induces consumption increases from Q_2 to Q_3 . Beyond Q_3 however, the market is sated. Further reductions in price induce little or no increased consumption. Looked at another way, if more than quantity Q_3 were put on the market people would be unwilling to pay anything for it- they would already be full. The larger the number of consumers and their income distribution the less pronounced one would expect the shifts from inelastic to elastic and back to inelastic portions of the demand curve. In Arlit, for example, the opposite conditions prevail: the market is isolated and it is made up of almost uniformly high-income consumers. The hypothesized demand curve for Arlit is as drawn in Figure 10.

Figure 10.

Hypothetical Demand Curve for Arlit



Here the extremely high incomes create a situation in which virtually everybody is in the price insensitive range of the demand curve. People consequently consume about the same quantity of meat regardless of the price. This market becomes a "price adjusting" (rather than quantity adjusting) market. Price variation can be expected to be severe as relatively minor changes in supply yield large changes in price. In such a market pressure for collusion among butchers is great. Too many animals slaughtered means that everybody loses (except of course the consumer). Efforts by individual butchers to increase their market share is likely to have the effect of shifting the supply curve below the point where a decrease in price is more than compensated for by an increase in quantity. That is, into the inelastic range of the demand function. That there is some tendency to oversupply the market (from a monopolistic point of view) was evidenced by a butcher in Agadez who told me that the butchers do better financially when meat is in short supply.

As we move south from Arlit three factors change on the demand side of the market. First the markets cease being solely slaughter markets and resell of animals becomes increasingly important. Lack of adequate forage in Arlit virtually precluded this possibility (not to mention the Sous-Prefet's specific order that all animals in Arlit are to be slaughtered the day after purchase—a matter about which we will have more to say in the following section.) Second, the income distribution of potential consumers becomes much wider, as a more normal range of occupations and opportunity (than

that of the uranium mines in Arlit) result in a wider range of incomes among individuals. This, in turn, leads to demand curves shaped more like that in Figure 9 than Figure 10. Finally, in all markets south of Arlit Nigerian buyers were present. These buyers, unlike the butchers in Arlit, are purchasing for resale in a (coastal) market that is so large relative to their power to serve it, that they need have no concern over the impact of their animals on the price. One can hypothesize, therefore, that these buyers provide some support under the price in markets in which they are present. The extent to which this support is firm depends on their degree of capitalization and their numbers. These three factors, the strength of the retail market, the wider distribution of incomes, and the presence of demand from the large Nigerian market, all act to widen the relatively elastic range of the demand curves in markets south of Arlit. This, one would expect would result in supply variations having less effect on prices in the southern markets than the northern. In addition the lower transport costs to Nigerian markets can be expected to result in a willingness on the part of buyers to pay higher prices in southern markets than in northern. Higher prices with less variability can be expected to provide a powerful incentive for a seller to sell in a southern market.

Supply

The supply side of the market is more difficult to analyze than the demand side. The difficulty arises from our lack of understanding of the roll of the dairy enterprise in the pastoralist's production

enterprise. Although most observers agree that the typical Sahelian cattle herd contains too many males and too many old animals to reflect an optimal management strategy for beef animals, the influence of the dairy enterprise on decision-making is not, at this point in time, well understood. Horwitz suggests that the existence of old males in the herds can be explained by their usefulness in helping to control and direct the herd--this could presumably be relatively easily verified through field questioning. The role of the dairy enterprise on the other hand is much more difficult to get a handle on. There are at least four general lines of inquiry that must be explored:

1. What is the role of dairy products in family subsistence? Are there "rules of thumb" which the herder-decision makers use to determine an adequate subsistence flow of milk; does total herd milk supply enter importantly into the culling decision?
2. How important is the role of dairy products as a contributor of cash income?

Both of these questions can only be answered when we have a better understanding of the total production of milk and its seasonality. Do cows all freshen at once? If not, how cyclical is milk production? How strong is the market for dairy products? How does price and revenue vary as a function of season and location?

Until the above is known it will be impossible to understand the determinants of supply in a meaningful way. In order to provide a frame of reference and to stimulate dialogue I here present the consensus of a group of Fulani with which I was talking in the Maradi market.

1. A milk cow will start to decrease milk production after having calved 12 times.
2. After about 10-12 years a cow will start to lose value in the market place, although this is highly variable depending on the fitness of the particular cow.
3. A cow will milk all year until she's bred back. I have the impression that I was told that often she's dried off when she's bred back although that is to be confirmed.
4. A very good cow (in the dagi) will produce 2-1/2 tia a day for human consumption. That is, after having fed her calve, there remains 2 1/2 tia for human consumption (1 tia equals approximately 3 litre). When asked how much milk would be available for human consumption from five cows the response was 7-1/2 tia or an average of four and one-half litres. (This figure is at the very high end of the Sahelian dairy production estimates as reviewed by Shapiro in the Summary edition of the CRED study. In fact Shapiro seems to doubt that the author reviewed actually was getting production figures net of the calve's subsistence.)
5. "In the dagi there is nothing to do with the milk." At this time of the year (August) there is apparantly such a surplus of milk relative to demand that it loses economic value.

In a purely qualitative sense we can be certain that the role of the animal as a provider of dairy products leads to a herd containing more old animals than a herd maintained solely for beef production. Until we know more about milk production and the market for dairy products we won't be able to assess its quantitative importance.

The decision to sell an animal is based on a number of considerations. We have just discussed the role of the animal in helping to maintain a subsistence level flow of dairy products. A similar concern was expressed in the project paper for attaining a herd size capable of providing a subsistence flow of meat products. These issues give cause for concern when one observes, as mentioned in Section II for Kao, the high percentage of slaughters that are females.

In Table 1 I summarize the data concerning slaughters of cattle by age and sex for Arlit and Agadez, and the total for the seven markets in the Tchén-Tabaradene Arrondissement (this data contains many missing entries and is consequently not to be taken as representative of total numbers of animals slaughtered. I see no reason, however, to expect a bias in age and sex composition). Despite repeated efforts, I have been unable to infer herd composition from this data. I am confident, however that given literature values (the Shapiro Review in the Summary volume of the CRED study shows remarkable consistency in herd composition throughout the post-drought Sahel) and breakdown of calve slaughters by sex it will be possible to infer herd composition and herd rebuilding behavior. The most that can be said concerning the data in Table 3 is that use of the figures for Tchén-Tabaradene to infer culling practices would be very misleading. This data seems to indicate that 79% of the culls of mature animals in the region are females with only 21% being males.

TABLE 1

Age and Sex of Cattle Slaughtered by Region.

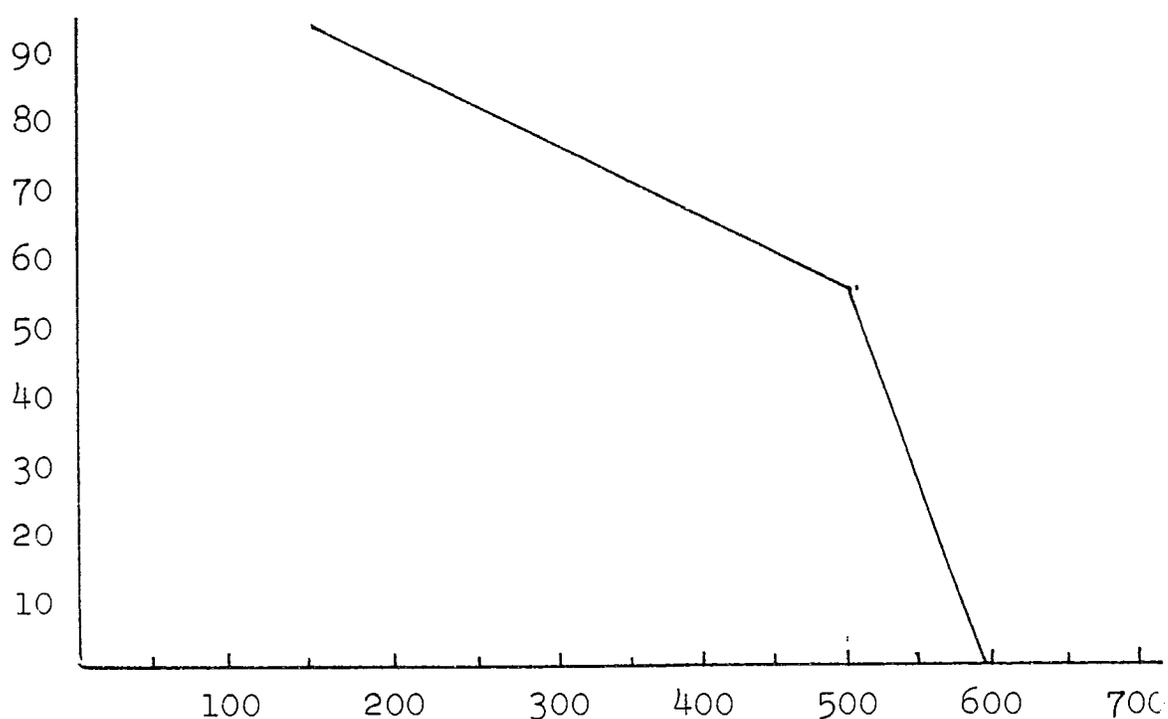
	<u>Arlit</u>	<u>Agadez</u>	<u>Arrondissement of Tchín-Tabaradene</u>
Steers	124 88.5%	159 77%	37 21%
Bulls	190	682	33
Cows	41 11.5%	254 23%	270 79%
Calves	138	194	180
Cows and calves as a percent of total.	36	35	87

For Arlit and Agadez, however, the culling proportions are in opposite proportion. In fact, if one starts at Arlit and moves south from Agadez to Tchín-Tabaradene, one observes a monotonous decrease in the percentage of males slaughtered. Clearly these numbers reflect a combination of decreasing transportation costs to the Nigerian market and the Niger government's policy of prohibition of exports of fertile females and cow-calves to Nigeria. If herd composition is relatively constant throughout the zone and it is safe to assume that the Arlit market represents the normal culling rate for males and females (transportation costs to Nigeria being prohibitive) then we may infer that for Agadez 2209 mature animals were marketed of which 254 were cows and were sold locally and 1955 were male. Of these 1955, 841 were marketed locally and 1114 were marketed in Nigeria. For Tchín Tabaradene we can calculate that the total number marketed was 2348 of which 270 were locally marketed females, 70 were locally marketed

males, and 2008 were males exported to Nigeria. Continuing to push these numbers we can graph the percent of mature males exported to Nigeria as a function of distance from Birni Nkonni as in Figure 11.

Figure 11.

Estimate of Percent of Animals Exported
to Nigeria as a Function of Distance from
Birni Nkonni.*



*

The Center of the market for the Tchib-Tabaradene Arrondissement is taken to be 175 miles north of Konni: latitude falling between Kao and Abalak.

Clearly these numbers are to be taken as suggesting hypotheses and methods—not as research results. The difference between sex composition of slaughters as a function of distance does however, appear to have the potential to provide important information concerning

the strength of the pull of the market in Nigeria. The initial assumption in the above is that cows represent 11.5% of the mature animals marketed in all regions. This number was used to estimate the total numbers of male animals marketed from the Agadez and Tchín-Tabaradene regions. Exports were then derived by subtracting locally sold males from the estimate of total males marketed. A variant of this procedure, with good herd composition data and Niger-Nigeria price differentials, should allow an indirect estimate of total transport costs to Nigeria. This will also provide an important means of locating inconsistencies in reported data.

Prices

The intersection of the forces affecting supply and demand results in market prices. In Tables 2 and 3 are presented the prices we collected on the August tournée. The prices vary in terms of their quantity and their comparability. This reflects somewhat learning-by-doing on my part. Clearly in the future, however, a tape or a scales is essential to obtain truly comparable numbers. For Arlit I obtained the prices of all the animals slaughtered on a given day. Unfortunately I have no description of the age and sex of the animals. My personal descriptions of animals in this market were found to be useless. Descriptions improved as I overcame my reluctance to be persistent in questioning. With the exception of Arlit all the raw data is presented in Table 2. Standard deviations (S.D.) are shown below the means (AVE) for each animal type in each market. Clearly sample sizes are too small and variability too large to reject the hypothesis that prices are the same in all markets. This variability

is, of course, a product of my inability to adequately define comparable animals in each market. In Table 3 the data is summarized and, in the lower table an attempt is made to develop a slightly more uniform data set by throwing out animals of less than one year of age under the assumption that they are not destined for the slaughter market. The rationale for this exercise is the fact that as we move south of Agadez the markets become more resell oriented than slaughter-oriented. The result is that a non-stratified sample will pick up more young animals in the southern markets than in the north, and when averaged, it will impart a downward bias on the prices in the south when they are interpreted as reflecting comparable animals. Although by and large the price differences are not statistically significant, the trend toward increasing prices for sheep as one moves southward does seem substantial. In general, however, it seems evident that any real differences are being masked by the poor quality of the data. Table 4, copied from the elevage "monthly" reports makes, to me anyway, even less sense. It is possible that further investigation may suggest some order in the numbers. At present however, my predilection is to believe that they have little basis in reality (note the apparant change in personnel in Chadawanka between December and March).

TABLE 2
 Prices Collected in Markets,
 August 12--August 29, 1980

	<u>Sheep</u>	<u>Goats</u>	<u>Bovine</u>	<u>Camel</u>
ARLIT				
AVE	8,679 (n=27)	4,970 (n=53)	55,000 F,2yr	80,000
S.D.	4,677	1,576		
AGADEZ				
	7,500	6,000	60,000 M,4yr	60,000 3 yr
	6,800	1,500	63,000 M,5yr	30,000 old
	6,000	2,500	75,000	
	10,000	2,500	20,000 F,1yr	
	20,000	2,000		
	7,500	6,500		
	7,500			
	<u>12,000</u>			
AVE	9,662 (n=8)	3,500 (n=6)	54,500 (n=4)	45,000 (n=2)
S.D.	4,599	2,168	23,896	21,213
INGAL				
	6,000	3,500	33,000 F,3yr	50,000
	2,000	3,500 F	15,000 1 yr	40,000 F,4yr
	1,500 M	1,500 M	51,000 3 yr	
	5,300 F,1yr	3,000 old		
	5,200 M	4,300 M,1yr		
	5,500 F,4yr	1,500 M,6m		
	15,000 F,3yr	1,500 F,3m		
	6,000 M,2yr	1,500 M,5m		
	1,500 M,6m	3,500 M,5yr		
	4,000 9m	3,500 F,2yr		
	7,500 M,3yr	3,500 F,2yr		
	3,000 F,1yr	3,500 F,4yr		
	14,000 M,5yr	3,000 F,4yr		
	14,000 M,5yr	2,000 F,3m		
	7,000 1yr	4,400 F,1yr		
	15,000 4yr	4,400 F,1yr		
	13,000 M,4yr	4,000 M,7yr		
		3,500 F,4yr		
AVE	6,045 (n=22)	3,089 (n=18)	33,000 n=3	45,000 n=2
S.D.	4,949	1,035	18,000	7,071

Table 1 (continued)

	<u>Sheep</u>	<u>Goats</u>	<u>Bovine</u>	<u>Camel</u>	
TCHIN- TABARADENE	5,000 M,6m	6,000 F	37,000 F,7yr	70,000 M,7yr	
		4,500 F	40,000 F,7yr	45,000 3½yr	
		4,000 F	28,000 F,18m	45,000 4yr	
		5,000 F,6yr	27,000 2yr		
		5,500 3 yr	57,000 3yr		
		2,500 1 yr	57,000 3yr		
		2,500 1 yr	40,000 3yr		
			35,000 2½yr		
			12,000 7m		
	AVE	5,000 (n=1)	4,286 (n=7)	37,000 (n=9)	53,000 n=3
S.D.		1,380	14,265	14,434	
KAO	15,000 castré		90,000 F,7yr	90,000 10yr	
	11,000 M,1yr		50,000 F,3yr	40,000 4yr	
	12,000 M,2yr		30,000 calf	65,000 6yr	
	5,000 F,1yr		80,000 castré		
	7,250 F,2yr	3,750	55,000 F,8yr,m		
	41,000 M,3yr	3,750	62,000 F,8yr,s		
	50,000 M,9yr				
	AVE	20,178 n=7	3,750	61,167 n=6	65,000 n=3
	S.D.	17,787	0	21,544	25,000
	ABALAK	18,000 M,5yr		50,000 F,4yr	70,000 7yr
25,000 M,5yrcastré			60,000 F,7yr	56,000 2½yr	
25,000 M,3yr			65,000 F,9yr	110,000 12yr	
25,000 M,3yr			80,000 F,12yr		
16,500 M,3yrcastré		7,000 F,2yr	70,000 F,7yr		
6,000 F,2yr		2,000 M,8m	30,000 F,1yr		
14,000 M,3yrcastré		7,000 M2½yr	40,000 F,13yr		
28,000 M,4½yr					
AVE		19,688 (n=8)	5,333 (n=3)	56,428 (n=7)	78,667 (n=3)
S.D.		7,430	2,887	17,491	28,024
MARADI	17,000 M,1yr	3,000 F,4m	120,000 M,8yr		
	30,000 M,2yr	3,000	80,000 F,7yr,s		
	16,000 M,7yr	3,000	50,000 F,3yr		
		4,000 1yr	30,000 M,1½yr		
		5,000 F	58,000 F,9yr,m		
		3,000 1yr			
		5,500 F,4yr			
		5,500 F,1yr			
	AVE	21,000 (n=3)	4,000 (n=3)	67,600 (n=5)	
	S.D.	7,810	1,165	34,334	

TABLE 3

Summary: Prices Collected in Market

	Whole Sample Averages (FCFA) (S.D.)							
	Sheep	n	Goats	n	Cattle	n	Camels	n
ARLIT	8,679 (4,677)	27	4,970 (1,576)	53	55,000	1	80,000	1
AGADEV	9,662 (4,599)	8	3,500 (2,168)	6	54,500 (23,896)	4	45,000 (21,213)	2
INGAL	6,045 (4,949)	22	3,089 (1,035)	18	33,000 (18,000)	3	45,000 (7,071)	2
TCHIN T	5,000	1	4,286 (1,380)	7	37,000 (14,265)	9	53,000 (14,434)	3
KAO	20,178 (17,787)	7	3,750 (0)	2	61,167 (21,544)	6	65,000 (25,000)	3
ABALAK	19,688 (7,430)	8	5,333 (2,887)	3	56,428 (17,491)	7	78,667 (28,024)	3
MARADI	21,000 (7,810)	3	4,000 (1,165)	8	67,600 (34,334)	5		

Animals at least 1 year old

Arlit and Agadez Compared with Others¹

ARLIT	8,679	4,970	55,000	80,000
AGADEV	9,662	3,500	54,500	45,000
INGAL	9,267	3,564	33,000	45,000
TCHIN-T	5,000	5,000	37,000	53,000
KAO	20,178	3,750	67,400	65,000
ABALAK	19,688	5,333	56,428	78,667
MARADI	21,000	4,000	67,000	

¹ NOTE - Ages were not asked in Arlit and Agadez. Thus, these markets are assumed to be terminal markets with animals sold no earlier than one year.

TABLE 4

Prices From Elevage's Mercurial

By Time and Location:

Boeufs gras

	Oct	Nov	Dec	Mar	Apr	May	June	July
Tchin-T	74,950					71,150	59,900	66,225
Tofamini	80,000					58,000		
Abalak	77,500			80,000	72,000	70,000		40,000
Kao		77,000	77,000				111,650	
Chadawanka	35,000	42,250		78,000	84,000	80,000		74,000

Boeuf 6 ans

Tchin-T	64,575					64,000	54,240	66,225
Tofamini	62,000					40,000		
Abalak	65,750			60,000	50,000	52,000		40,000
Kao		80,000	80,000				85,660	
Chadawanka	33,400	39,500		67,000	73,000	75,000		74,000

Belier

Tchin-T	7,200					7,625	14,200	7,750
Tofamini	12,125					14,000		
Abalak	14,875			15,000	8,000	12,000		7,000
Kao		15,000	15,000				16,935	
Chadawanka	13,000	8,500		16,000	12,000	9,500		8,000
Tabalak	15,000	17,000						

Chèvre 3 ans

Tchin-T	3,625					6,500	7,780	5,300
Tofamini	5,000					3,500		
Abalak	5,875			4,000	5,000	4,500		5,000
Kao		4,000	4,000				4,800	
Chadawanka	3,550	3,300		5,000	4,000	5,000		3,000
Tabalak	5,000	5,000						

IV. PRELIMINARY OBSERVATIONS ON PROJECT ACTIVITIES

In this section I suggest activities which I feel would be useful in helping the project to better fulfill its mandate.

The March 1980 "First Revised Work Plan" provides a good starting point for evaluating project activities. In view of the delays already encountered, both in the recruitment of necessary personnel and in the commencement of information acquisition by personnel already in the field, I feel that it is a useful exercise to begin now, before it is too late to take steps to assure that the most essential activities be performed. Pressure to initiate positive interventions during a second phase will be insurmountable. Furthermore, such pressure is not likely to be tolerant of a second phase consisting of pilot interventions combined with careful study of their impact. For this reason, as well as others to be elaborated below, I suggest that selected pilot interventions be initiated at present, as part of the study phase of the project. My recommendations are the following:

1. Someone must do a thorough review of the relevant literature, both project and academic, in both the French and English languages. In particular I suggest a careful study of the materials produced by the CRED livestock studies, a study of relevant World Bank project documents, and study of the available technical literature in French concerning grassland species, succession and composition, and herd composition, dynamics and disease incidence. The assumption that no such literature exists or that it is

of too poor quality to bother with is sheer intellectual arrogance. This project already does not have sufficient resources to dismiss the work of others. Our energy in the field should be devoted to obtaining information which our literature survey clearly determines to be essential and either absent or controversial.

2. The present study of grassland response to herd pressure must be supplemented. The single most important variable, upon which virtually all subsequent interventions hinge, is the response of grassland to different amounts of grazing pressure under different quantities and distributions of rainfall. Furthermore this appears to be the area of project interest having had the least amount of prior scientific investigation. These annual grasses, and the agristological evidence indicates that they have always been annual grasses, clearly do not respond to grazing pressure in the same way as American annuals.

The essential questions to be answered are the following:

- a. Are present reports of the deterioration of the quality of grasses true?
- b. If this deterioration is a fact is it to be attributed to a natural change in the succession due to the drought, or to herd pressure?

- c. Does grazing intensity change succession or not? If so how?
- d. Is the change in succession under intense grazing influenced by rainfall and if so how?

Answers to these questions can only be obtained by observing different sites in which the following characteristics vary simultaneously:

- a) length of time between the drought and the commencement of grazing activity
- b) grazing intensity
- c) inter and intra-annual rainfall distribution

The present study varies only (b) the grazing intensity, and will vary it over a very short period of time. The results will clearly be too conditional in nature to be relied upon as the sole basis for grassland management.

Fortunately the means exists to supplement the existing study with the necessary information literally hundreds of wells exist in the project area. Some have existed before the drought and many have been constructed since the drought. The date of construction gives us the necessary information on characteristic (a) above. Grazing intensity increases as one approaches a well. This provides information on characteristic (b) above. The wells are located in widely disperse areas receiving widely variant quantities and distributions of rainfall. Furthermore, I have been told, rainfall gauges have been installed at government wells. This provides information concerning the third variable (c) above.

Therefore the means exists to observe the necessary range of variables. Peace Corps Volunteers, trained to do the grassland species and quantity composition analysis exist, are under-utilized and would be more than happy to carry out the study. I urge in strongest terms that this opportunity to provide this essential information not be lost. I would be happy to have students do the necessary statistical analysis of the data back at Williams.

3. The socio-economic group should begin now with selected, pilot interventions. This would serve the dual purpose of creating an environment in which the response of the herder groups can be observed by those presently involved in their study, and of providing a test of actual interventions at a level and a time which permits modification and abandonment.

The type of socio-economic research being presently conducted is extra-ordinarily difficult. Many months of close personal control are required to build the confidence requisite to learning about household production, household and group decision-making and the location of decision-making power. Such time intensive research limits dramatically the number and range of groups that can be studied. This in turn, puts severe limitations on the ability to generalize from the information learned. The idea that the basic research can be completed and then a full scale and ready-made, optimal project can be designed is not tenable. The basic research now being conducted could best be conducted in the presence of selected pilot interventions. This procedure

would improve the rate of information flow by providing a focus for questions concerning herder decisions, values, and constraints. It would provide a more clear justification to the herders for the presence of "all those people asking all those personal questions". Furthermore it would put a technique or a service to the empirical test. The exercise of trying to choose these interventions, their location, and their scale would provide an important stimulus for beginning to think about implementation.

4. A means must be found to improve communication among the researchers. Papers, ideas, hypotheses, observations, guesses—these should all be circulating among the researchers in such a way that they feel a part of a research team, not a group of individual researchers doing vaguely associated things. This should be combined with the task of reviewing the literature so that the researchers presently in the field will be aware of issues raised by others.

V. WORK PLAN

The following work plan specifies how I think I can use my time to most effectively contribute to the project as well as how others (presumably Moussa will be one) can collect information essential to the study.

My Proposed Work Plan

December - three days at CRED (Ann Arbor) to talk to Shapiro and Arizio Nino and to check on the state of data provided them by Merle Baker and to collect literature.

February 1-15. Review literature concerning livestock production and marketing in the Sahel.

February 15 - March 25.

1. Meet with project personnel to exchange ideas.
2. Repeat market tournée perhaps adding Eastern markets. Use scales and/or tape. Attempt to collect data on dairy production and markets.
3. Look at well-site rangeland data. Take it back to Williams to analyze.
4. Begin to consider recurrent costs of phase II project
5. Write report.

May 25 - June 30.

1. Repeat the above
2. Work up recurrent cost data.
3. Write final report concerning marketing patterns and the design and recurrent costs of a phase II project.

Moussa's Work Plan

On a monthly basis Moussa should repeat the tournée I took in August. In order to assure comparability in the data he must, as we discussed, use a body tape to estimate the weight of the animals. For animals purchased for local slaughter I suggest that purchase price be recorded on market day and that the animal be tagged and weighed the following day at the abbatoir. The easiest technique would clearly be to purchase a spring scale which could be fitted with a meat hook and hung in the abbatoir. I recommend that such a device be obtained immediately. An alternative would be to use the small ruminants scales which I saw at the Ibessetene ranch. If beef or camel carcasses are too heavy they could be weighed in quarters. The scales can be transported in the back of the Scout (inasmuch as anything can be said to be reliably transported in a Scout). This procedure will clearly be possible in Arlit, Agadez, and Ingal, all of which are daily markets. It should also be possible in the other markets although scheduling will be close. This procedure would require the following schedule:

- | | | |
|--|---|---------|
| 1. Arlit | } | any day |
| 2. Agadez | | |
| 3. Ingal | | |
| 4. Sunday - Tchén-Tabaradene market day; tape animals sold for resell. Tag animals sold for local slaughter. | | |
| Monday - Weigh tagged carcasses at abbatoir. | | |
| 5. Tuesday - Kao market day. Tape and tag. | | |
| Wednesday - weigh tagged carcasses. | | |

6. Thursday - Abalak market. Tape and tag.
Friday - Weight tagged carcasses.
7. Maradi. Repeat.
8. Sakabel. Repeat (a Sunday market)

Price, Age, Weight and Sex should be recorded for all taped and tagged animals. Periodically tagged animals should also be taped in order to derive a correspondance between live weight (as estimated by the tape) and carcasse weight.

In general Moussa (and he will clearly need a helper) should record as many animals as possible. At a minimum he should record the above data for the following animal catagories.

1. All cattle and camels purchased for local slaughter.
2. For the following he should attempt to record 3 animals in each category.
 - a. Boeufs gras
 - b. Boeuf 6 ans
 - c. taureau
 - d. genisse
 - e. vache sterile
 - f. vache laitière
 - g. belier
 - h. belier castré
 - i. brebis

- j. bouc
- k. bouc castré
- l. chèvre 3 ans

Clearly not all categories will be represented in all markets. My expectation is that the bulk of the market weight animals would be weighed as carcasses. It is important, however, that a substantial number of younger animals be represented. It may be a good idea to have a Peace Corps Volunteer help Moussa on the first trip or so.

VI. FINAL COMMENTS

The purpose of this report has been primarily to stimulate as much thought, discussion, and conjecture as possible. Its design has been to generate hypotheses, not to test them. It presents evidence of varying degrees of reliability and some attempt is made to make apply simple economic analysis to the interpretation of the evidence. I have reported responses to questions concerning age price relationships, age milk production relationship and others. These responses are recorded in order to promote contradiction or verification. I do not necessarily believe these numbers. I present them in an effort to interest others in the project in obtaining and communicating supporting or conflicting evidence. I do believe that we need this dialogue and this data. I firmly hope that this report will be of help to project personnel in developing a clearer understanding of events in the project. I look forward to your comments and insights.

APPENDIX I.

Animals Slaughtered in Tchín-Tabaradene. 1978 1980. Elevage Data.

	<u>Abattoir</u>	<u>steer</u>	<u>bull</u>	<u>cow</u>	<u>heifer</u>	<u>sheep</u>	<u>goat</u>	<u>camel</u>
JULY	Tchinta			3	1	34	459	
	Chadawanka		2	2	1	18	86	4
	Togalal					5	40	
	Abalak	1		2	3	74	354	4
	Tofamini			1		7	21	1
	Kao			3		29	155	1
	Tabalak			2	1	22	82	3
			1	2	13	6	194	1197
AUGUST	Tchinta	1		2	3	70	438	4
	Chada		4	3	5	38	171	15
	Togalal					6	42	
	Abalak	3		8	6	96	327	2
	Tofamini			1	1	3	36	
	Kao			1	1	47	129	1
	Tabalak			2	1	25	115	5
			4	5	17	17	285	1258
SEPTEMBER	Tchinta	4	0	6	3	126	403	1
	Tabalak			2	2	22	97	3
	Kao			3	5	34	100	
	Tagalal			0	0	6	42	
	Chadawanka		3	4	2	26	153	3
	Abalak	2	0	14	8	103	353	
	Tofamini	0		0	1	4	42	
			6	3	29	21	321	1190

Appendix I (continued)

	<u>Abattoir</u>	<u>steer</u>	<u>bull</u>	<u>cow</u>	<u>heifer</u>	<u>sheep</u>	<u>goat</u>	<u>camel</u>
OCTOBER	Tofuminar	0	0	0	0	5	38	
	Abalak	5	0	10	13	74	333	6
	Tabalak	0	1	2	6	29	108	2
	Kao	0		3	6	25	94	3
	Chadawanka	0	2	7	2	15	156	5
	Tagalal	0		0		5	38	
	Tchin-Tabaradene	2	0	6	6	189	404	3
		7	3	33	28	346	1171	19
NOVEMBER	Kao			3	3	29	78	1
	Tabalak		1	3	5	18	62	1
	Chada			1	1	6	53	0
	Tagalal			0		5	42	
	Abalak			8	12	36	178	
	Tchin-Tabaradene			0	3	160	280	
		0	1	15	24	253	637	2
DECEMBER	Tchinta			7	1	100	321	
	Kao			1	5	29	46	1
	Tabalak			1	2	18	56	5
	Chada		1	2	0	17	78	
	Abalak	4		22	19	64	201	3
	Tagalal			0		5	40	
	Togamini			0		0		
		4	1	33	27	333	742	9
JANUARY	Tchin-Tabaradene			5	1	215	352	5
FEBRUARY	Tchin-Tabaradene		1	5	1	168	363	3
MARCH	Tchin-Tabaradene	2	0	7	7	247	374	7

Appendix I (continued)

	<u>Abbatoir</u>	<u>steer</u>	<u>bull</u>	<u>cow</u>	<u>heifer</u>	<u>sheep</u>	<u>goat</u>	<u>camel</u>
APRIL	Tchin-Tabaradene		3	4	7	188	401	3
	Kao	1		8	5	113	100	4
	Abalak		1	8	4	58	109	2
	Chadawanka		3	4	3	33	126	4
	Tagalal					6	29	0
			1	7	24	19	398	765
MAY	Tchin-Tabaradene	4			4	158	397	5
	Kao	2	2	8	3	86	117	1
	Abalak	0	1	7	4	34	112	0
	Tofamini	0	1	6	1	9	21	0
	Chadawanka		1	4	1	20	100	3
	Tagalal					8	42	0
		6	5	25	13	315	789	9
JUNE	Tchinta	2		8	4	150	471	1
	Kao	1		20	3	51	105	5
	Tabalak	0				14	45	0
	Chadawanka		1	4	6	38	133	7
	Tagalal					11	32	
	Abalak			5	4	48	111	2
	Tofamini			4	1	3	13	1
		3	1	41	18	315	910	16
JULY	Tchita	1				63	417	1
	Abalak		1	4	2	49	156	
	Tofamini		1	1	3	4	6	1
	Chadawanka		2	6	1	22	84	2
	Tagalal		0			6	33	
	Kao	2	0	12		78	191	3
	Tabalak		0			9	54	
		3	4	23	6	231	941	7

APPENDIX II

Numbers of Animals Presented in the Market. Tchín-Tabaradene Arrondissement. 1979-80.
Elevage Data

	<u>Market</u>	<u>Horses</u>	<u>Donkeys</u>	<u>Cattle</u>	<u>Sheep</u>	<u>Goats</u>	<u>Camels</u>
JULY	Tchin-Tabaradene	0	239	374	2199	1764	271
	Chadawanka	1	119	77	1333	1075	32
	Tagalal	0	0	0	2070	471	0
	Abalak	1	243	508	1681	0	336
	Tofamini	0	143	126	1196	1069	89
	Kao	0	226	624	1774	2036	237
	Tabalak	0	33		775	968	0
	<u>Total</u>	<u>2</u>	<u>1009</u>	<u>1699</u>	<u>9228</u>	<u>7383</u>	<u>1035</u>
AUGUST	Tchin-Tabaradene	-	131	0	1046	1466	307
	Tagalal	-	0	0	88	121	0
	Chadawanka	-	157	75	1232	1469	73
	Abalak	1	211	859	2736	2103	536
	Tofamini	-	208	120	1479	1415	83
	Tabalak	-	94	0	1423	1830	0
	Kao	-	243	997	2488	2265	277
	<u>Total</u>	<u>1</u>	<u>1044</u>	<u>2051</u>	<u>10492</u>	<u>10769</u>	<u>1276</u>
SEPTEMBER	Tchin-Tabaradene		125	296	1593	1484	227
	Chadawanka		152	20	1665	1533	54
	Tagalal		0	0	43	76	0
	Kao		338	1129	2907	2889	517
	Tabalak		97	0	1622	2075	0
	Abalak		231	701	2027	1673	384
	Tofumini		198	174	1195	1477	176
	<u>Total</u>	<u>0</u>	<u>1041</u>	<u>2390</u>	<u>11052</u>	<u>11207</u>	<u>1358</u>
OCTOBER	Tofamini	0	198	139	1241	1292	58
	Abalak	2	241	650	2134	1708	330
	Tabalak	0	103	0	3513	2968	0
	Kao	0	308	1054	3605	3510	464
	Chadawanka	1	95	98	1739	1125	48
	Tagalal	0	0	0	38	59	0
	Tchin-Tabaradene	0	179	262	1606	1277	170
	<u>Total</u>	<u>3</u>	<u>1124</u>	<u>2193</u>	<u>13876</u>	<u>11919</u>	<u>1070</u>

Appendix II (continued)

	<u>Market</u>	<u>Horses</u>	<u>Donkeys</u>	<u>Cattle</u>	<u>Sheep</u>	<u>Goats</u>	<u>Camels</u>
NOVEMBER	Kao		299	1660	4164	4924	446
	Tabalak		57	0	7080	1471	0
	Chadawanka		96	48	6096	718	21
	Tagalal		0	0	54	81	0
	Abalak		98	319	590	663	78
	Tchin-Tabaradene		96	102	945	952	102
	<u>Total</u>	0	636	2129	7230	8809	647
DECEMBER	Tchin Tabaradene		104	161	1179	1335	134
	Kao		178	983	2487	378	261
	Tabalak		30	0	729	1190	0
	Tofamini		0	0	0	0	0
	Chadawanka	1	98	74	689	635	37
	Tagalal		0	0	0	65	109
	<u>Total</u>	1	597	1218	5084	3603	541
JANUARY		0	0	0	0	0	0
FEBRUARY	Vaccination Campaign						
MARCH	Abalak	0	238	1535	1280	1095	715
	Chadawanka	0	97	71	681	1025	42
	Tagalal	0	0	0	4	23	0
	<u>Total</u>	0	335	1606	1965	2143	757
APRIL	Tchin Tabaradene		111	187	1565	1129	159
	Kao						
	Abalak		234	1713	1136	1332	540
	Chadawanka		56	71	634	768	34
	Tagalal	0	0	0	39	92	0
	<u>Total</u>	0		1971	3384	3281	733

Appendix II (continued)

	<u>Market</u>	<u>Horses</u>	<u>Donkeys</u>	<u>Cattle</u>	<u>Sheep</u>	<u>Goats</u>	<u>Camels</u>
MAY	Tchin-Tabaradene	1	138	188	1237	995	335
	Kao	2	166	1306	1212	1527	298
	Abalak	0	260	1228	1237	967	712
	Tofamini	0	103	125	573	587	104
	Chadawanka	1	53	60	742	1150	40
	Tagalal	0	0	0	52	63	0
	<u>Total</u>	<u>4</u>	<u>720</u>	<u>2907</u>	<u>5186</u>	<u>5289</u>	<u>1489</u>
JUNE	Tchin-Tabaradene		103	114	1139	954	177
	Kao		145	1364	1234	1553	184
	Tabalak		17	1	698	728	0
	Tofamini		11	121	435	459	61
	Abalak		160	368	1367	631	320
	Tagalai		0	0	25	41	0
	Chadawanka		0	70	984	1490	51
<u>Total</u>	<u>0</u>	<u>436</u>	<u>2038</u>	<u>5882</u>	<u>5956</u>	<u>793</u>	
JULY	Tchin-Tabaradene	0	182	219	1517	1368	151
	Abalak	0	276	44	1913	1363	414
	Tofamini	0	33	164	622	345	101
	Chadawanka	1	38	24	486	930	18
	Tagalal	0	0	0	25	31	0
	Tabalak	0	17	1	815	751	0
	Kao	2	222	2338	3000	3148	385
<u>Total</u>	<u>3</u>	<u>768</u>	<u>3167</u>	<u>8378</u>	<u>7936</u>	<u>1069</u>	