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ALPACA MEAT PRODUCTION AND EXCHANGE IN SOUTHERN PERU

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CHAPTER 1

INTRODUCTION

This report is based on a research project which was initially conceived as an extension of two previous projects of the Sociology component in the Small Ruminant CRSP research program in Peru. One of these projects looked at the marketing structure that supplies the city of Cuzco with mutton (Primov, 1981). The other was a baseline study of alpaca production in Puno (West, 1981). Examining these two reports together led to a new question; namely, what happens to the meat that is obtained from the more than two million alpacas that are produced in southern Peru?

We regard this question to be important for establishing an accurate and comprehensive understanding of small ruminant production and utilization in Peru. We could not find satisfactory answers in the literature and therefore conceived, with the support of the Instituto Nacional de Investigacion y Promocion Agraria, a research project aimed at discovering the basic structures of exchange and consumption of alpaca meat in southern Peru.

It is truly surprising how little is known about this topic. A recent book on alpacas has as its title, La alpaca: Ese camelido desconocido (The Alpaca: That Unknown Cameloid). This is a rather apt title, and if indeed the alpaca is relatively unknown to all but the Indian peasants who domesticated it, then we might regard its meat as its most unknown byproduct. We could, I suppose, define alpaca meat as the relatively unknown product of a relatively unknown domesticate!

This is really not too far from the truth. The production and exchange of alpaca meat have generated remarkably little scholarly or official interest. This is remarkable considering the great number of alpacas produced and the volume of meat that they yield. One cannot research very long this topic without developing a strong curiosity about the possible reasons for this neglect. We suspect that scientific and official uninterest reflect the widespread public prejudice against alpaca meat, especially among the urban population.

Alpaca meat is regarded by much of the urban population as staple which is strangely associated with the Indian peasantry; its consumption is viewed as an Indian custom. In a society, and especially in the highlands where many urbanites are only one or two generations removed from Indian ancestry and where Indian status is highly stigmatized, any connection or identification with Indian beliefs or practices is studiously avoided. Thus, most mestizos avoid eating alpaca meat; not only do they simply avoid it, but they have developed a psychological reaction to it. This is perhaps most true in the city of Cuzco.

In Cuzco, alpaca meat is regarded not only as something that only Indians eat, but also as something potentially harmful. Most Cuzquenos will tell you privately that eating alpaca meat is very dangerous because one can contract syphilis, leprosy or other terrible diseases from it. One of the more popular suspicions by locals in Cuzco is that restaurants really serve alpaca meat, rather than the beef or mutton that they advertise. Although such beliefs remain in the realm of local folklore, it is significant that it is not legally possible to buy alpaca meat in Cuzco.

Small wonder, then, that the same Cuzquenos who understand the value of studying and improving the production and distribution of mutton in the region, are often genuinely perplexed by a similar study of alpaca meat. Some are openly amused.

The lack of rationality towards alpaca meat by the urban public does not end here. As has been often pointed out by others, there is a further paradox. Although red alpaca meat is avoided and stigmatized, alpaca charqui is relished and is often regarded as a delicacy. It may be that charqui is not regarded as potentially dangerous. However, since charqui is also an Indian food, it is not clear why it is more acceptable.

Perhaps all these social factors help to explain why so little research has been done on alpaca meat. Most research on alpacas has been concerned with its wool; given the high value of alpaca wool, this is an understandable interest. A review of the literature reveals only two serious studies of alpaca meat: Tellez Villena and Tenicela Magno (1970) and Ponce de Leon (1971). The first is an applied analysis of current systems of alpaca meat production and an assessment of the potential for improving this sector. The second is a scholarly analysis of the characteristics of alpaca meat as well as of various physiological parameters of alpaca meat production; this work also develops guidelines for the standardized grading of the meat. It is perhaps the best reference on alpaca meat currently available.

The paucity of the literature concerned specifically with alpaca meat is compensated somewhat by a more extensive literature on alpacas in general, and especially on alpaca wool production. Within this literature are found scattered bits of information about meat

production. However, this information is interspersed and constitutes a fugitive literature for the meat researcher. For this reason, the original scope of this report was broadened from a simple analysis of current alpaca meat exchange systems, to a more general outline of various aspects of alpaca meat production and exchange. In this way, some of the dispersed literature is brought together and becomes more accessible.

Although this report focuses exclusively on alpaca meat, it should be clear that any meaningful policy analysis regarding alpaca meat must be executed within the context of total meat production and demand. The advantages and disadvantages of alpaca meat can only be properly gauged in comparison with the alternate sources of meat. We have focused on alpaca meat because it is produced on a significant scale and because we know so very little about it and about what happens to it. However, we do not thereby implicitly recommend the production of alpacas as a primary meat source. It is our feeling that alpacas will always remain a secondary source of meat. Nor is it clear that alpacas are the best meat producers from among the Andean domesticates. There is some evidence that suggests that as meat producers llamas are superior animals. However, since as a wool producer the alpaca is unrivaled, and since for that reason it is produced in large numbers, it becomes expedient to rationalize as much as possible, the utilization of its meat.

The period of research for this study was from March to June 1982. The project was based at the Centro Nacional de Camelidos Sudamericanos at La Raya (Cuzco), about 30 kilometers from the Santa Rosa slaughterhouse - the main slaughterhouse for alpacas in southern Peru.

In addition to the data obtained in the field, we also collected statistical data from the records of the municipality of Santa Rosa, as well as from the records of the regional offices of the Ministerio de Agricultura y Alimentacion at Ayaviri, Sicuani, Macusani, Juliaca, Huancane, and Ilave. These statistics are of variable and dubious accuracy and are used simply because they are the best available. They should be interpreted as indicators of the general orders of magnitude and not as accurate measures of actual levels of production and exchange.

It should also be noted that in some cases statistics on alpacas and on alpaca meat include llamas and llama meat. The distortions caused by this practice are probably not significant and do not pose a serious statistical problem. Since neither the statistics nor much of the pertinent research literature make an important distinction between Suri and Huacaya alpacas, we have followed this practice and have disregarded this distinction in our discussion.

The report is organized in the following manner. This introduction constitutes the first chapter. In chapter 2, Alpaca Production, we present some of the results of research on those aspects of alpaca production which have a bearing on meat production. In chapter 3, Alpaca Meat Production, we present results of research on meat production as well as on other aspects related to meat production. In chapter 4, Alpaca Meat Exchange, we describe the various manners by which alpaca meat is distributed and marketed in southern Peru. In the final chapter, we present some recommendations regarding how the exchange of alpaca meat can be improved within present production parameters and social patterns of consumption.

CHAPTER 2

ALPACA PRODUCTION

The structure of alpaca meat production and exchange is largely determined by the structure of alpaca production. In order to understand the characteristics and dynamics of the production and consumption of the meat, one needs to understand first the factors which determine the production of the animals themselves.

There are five factors related to alpaca production which influences the production and exchange of its meat. They are:

Levels of production
Location of the production zones
Characteristics of the producers
Purposes of production
Production practices

Levels of Production

Animal census figures are notoriously imprecise and must be used with great caution. One of the problems which invariably arises when dealing with demographic time series data is trying to decide whether fluctuations in the data reflect actual demographic factors or represent simply measurement errors. In the case of livestock censuses in Peru, there is a definite and systematic trend toward underestimating the actual populations. So, in the following statistics it may be assumed that the official figures fall short of the real numbers. Despite this problem, the available statistics show a clear long-term pattern for which we have an appropriate explanation.

Table 1 presents the census figures that are available. We can see clearly a small but steady increase in the alpaca population during

the sixties. In that decade, the total population increased by approximately 20 percent. The next decade shows a steady decrease in numbers. Between 1971 and 1976, the alpaca population decreased by about 14 percent.

TABLE 1

Alpaca Populations in Peru for Selected Years

Year	Population
1961	2,720,000[1]
1962	2,830,000[1]
1963	3,000,000[1]
1964	3,200,000[1]
1965	3,304,000[1]
1966	3,290,000[1]
1966	3,865,000[2]
1967	3,140,000[1]
1967	3,290,000[3]
1968	3,213,000[1]
1969	3,300,000[1]
1971	2,854,400[3]
1972	2,658,800[4]
1973	2,658,800[4]
1974	2,671,000[4]
1975	2,507,000[4]
1976	2,449,800[4]
1980	3,020,248[5]

1 Oficina Nacional de Estadistica y Censos, 1969.
2 Flores Ochoa, 1982. Cited from Orlove, 1977.
3 Flores Ochoa, 1982.
4 Ministerio de Agricultura y Alimentacion, 1976.
5 Flores Ochoa, 1982. Cited from La alpaca, ese camelido desconocido. Alpaca Peru, 1981.

The increase of alpacas in the sixties reflected the producers' reaction to increasing alpaca wool prices. In 1968, however, there was a change in government and along with it, a change in agrarian policy. The new government instituted an effective program of agrarian reform. This program was first carried out in the coastal region of the country

and was later introduced in the highlands. The large alpaca haciendas, which were located mostly in the higher and more remote regions of the highlands, were among the last to be expropriated. This delay gave them time to sell or slaughter most of their livestock before it was expropriated. It is this process of decapitalization which explains in large part the reduction of alpaca herds in the seventies.

By the late seventies the program of agrarian reform had run its course and the new agrarian structure had stablilized. This, plus a relatively steady increase in the price of alpaca wool, motivated the producers to once again expand their herds. This expansion has continued to the present and can be expected to do so in the near future. However, it cannot continue much longer unless the production of other livestock is decreased or alpaca production methods are intensified.

Although Peru possesses extensive rangelands, much of these are used for cattle and sheep production. In general terms, the alpacas tend to compete for pastures with the sheep. Since alpaca and sheep production zones overlap in great part, the potential for the expansion of alpaca production is constrained by sheep production. In some areas, alpaca production can only increase at the expense of sheep production. One cannot expect alpaca herds to keep expanding indefinitively at present rates. It is likely that if alpaca wool prices keep their current high levels, in some areas alpacas may displace sheep, thus reversing the long process of "ovinization" which has been occurring since the beginning of this century (Flores Ochoa, 1982). However, it is very unlikely that alpacas will displace sheep in very great numbers.

Location of the Production Zones

Alpaca production is not evenly distributed throughout Peru. There exist two zones which concentrate production, they are the central and southern zones. The central zone includes the departments of Huancavelica, Junin, Lima and Cerro de Pasco. The southern zone is made up of the departments of Puno, Cuzco, Apurimac, Arequipa, Ayacucho, Moquegua and Tacna. For a very long time now, the southern zone has been by far the most important of the two. Maccagno (1932) estimated that in the 1920s about 92 percent of the alpacas were found in the southern zone. As we can see from Table 2, this figure has barely changed 50 years later.

It is also clear from Table 2 that the department of Puno is by far the most important producer of alpacas in Peru. This department traditionally had produced at least one-half of all the Peruvian alpacas. However, according to the official statistics, its share had decreased to about 37 percent by 1980.

Table 3 shows the long-term decline in the department's herds. We can see that 1980 is the first year in which there is an increase in the number of animals. We suspect that this increase has accelerated in 1981 and 1982.

The location of the two production zones has direct consequences for the exchange of alpaca meat. First, the principal alpaca production area is well removed and isolated from the Lima-Callao metropolitan region with its four million inhabitants. This urban region represents by far the highest concentration of potential urban consumers in Peru. The capital and the southern highland areas are

TABLE 2

Alpaca Populations by Production Zones

	1967[1]	1968[1]	1976[2]
Southern zone	2,860,000	2,945,000	2,177,500
Puno	2,000,000	2,100,000	1,200,000
Cuzco	280,000	280,000	275,000
Apurimac	155,000	180,000	200,000
Arequipa	240,000	200,000	250,000
Ayacucho	110,000	115,000	190,000
Moquegua	35,000	40,000	31,000
Tacna	40,000	30,000	31,500
Central zone	280,000	268,000	266,000
Huancavelica	230,000	231,000	230,000
Junin	5,000	6,000	7,000
Lima	45,000	30,000	27,500
Cerro de Pasco	0	1,000	1,500

1 Oficina Nacional de Estadistica y Censos, 1969.
2 Ministerio de Agricultura y Alimentacion, 1976.

poorly articulated and urban demand for meat does not seem to have stimulated alpaca production. Although the central zone is much closer to the capital, its levels of production are rather low. It would appear that its proximity to the metropolitan region has not facilitated the development of a dynamic alpaca meat sector.

The southern zone is within reach of two other urban centers; the city of Cuzco has about 150,000 inhabitants, while the city of Arequipa has more than 500,000 inhabitants. These two populations, plus that of the smaller urban centers located within the southern production zone, such as the towns of Puno, Juliaca and Sicuani, add up to a total population of urban consumers numbering about 750,000 people. However, even the proximity of this market has not been sufficient by itself to influence alpaca meat production.

TABLE 3.

Alpaca Population of the Departent of Puno

Year	Size
1971	1,600,000[1]
1972	1,400,000[1]
1973	1,380,000[1]
1974	1,380,000[1]
1975	1,250,000[1]
1976	1,200,000[1]
1979	1,095,690[1]
1980	1,128,210[2]

[1] Organismo Regional de Desarollo de Puno, 1980.
[2] Organismo Regional de Desarollo de Puno, 1981.

Another manner of looking at the location of production sites is to look at their vertical distribution. When we do that, we see that for all practical purposes alpaca production is restricted to sites located at 3,500 m. or more of altitude (Flores, Ochoa, 1982). The great bulk of this production, especially in Puno, takes place at more than 4,000 m. of elevation. The importance of this fact lies in the result that agriculture is highly restricted at such elevations and therefore the production of alpacas tends to be the only or primary economic activity of its producers. This has meant that alpaca producers have institutionalized effective means for gaining access to agricultural staples. They have achieved this by establishing long-term exchange relationships with the agricultural populations located in the lower and more temperate zones. A great deal of the alpaca meat production has been traditionally destined to this trade. This has meant that the volume of alpaca meat available for market exchange has been limited. This in turn has vitiated the emergence of a strong tradition of alpaca meat market exchange.

Characteristics of the Producers

Alpacas are produced by three different types of producers: households, cooperatives, and waqcho owners.

Households. Households are producers wherein ownership of the animals is commonly vested in individual members. The size of household herds varies greatly from zone to zone and within zones.

In general terms, the size of household alpaca herds in a zone is determined by the amplitude of the total production system possible in that zone. In the lower highland zones, the prevailing production system is a mixed one, several crops are combined with cattle and sheep production; in these areas, alpaca production is almost nonexistent. Moderate increases in altitude result in regions where crop production becomes increasingly restricted and livestock production becomes more important. Households located in such zones engage in alpaca as well as in cattle and sheep production. However, they do so within a system of mixed production and their alpacas represent just one of various production lines; most often, not the most important one. Average alpaca herd sizes in such zones tend to be under 100 animals. Flores Ochoa (1982) reports average herd sizes of between 80 and 100 animals for one such community in the province of Canchis (Cuzco) and of 60 for another community in the same province.

Households located in the highest zones, the puna, tend to rely almost exlusively on animal production, mostly llamas and alpacas. These households strive to maximize the size of their herds. Households in one such community in the province of Lampa (Puno) own an average of 300 alpacas (Flores Ochoa, 1968). This figure probably

represents close to the maximum average herd size of household alpaca herds in the southern highland area of Peru.

As might be expected, the systems for the production, utilization, and disposition of the alpacas and of their products vary considerably between the zones. In the lower regions, the alpacas are produced and utilized in a much more unsystematic manner. On the other hand, the production of alpacas and the use and exchange of their products represent the central economic activity of puna households and these activities follow very systematic patterns throughout the annual production cycle. We can generalize that the alpaca meat produced by producers in the intermediate highland zones is destined largely for self- or local consumption, while the meat produced in the highest zones is used both for self-consumption and long distance trade.

As we mentioned above, the size of alpaca herds also varies considerably within zones, even within the same community. These variations are both a reflection and a cause of economic inequality within pastoral communities. Such differences tend to be more pronounced in the puna. Flores Ochoa (1968) reports the following distribution for a high altitude community:

> Rich households had 500 or more alpacas, some had as many as 2,000.
> Middle households had between 300 and 400 alpacas.
> Poor households had between 10 and 20 alpacas, some had none.

West (1981) reports that in an intermediate altitude community located in the province of Huancane (Puno), the pattern was:

> Rich households had about 50 alpacas.
> Middle households had between 25 and 30 alpacas.
> Poor households had about 12 alpacas.

It seems that the major determinant of these differences is differential access to pastures. Another two important causes are differential access to water and differential availability of labor (Palacios Rios, 1977).

There is a bewildering number of different arrangements whereby individual households have access to pasture. Arrangements vary from free and uncontrolled access to communal lands to completely restricted access to enclosed private pastures. In many cases, different arrangements coexist within the same community. Arrangements can also vary during different seasons of the year. In the higher zones, the prevailing production system is one of transhumance, where access to pastures is determined primarily on the basis of kinship. There is a rich ethnographic literature which describes various household systems of alpaca production, among the best sources are Flores Ochoa (1968), Webster (1972), Orlove (1977), and Palacios Rios (1977).

In aggregate terms, households produce the great majority of alpacas in Peru. In 1980 in the department of Puno, about 73 percent of the alpacas were produced by households (Organismo Regional de Desarollo de Puno, 1981). This means that the prevailing system of alpaca production is based on small production units and therefore that any attempts to improve alpaca production on a significant scale must be directed at household producers.

It also means that about three-fourths of all the alpaca meat is produced by household producers. This, as we shall see later, has important consequences for the development of an improved meat marketing sector. However, as we shall also see later, present trends may reduce somewhat in the future the share of alpacas that are produced by households.

Cooperatives. Here we are grouping together several different types of the government created cooperative enterprises which were formed during the agrarian reform. Although these enterprises vary significantly in their internal organization and in their social and economic impact, these differences are not important in terms of their systems of alpaca production. The two main types of cooperative enterprises are the Cooperativa Agraria de Produccion (CAP) and the Sociedad Agricola de Interes Social (SAIS). For a brief description of these two types of enterprises see Orlove (1980).

Most of the cooperatives in Puno concentrate on animal production, although not exclusively. The great majority produce cattle, sheep and alpacas as well as some crops, primarily potatoes. Livestock production systems tend to be rather similar between the cooperatives essentially because they all receive technical assistance from the same source, the Ministry of Agriculture. During the last decade, most of the cooperatives have established cultivated pastures; however, these are small in size and are reserved for cattle and sheep.

The cooperatives of Puno produce close to 30 percent of the alpacas produced in that department. According to the last official census figures, the 1980 alpaca population belonging to the cooperatives numbered 306,850 animals (Organismo Regional de Desarollo de Puno, 1981). The size of the individual cooperative herds vary considerably, as can be seen in Table 4. This table lists most of the cooperatives in the Department of Puno that produce alpacas, however, it is not an exhaustive list. The table also includes the SAIS Marangani, which is located in the department of Cuzco.

TABLE 4

Alpaca Herd Sizes for Selected Cooperatives in the Department of Puno in 1981

Name	Herd Size
Cap Gigante	75,000[1]
SAIS Cerro Grande	32,000[1]
SAIS Aricoma	32,000[1]
EPS Rural Alianza	26,000[1]
SAIS Picotani	23,000[2]
SAIS Kenamari	19,000[1]
SAIS Rosaspata	19,000[2]
CAP Tupala	12,000[3]
SAIS Huayna Capac	9,000[4]
EPS Rural Nunoa	8,000[1]
EPS Kunuruna	5,000[1]
SAIS Churuna	5,000[2]
SAIS Sollocota	5,000[4]
CAP Manco Capac	4,000[1]
SAIS Posoconi	2,000[4]
SAIS Marangani	54,000[1]

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1 Personal communication.
2 Ministry of Agriculture records in Huancane office.
3 Ministry of Agriculture records in Ilave office.
4 Agronoticias 35/36, 1982a.
5 This cooperative is located in the province of Canchis (Cuzco).

As we can see, the alpaca herds of the cooperatives vary from 75,000 to 2,000 animals. In fact, there are other cooperatives that have much smaller alpaca herds and some that have none. It is perhaps useful to distinguish two different groups of cooperatives. Those with large alpaca herds, such as the first seven in the table, and those with much smaller herds, the other cooperatives in the table. The first group controls about 226,000 alpacas. This corresponds to about 20 percent of Puno's entire alpaca population, or about 8 percent of Peru's population. The significance of these figures is enhanced by the fact that the large cooperatives are now engaged in attempts to

increasingly rationalize the production of their alpaca herds since in most cases this line presently constitutes their most profitable production sector. In most cases, attempts to increase herd sizes are constrained by the lack of sufficient pasture or water. Alpaca production within cooperatives must compete with cattle and sheep production, especially the latter, for land and water use.

In the past, the large haciendas, which form the basis for the present cooperatives, concentrated almost exclusively on cattle and sheep production. Alpaca production was left in the hands of the household producers in the Indian communities. What little alpaca production took place in the haciendas was swiftly reduced during the agrarian reform. The preference for sheep and cattle production was based on the much higher market prices for the meat of these animals.

Thus, most cooperatives started with relatively small alpaca herds. However, increases in the value of alpaca wool have made alpaca production much more attractive to large producers. This, plus an heightening demand for meat at the national level, have motivated the cooperatives to expand sharply their alpaca herds during the last five years.

Many of the cooperatives have reached a stage where they can no longer increase alpaca production by intensifying the use of natural pastures or by incorporating new pastures. They must now look for different options. In the short run, they are contemplating two solutions. One is to concentrate sheep production on cultivated pastures and free more natural pastures for the alpacas; the other option is to reduce sheep production in order to increase alpaca production. A more distant solution, and one which is not viewed as

imminent, is to intensify alpaca production through the use of cultivated pastures.

Waqcho owners. Waqcho is the name given to animals which are owned by households but are grazed on cooperative-owned lands. In some places they are herded together with the animals belonging to the cooperative, while at other cooperatives they are grazed separately. By having waqcho herds, households which do not have access to land are able to produce animals as long as they are associated with or work for a cooperative. In most cases, the waqcho owner pays a yearly fee to the cooperative for each animal which he grazes on its land.

There are no estimates of the total alpaca waqcho population in the department of Puno. Table 5 presents the size of the aggregate alpaca waqcho herds of some cooperatives. It can be seen that their number varies greatly and that their relationship to the sizes of the cooperative herds is unsystematic. In three cases, the wawcho herds actually outnumber the cooperative herds.

Waqcho alpacas are produced similarly to household animals. Like the latter, they tend to be consumed locally and are not usually commercialized. The number of waqchos may decline in the future as the cooperatives seek to expand their own herds. The elimination of waqcho herds would permit some expansion of cooperative herds. Although this would be very easy to implement technically, there is strong opposition to such a measure by many of the cooperative members who also own waqcho herds. However, it seems likely that such herds will eventually disappear. In this report we will not distinguish between household and waqcho producers and will include the latter under household producers.

Table 5

Aggregate Alpaca Waqcho Herd Sizes and as Percentages of Cooperative Herds for Selected Cooperatives in the Department of Puno in 1981.

Cooperative	Waqcho Herd Size	As Percentage of Cooperative Herd
SAIS Cerro Grande	35,000[1]	109
SAIS Rosaspata	19,000[2]	100
CAP Gigante	15,000[1]	20
SAIS Churuna	9,000[2]	180
SAIS Picotani	8,000[2]	35
EPS Rural Alianza	8,000[1]	31
SAIS Aricoma	7,000[1]	22
SAIS Kenamari	5,000[1]	26
EPS Rural Nunoa	2,000[1]	25
SAIS San Pedro	1,500[2]	250
EPS Kunuruna	1,500[1]	30
SAIS Huayna Capac	500[2]	5

1 Personal communication
2 Ministry of Agriculture records in Huancane office.

Purposes of Production

Alpacas have traditionally been produced for wool. It appears that they were initially domesticated for their fiber and this product continues to be their most valuable asset. Most attempts at selective breeding have sought to either improve the qualilty of the fiber or to increase its fleece; much of the current research effort has similar goals.

The specialization of alpacas for wool production probably obeyed a series of conscious choices for the optimal utilization of the Andean camelid community. The alpaca was second only to the vicuna in terms of the quality of its wool and it represented a vital source of fiber for Andean pre-Columbian textile production, it seemed to be less important as a source of meat. There is some reason to speculate that

the meat from llamas and guanacos was preferred to that of the alpaca. It may be that the virtual extinction of guanacos from southern Peru may have resulted in part from the preference for its meat. There is also some reason to speculate that as primary meat producers, llamas are superior to alpacas. It appears, then, that the production of alpacas primarily for wool resulted both from the superior quality of its fiber and the lesser palatability of its meat (Fernandez Bernel, 1970).

Today, alpaca wool continues to be much more important than alpaca meat. Although alpaca wool prices fluctuate significantly, in general, the value of one year's wool production represents between one-third to one-half of the value of an animal if sold for slaughter. Since alpacas are shorn between five to eight times during their productive lifetime, producers derive at least two-thirds of their total income from the wool and a third or less from the meat.

It is not suprising, therefore, that alpacas continue to be produced in a manner that optimizes the production of wool. The animals are normally kept throughout their productive wool-growing years before they are sold or slaughtered. This means that alpacas are normally slaughtered after they are five years old, in many cases they are not slaughtered until they are seven or eight years old.

A crucial question which emerges from these practices is what is the degree of compatibility which exists between the current production system which optimizes wool production, and one intended to optimize meat production. Since there are presently no production systems intended to maximize alpaca meat production, one can only speculate.

There are four factors which would seem to be most significant in developing a system of production intended to optimize meat: carcass weight, carcass yield, meat tenderness, and meat fat content. The production requirements for the maximization of each of these factors are sometimes contradictory to each other as well as to the requirements for the optimization of wool production.

The first factor is self-evident. The maximization of meat production requires that the carcasses be as large as possible. This, in turn, necessitates that the animals be large and that they be slaughtered when they are at their highest weight level. This strategy is not particularly incompatible with wool-optimizing production strategies.

The second factor, carcass yield, is also self-evident. To maximize meat production implies obtaining the highest possible carcass yields. As with most ruminants, there is a direct relationship in alpacas between live weight and carcass yield (Calderon and Fernandez-Baca, 1972). Thus, this factor requires strategies similar to the one above and therefore is also compatible with wool production.

The third factor, meat tenderness, calls for production strategies clearly contradictory to the previous ones. As with most livestock, meat tenderness in alpacas declines with the age of the animal. Strategies for the maximization of tenderness thus require that the animals be slaughtered at a relatively young age, certainly not past the first shearing, this normally occurs between twelve and eighteen months. Production for wool results in tough meat, while production for tender meat results in very little wool, less meat and lower carcass yields.

The fourth factor, meat fat content, is somewhat of an unclear issue. Alpaca meat is remarkably lean, and that has always been touted as one of its great advantages. However, it appears that consumer preference favors alpaca meat that is well marbled. Since the fat content increases with the age of the animal, enhancing marbling requires production strategies which slaughter only mature animals. This practice is compatible with strategies for maximizing wool, high carcass weights and high carcass yields, but contradictory with strategies for producing tender meat.

It would seem, therefore, that the current production strategy, which aims at wool production, is not inherently incompatible with the requirements for meat production. The most important negative consequence is that the meat that is produced, is rather tough. Traditionally, this problem was resolved by processing the red meat into charqui, thus solving the problems of palatability and preservation in one step. To a large extent, this solution is still practiced today. However, the increasing demand for red meat calls for alternative solutions to this problem.

There are two relatively recent developments which have diversified somewhat the traditional aims of alpaca production in the southern zone. One has been the large-scale development of a local fur industry catering to the tourist trade; the other has been the fact that many of the large cooperatives have increased their alpaca herds to levels approaching maximum stocking rates and must now cull large numbers of young animals each year because they are not able to accommodate any further expansions of their herds.

Although there has been an alpaca fur industry in southern Peru for a long time, increased tourist demand in the last decade has spurred a great expansion in the number of furriers and in their aggregate output. The basic raw material for this industry are the skins of very young animals. In the past, the demand was met by the relatively high rates of infant mortality which characterize alpaca husbandry. Now, however, the increased demand for the skins has outpaced the natural supply and it is becoming increasingly clear that household producers are deliberately killing infant animals, probably males, in order to sell the skins.

Since the price that the producers receive for these skins is relatively high, there is a strong economic incentive to kill infant animals. It is conceivable that if this practice continues to be as widespread and as profitable as it appears to be now, that it might have long-term consequences on the production strategies pursued by household producers.

Production Practices

There are some differences in the manner in which alpacas are produced which have direct consequences on meat production and exchange. Households take no special steps with animals culled or sold for slaughter. This means that the animals are sometimes slaughtered at very low weight levels. Some of the cooperatives, on the other hand, separate the animals for as long as 60 days before selling them, and graze them on reserved pastures in order to increase their weight.

Another difference results from the selective breeding which some of the cooperatives are now implementing. Although the purpose of this

selective breeding is to improve wool production, it nevertheless seems to have resulted in larger animals. Most meat merchants agree that cooperative-produced alpacas yield larger carcasses. Some of them think that this is not merely the result of better care or nutrition but also of better selected stock. Since households always try to maximize the size of their herds, they are very reluctant to eliminate animals for the sake of an eventual general improvement of their livestock.

The same merchants also agree that cooperative animals are much healthier and that their meat has lower levels of parasitic infections and other illnesses. The healthier state of the animals from the cooperatives is readily explained by the cooperatives' access to economic resources. Most households cannot afford to buy the vaccines and medicines that might improve the health of their herds.

In fact, sick animals are among the first selected for slaughter by households (Janampa Janampa and Taipe Rivas, 1981). Their reasoning is that it is better to slaughter an incurable animal while it is in the early stages of illness and therefore still edible. If the meat appears to be already diseased, then it is invariably made into charqui. This process is apparently quite effective in destroying some parasites. Very seldom will a household simply destroy the meat from one of its sick animals (McCorkle, 1982).

CHAPTER 3

ALPACA MEAT PRODUCTION

It is almost impossible to determine accurately the annual production of alpaca meat in Peru. As we shall see, there are various figures that have been published on the production of alpaca meat both at regional and at the national level. It is generally agreed that almost all of these figures underestimate significantly the actual levels of production.

The reason for the inaccuracy of the official figures is a simple one. The majority of alpacas are slaughtered privately and the meat is either consumed at the production site or is exchanged outside of the official marketing channels. This volume remains undetected by official statistics. Table 6 presents the figures that are available; most of the information is somewhat dated. The figures document an apparent trend towards a reduction in the official levels of supply.

As we might expect, the production of alpaca meat is concentrated in the southern zone. In 1966, the central zone officially recorded a production of only 923 m.t. while the southern zone reported 10,075 m.t., or about 92 percent of the official annual supply (Tellez Villena and Tenicela Magno, 1970). In 1976, official statistics showed a change in this proportion. The southern zone's 3,813 m.t. of meat production represented only 78 percent of the total official annual supply, the central zone produced 1,051 m.t. (Ministerio de Agricultura y Alimentacion, 1976).

TABLE 6

Production of Alpaca Meat in Peru

Year	Volume (In Metric Tons)
1961	18,311[1]
1962	19,052[1]
1963	20,196[1]
1964	22,176[1]
1965	11,033[1]
1966	10,998[1]
1967	10,512[1]
1968	10,756[1]
1969	11,095[1]
1976	8,318[2]

1 Oficina Nacional de Estadistica y Censos, 1969.
2 Ministerio de Agricultura y Alimentacion, 1976.

In accordance with the distribution of its herds, meat production in the southern zone is concentrated in the department of Puno. Table 7 shows the distribution of the production of alpaca meat within the zone.

TABLE 7

Production of Alpaca Meat Within the Southern Production Zone
(In Metric Tons)

Department	1967[1]	1968[1]	1976[2]
Puno	6,480	6,804	1,326
Cuzco	1,008	1,008	490
Apurimac	614	713	657
Arequipa	808	673	684
Ayacucho	406	424	486
Moquegua	135	154	96
Tacna	138	103	74
TOTAL	9,589	9,879	3,813

1 Oficina Nacional de Estadistica y Cannos, 1969.
2 Ministerio de Agricultura y Alimentacion, 1976.

The most noticeable item in Table 7 is the very large decrease in 1976 in the officially recorded production in Puno. It is our guess that this decline reflects not only an actual decrease in the size of the departmental herds but also an increase in the proportion of meat exchanged illegally.

Meat production within the department of Puno appears to be relatively evenly distributed, more evenly distributed than the alpaca herds.

TABLE 8
Production of Alpaca Meat Within the Department of Puno (In Metric Tons)

Province	1979[1]	1980[2]
Puno	188	194
Azangaro	203	217
Carabaya	309	311
Chucuito	480	405
Huancane	220	282
Lampa	412	385
Melgar	361	395
Sandia	93	93
San Roman	2	3
TOTAL	2,268	2,285

1 Organismo Regional de Desarollo de Puno, 1980.
2 Organismo Regional de Desarollo de Puno, 1981.

When reconciling meat production figures with data on herd size, offtake rates and carcass yields for the department, we find the data in Table 8 to be more relatively accurate, if still short of actual levels. Nevertheless, these figures represent a reasonable indication of the production of alpaca meat in the Department of Puno. This means that the figures probably include estimates of the volume of illegally slaughtered meat.

There are three management factors which influence the level of meat production. One of them, herd size, we have already mentioned. The other two are offtake practices and carcass weights. The number of animals slaughtered and the weight of their carcasses represent the basic determinants of the aggregate level of meat production.

Offtake Practices

The timing of the culling of alpaca herds is largely determined by the conditions of the pastures. These, in turn, reflect rainfall conditions. In general, the winter months, May through August, are the driest, with little or no precipitation. The summer months, November through February, usually have abundant rainfall. However, there is a considerable annual variation in this pattern. Traditionally, alpacas are culled after the end of the rainy season, when the animals are at their highest weight levels and before the onset of the dry season, when the carrying capacity of the pastures diminishes considerably. As we shall see later however, some of the cooperatives are no longer following this practice and are culling at other times because of economic incentives.

Alpacas are culled for four basic reasons:

a. When there is insufficient land for herd increases.

b. When the producer needs money and has no other ready source.

c. When the producer has a need for meat or skins.

d. When the animal is no longer productive or reproductive.

Both households and cooperatives are forced sometimes to sell animals because of the lack of sufficient pastures. In the case of households, this is a perennial problem, especially in the higher

regions where much of the pastures are privately owned or controlled. In such cases, households cannot increase the size of their herds beyond a given point. Thus, any natural increases must be offset by offtakes. This problem tends to be more acute in the regions which specialize in alpaca husbandry and strive to maximize production (Orlove, 1977; Palacios Rios, 1977). In areas where alpaca production is less important, pastures tend to be collective and the households are less constrained.

In the case of cooperatives, lack of sufficient rangeland for the alpacas is a problem of relatively recent origin and one which developed as the result of the intensive efforts to increase alpaca herds by substantial numbers. Now, some of these cooperatives will have to start limiting their alpaca herds or will have to expand the land devoted to their production; this is something which apparently only a few can do. One cooperative has actually had to reduce its herd because of overgrazing. The net result of this situation is, we expect, that the offtake rates of the cooperatives will increase noticeably in relation to the last few years. This, in turn, will mean higher levels of alpaca meat being placed through the official marketing channels.

Unforeseen financial demands on the producers often result in the culling of animals in order to generate cash, this is especially true of household producers. Although household producers normally do schedule culls for specific times of the year, they also often resort to unscheduled offtakes when they have an immediate need for money and have none or not enough. In such cases, the producer will only cull enough animals to meet his need. This is a cross-cultural trait found

in most societies where households manage livestock on a private basis. The herds serve as a primary form of accumulated capital which can be tapped periodically to satisfy the household's needs (Primov, 1982).

Households will also slaughter animals when they need meat or skins, most often the former. Such needs arise most frequently in relation to the various ceremonies which highlight the annual production cycle in most highland communties as well as during other social and religious occasions, such as the celebration of a community's patron saint day. At such events, the ritual may require the consumption of alpaca meat. Responsibility for providing the meat is placed on one or more individuals who have been chosen in anticipation, usually because they have large herds or have the money to procure the meat. The number of animals slaughtered at such occasions tend to be constant; West (1981) for example, cites an occasion in a community in the department of Puno where about seven alpacas are slaughtered each year. It should be noted that these events represent one of the few times at which the rural population consumes red meat from alpacas. Generally, its consumption of meat is quite restricted and most of what it does consume is in the form of charqui. Households consume relatively few of their animals. West (1981) reports in a mixed production zone in Puno, households will slaughter only one or two alpacas each year. Gallegos Tello (1981) calculates that the households in a community which specializes in alpaca production, also in Puno, slaughtered on the average between three and six animals annually. Meat, in the form of charqui, is required in larger volumes by specialized high-altitude producers for

barter with other staples, usually agricultural crops from the warmer lowlands.

Although the cooperatives have alternative means for meeting their unexpected financial demands, they too seem to adjust the size of their offtake in accordance with their overall economic situation. One cooperative, which had projected a 12 percent offtake rate for 1981, ended up with an offtake of 18 percent because it had to generate extra cash to meet its payroll. We suspect that this type of situation occurs fairly frequently. We would expect cooperatives to choose to sell their alpacas first when they have a need for cash, it may be more difficult to sell their sheep or cattle on short notice. The alpacas culled under such conditions are invariably sold to meat merchants.

We are not aware of recurring occasions when the cooperatives have slaughtered a considerable number of alpacas in order to consume the meat. The demand for alpaca meat by the members of the cooperative is met either from their own waqcho herds, or from their own animals pastured outside of the cooperative, or by buying meat from household producers. Sometimes, the meat from very old animals, which cannot be sold to the meat traders, is made into charqui and is consumed by the members or workers of a cooperative.

Another reason for culling alpacas is when the animals are no longer useful, either for the production of fiber; or in the case of females, in their reproductive functions. The criteria for determining acceptable levels of fiber production are somewhat flexible and arbitrary. Households tend to accept lower levels of fiber production from their animals than do the cooperatives. When the producers are trying to maximize animal production, females are retained beyond their

best fiber-producing years so long as they are reproducing. Males are seldom kept beyond their peak fiber-producing age. We would expect that as the cooperatives attain stable herd sizes, that many of the animals will be culled at an earlier age so that their meat can be sold as red meat.

In actual practice, the calculus for choosing culls is very complex and may vary at different periods of the production cycle as well as during different years. This is especially true of household producers. Miller (1977) lists the following criteria as operative among small producers when selecting culls:

Problem animals
Thin or weak animals
Barren females
Old animals, past 7 or 8 years old
Other idiosyncratic factors

Another source, Janampa Janampa and Taipe Rivas (1981), presents an overlapping list of criteria:

Age of animal
Animals with reproductive problems
Demand for meat
Illness

In different areas the actual criteria may differ depending on the characteristics of the producers. But in all areas, households tend to cull as few animals as possible. The general attitude is that the animals are much more valuable alive than dead.

Although the specific reasons and criteria for culling may vary in different regions, the net result is that the alpacas produced by households tend to be slaughtered only after they are about five years old. Maccagna (1932) reported that in the early part of this century Indians would cull their alpacas when they were about seven years old,

we do not think that this has changed appreciably. Most informants agreed that household producers would get rid of their alpacas after they were seven or eight years old. The exception is reproducing females which are sometimes kept longer, usually until their reproductive capabilities decline. The meat from these older females is only fit to be rendered into charqui, it is too tough to be eaten as red meat.

The age of the alpacas culled in the cooperatives tend to vary considerably. One cooperative, which can no longer increase its herd, culls wethers at 18 months and sells them to meat merchants. Most of the other cooperatives, however, do not yet face this problem and retain their animals longer. In general, wethers are culled between four and six years of age. Females are culled as early as six years and as late as twelve years; most are probably culled at about eight or nine years. This means that the meat from most of the females is not marketed as red meat.

It is very difficult to translate these diverse practices for selecting culls into actual average offtake rates. Again, official statistics are of dubious help. Table 9 presents nationwide offtake rate based on official figures.

It has become common to use a 10 percent offtake rate as the average rate in the country. We suppose that in lieu of any more precise figures, these figures are as useful as any. The figures for regional rates tend to be rather similar. The 1975 offtake rate for the southern zone was estimated at 9.4 percent and that for the department of Puno at 9.0 percent (Ministerio de Agricultura y Alimentacion, 1976). However, the rate for the department of Puno in

TABLE 9

Alpaca Offtakes in Peru

Year	Number	Rate
1966[1]	348,740	10.6
1971[2]	166,550	5.8
1972[2]	264,500	9.9
1973[2]	307,055	11.5
1974[2]	370,522	13.8
1975[2]	463,078	18.5
1976[3]	229,675	9.3

1 Tellez Villena and Tenicela Magno, 1970.
2 Organismo de Desarollo de Puno, 1980.
3 Ministerio de Agricultura y Alimentacion, 1976.

1980 was calculated to be only 7.7 percent (Organismo de Desarollo de Puno, 1981).

We have no reliable information about offtake rates among household producers. Our best guess would be that it is below 10 percent. Given the reportedly high abortion and mortality rates among these herds, there is reason to assume that the net annual biological increase is not very large; therefore, we would not expect very large offtakes. We would expect, however, that offtakes among household producers could vary significantly from year to year, depending on conditions such as the weather, the condition of the pastures, and the health of the herds, as well as on the economic fortunes of the households.

Ramirez Vallejos (1979) calculates three different rates depending on the level of technological sophistication of the production systems. Producers with low levels of technological inputs, presumably household producers, are posited to have an offtake rate of around 6 percent.

Intermediate level producers, and we are not sure who they would be, have a rate of 8 percent. While the most sophisticated producers, presumably the cooperatives, have a rate of about 11.5 percent.

It is our impression that offtake rates among the cooperatives also tend to vary considerably. In general, the rates tend to be somewhat lower than might be expected, because many of the cooperatives are trying to increase their alpaca herds. Offtake rates in 1981 in the cooperatives ranged from as low as 5 percent to as high as 18 percent, most of them were between 7 and 10 percent.

We think that as the cooperatives exhaust their unused rangeland and stabilize their alpaca herds, that their offtake rates will increase greatly, perhaps nearing 20 percent. Fernandez Baca (1971) estimates that with better production methods, the offtake could eventually increase up to 35 percent. This should increase drastically the supply of legal alpaca meat, since the offtakes from the cooperatives are channeled almost entirely through the official marketing system.

If we recall that the southern zone has about 2.2 million alpacas, then an average offtake rate of 10 percent results in an annual cull of 220,000 animals. This figure probably represents close to the actual annual offtake in the region. If we just look at the cooperative herds in the department of Puno in 1980, we find an aggregate herd of 306,850 animals (Organismo de Desarollo de Puno, 1981). A 10 percent offtake rate yields 30,685 alpacas, an increase in the rate to 15 percent would result in an increase of more than 15,000 animals for the legal meat market. This represents a considerable expansion in supply.

Carcass Weights

The weight of the carcass is a function of the live weight of the animal and of the carcass yield. Most efforts at increasing carcass weights concentrate on increasing live weight, since it is more difficult to alter carcass yields. Although only a few of the meat production parameters of alpacas have been investigated, there is a limited amount of information available on alpaca carcass weights and yields.

Calderon and Fernandez Baca (1972) report that alpacas achieve full mature weight at about the age of four years. They add that the animals show no appreciable weight increases after that. The average weight of their sample (all females) was 58.3 kg., the heaviest animals weighed about 60 kg. Using biometric measures of carcasses, Tellez Villena and Ponce de Leon (cited in Tellez Villena, 1975) found that the highest measurements, as well as the best weights and yields, came from animals between three and four years old. However, Calderon C. and Pumayalla D. (1981) have reported eight year olds to have the highest live weight levels, the average live weight of their sample (also females) was 70.45 kg. Most of the meat merchants that we interviewed appeared to agree that maximum live weight is achieved at around four or five years. West (1981) cites a similar estimate. We can tentatively conclude that alpacas do attain their mature live weight sometime between three to five years. Clearly, the system of production in which they are raised influences significantly the time needed to attain adult weight as well as the level of that weight.

If it is relatively clear when alpacas reach their full adult weight, it is not so clear what constitutes the average adult weight of

alpacas. There is considerable variation in the weights that are reported. Perhaps this is attributable to differences in health and nutrition between herds, especially between household and cooperative herds. The heavier animals are probably concentrated in the cooperative herds. Combining the various weights that have been reported in different sources, we would conclude that the adult live weight of alpacas produced under prevailing systems of production, meaning grazed exclusively on natural pasture, ranges between 45 and 65 kg. Most of the animals probably weigh around 50 kg. As an example of representative weights we can cite the average live weights of four different lots of alpacas slaughtered at the now-closed packing plant in Cabanillas (25 km from Juliaca); the four lots averaged 54.8, 53.5, 48.9 and 58.3 kg. at the time of arrival at the plant (Universidad Nacional Tecnica del Altiplano, 1970).

Both varieties of alpacas seem to have similar live weights. Calderon and Fernandez Baca (1972) report no significant differences in the live weight of Huacaya and Suri females. Sex specific weight data suggests that there is probably less than a 5 percent difference between sexes, males tending to be slightly heavier (Bravo, 1973; Roman, 1973). This means that for purposes of meat production the sex composition of the herds is not a crucial factor.

Alpacas grazed on cultivated pastures apparently attain considerably more weight. Such animals are reported to easily surpass 70 kg. or more (Condorena, 1977). The now-terminated New Zealand project (Convenio Peruano-Neozelandes) was able to produce alpacas twice as heavy as those grazed on natural pastures. Their six month old infants weighed around 45 kg., more than twice the average weight

of 20 kg. characteristic of animals fed on natural pasture (Agronoticias, 1982b). Similarly, the average carcass weight of two-month old animals grazed on cultivated pastures was 11.8 kg. while that of similar animals grazed on natural pastures was only 8.25 kg. (Novoa et al., 1974).

The significant variation in the live weights of adult animals must be a contributing cause for the variability in their carcass yields. Carcass yields of adult alpacas have been variously reported as between 45.7 and 52.6 percent (Tellez Villena, 1975); 55.18 percent (Calderon and Fernandez Baca, 1972); 53.33 (cited in Calderon and Fernandez Baca, 1972); 57 percent for males and 55 percent for females (Roman, 1973); and 56.2, 58.5, 56.6 and 52.1 percent (Universidad Nacional Tecnica del Altiplano, 1970).

Differences in carcass yield may be partly the result of the animals being slaughtered during different seasons of the year. Animals slaughtered during the rainy season should have higher carcass yields because the animals are at their highest levels. In the dry season, we would expect the yields to decline. However, beyond such partial explanations there seem to be genuine differences in yields; meat merchants are quite specific about this. They stress that even experienced traders find it difficult to estimate yield and that sometimes they are badly fooled. In addition, certain regions have a reputation among merchants for growing large animals which have very low yields. It seems safe to assume that under the present system of production the average carcass yield of alpacas is around 55 percent.

In the foregoing, we have suggested that the average live weight of adult alpacas is around 50 kg. and that the average carcass yield is

about 55 percent. These figures yield an average carcass weight of 27.5 kg. We can compare our projected carcass weight with those reported in various sources. As with previous measures, there is great variation in the figures given as the average weight of alpaca carcasses. Roman (1973), working with 10 to 12 year animals, reports male carcasses to average 29.2 kg. and those of the females 29.1 kg. West (1981) reporting on the average carcass weights in two different communities notes that in one community mature plump males yielded carcasses of between 26.1 and 27.0 kg., while the lean animals gave carcasses of between 20.5 and 21.15 kg.; in the other community, males yielded carcasses of between 15.5 and 18 kg., while the females yielded between 11.25 and 13.5 kg. The four lots of alpacas slaughtered at Cabanillas had average carcass weights of 30.8, 31.3, 27.7 and 30.4 kg. (Universidad Nacional Tecnica del Altiplano, 1970). Ramirez Vallejos (1979) claims that depending on the system of production, carcasses will range from an average of 23.0 kg. in 'primitive' systems, to 28 kg. in the more sophisticated production systems.

Data from aggregated departmental statistics result in an average carcass weight of 25.6 kg. for the department of Puno (Organismo de Desarollo in Puno, 1981). We observed the weighing of a lot of 25 carcasses at the slaughter house in Santa Rosa. The carcasses had been slaughtered in early May and therefore had not been stressed by the dry season. The average weight of the lot was 29.39 kg.; the carcasses ranged in weight from 22.5 to 36.45 kg.

One meat trader stated that some of the alpacas produced at the Centro Nacional de Camelidos Sudamericanos (La Raya) had yielded carcasses weighing as much as 40.5 kg. He implied that these were the

largest carcasses he had seen. We can assume that 40 kg. carcasses probably represent the upper limit for alpaca carcasses produced under current systems of production. Clearly, the vast majority of the animals raised by the households, and thus the vast majority of all alpacas, do not even yield 30 kg. carcasses.

We did not obtain data on the weight composition of the carcass. However, West (1981) provides some data which we can apply to our average 27.5 kg. carcass. According to his figures, hind quarters constitute about 36 percent of the carcass weight, or around 10 kg. The front quarters represent 35 percent of total weight, or about 9 kg. The ribcage accounts for 18 percent, or about 5 kg. Finally, the neck makes up the remaining 13 percent of the weight, yielding an average neck of 3.5 kg.

We can now try to estimate the alpaca meat production in the southern production zone and in the department of Puno. If we use a population figure of 2,200,000 alpacas for the zone and a 10 percent offtake rate, we obtain an annual cull of 220,000 animals. Using a 27.5 kg. as the average carcass weight yields an annual production of 6,050 m.t. of alpaca meat, considerably more than what is suggested in Table 2. Using a 1,100,000 herd size for the department of Puno results in an annual production of 3,025 m.t. The question now is, what happens to all this meat?

Health Problems

Before we describe the structures of exchange of alpaca meat, it is necessary to discuss briefly the pathogenic potential of alpaca meat because there exist strong and widespread misconceptions about its

potential effects on human health. On the other hand, it is true that most alpaca meat does exhibit some degree of parasitic infection.

One of the strongest beliefs which supports the prejudice against alpaca meat is that it propagates serious diseases. In the city of Cuzco it is widely believed that alpaca meat transmits syphilis; some believe that it also transmits leprosy. For these reasons, it is avoided by the residents of the city, especially by the middle class.

It is difficult to disassociate how much of the avoidance of alpaca meat is actually caused by such beliefs and how much is due to the association of eating alpaca meat with the ethnic status of being an Indian. The mestizos of Cuzco go to great lengths to distance themselves socially from the Indian peasantry and it is extremely likely that they may avoid eating alpaca meat in order to reinforce their own ethnic status (van den Berghe and Primov, 1977).

Rivera (1970) has experimentally shown that alpacas are not susceptible to Treponema pallidium and that they do not develop any clinical reactions when exposed to it. His conclusion is that alpacas cannot contract nor trasnsmit syphilis. As might be guessed, however, such scientific conclusions have not done anything to reverse popular misconceptions.

If alpaca meat cannot transmit syphilis, it can and often does present other diseases. Without a doubt, the most common of these is sarcocistiosis, caused by the protozoan parasite, Sarcocystis aucheniae. Sarcocistiosis is apparently endemic in alpacas and is not normally pathogenic. Presently, it can only be diagnosed post-mortem. It can be detected visually in the carcass by the presence of cysts lodged in the striated muscles (Moro and Guerrero, 1971).

Carcasses diagnosed as presenting sarcocistiosis represent only those which have readily observable cysts. The other carcasses, which in all probability have sub-clinical sarcocistiosis, are normally judged to be free of this parasite. Thus, the rates of sarcocistiosis reported in slaughterhouses represent only those cases in which infestation is visually observable. The now-closed slaughterhouse of Cabanillas used a criterion of three or more cysts per cut as a measure of massive infestation. Using this rule, 16.57 percent of a total of 525 alpacas were determined to have massive infestation and their carcasses were deemed unfit for human consumption (Universidad Nacional Tecnica del Altiplano, 1970). The manager of the La Tomilla slaughterhouse in Arequipa estimated that between 10 and 15 percent of the alpacas that he slaughters have massive infestation; we are unsure what criteria he uses for this estimate.

The most common procedure for dealing with massively infested carcasses, especially in household-produced carcasses, is to process the red meat into charqui. Apparently, this process is quite effective in destroying the parasites. Although alpaca meat is susceptible to other types of pathologies, none are as widespread as sarcocistiosis.

Currently, slaughterhouse detection of sarcocistiosis, or of any other disease, is a very haphazard affair. In the Santa Rosa slaughterhouse there is no medical inspection of the meat, although the carcasses are supposed to be inspected by a veterinarian pathologist. We do not know whether the carcasses at La Tomilla are inspected. The legal meat which arrives in Arequipa is also supposed to be inspected before it is sold to the retailers; again, we do not know whether this

actually happens. Carcasses processed and marketed within the illegal system undergo no inspections.

In general, hygienic conditions in the slaughterhouses are very poor. It would be quite possible for healthy carcasses to be contaminated in the slaughterhouse. In the Santa Rosa slaughterhouse the animals are killed in an open, concrete-floored yard. They are skinned and gutted in the same yard and then taken to an adjacent yard where they are hanged on hooks, hosed off and then stored on the concrete floor, sometimes in the open. This second yard is also where the viscera are sorted and washed. For a discussion of slaughtering methods for alpacas, see Miller, 1977.

We have had a few opportunities to witness the slaughter of household animals in the communities. The animals slaughtered were sheep, but we do not believe that conditions for the slaughter of alpacas would differ materially. Although slaughtering conditions in the communities are quite poor and unsanitary, we do not believe that they are much worse than those at most of the legal slaughterhouses. Perhaps the most important differences are that the latter normally have running water and concrete floors. We do not see differences that would justify the claim that carcasses slaughtered illegally represent a greater health risk and that those processed in the legal slaughterhouses do not.

CHAPTER 4

ALPACA MEAT EXCHANGE

The manner of disposition of the alpaca meat produced in the southern production zone is largely determined by who produced it. Although there is some overlap, by and large the meat produced by households is consumed and commercialized in ways different from that produced by the cooperatives. Furthermore, whereas the greater part of household-produced meat is probably processed into charqui, most of the meat produced by the cooperatives is exchanged and consumed as red meat. Since the exchange of the meat produced by the households and by the cooperatives is so different, we will treat them separately.

The Exchange of Household-Produced Meat

The utilization of the meat obtained from animals raised by households tends to vary according to the characteristics and the location of the production unit. Historically, the traditional practice was one of exchange between the livestock-producing highlands and the crop-producing temperate zones. The importance of this trade system has diminished during this century with the expansion of the cash economy into the highlands and the penetration of transportation roads into the region. However, long distance barter still persists in some areas and an undetermined volume of alpaca meat continues to be channeled through this medium.

The barter of alpaca meat in the southern zone seems to persist most strongly among households located in the higher zones along the

western Andean rim. These relatively isolated regions, some inaccessible to motor transport, maintain long-established trade routes down along the western slopes, giving them direct access to the warm coastal valleys where are grown many of the staples of their diet.

Households from these alpaca-producing zones travel each year down to the coastal valleys during harvest time to exchange their animals for crops. The timing of these visits coincides with the time when their alpacas are at their best weight levels. Each household tends to visit the same community or valley year after year, often trading with the same families. In this way evolve relationships of fictive kinship (compadres) or preferential trade (caseros) between the trading partners. These relationships help to insure long-term access to food supplies even in years of scarcity. Other households have less stable trade relationships and shop around each year for trading partners.

The most important long distance barter routes in the southern zone link the western regions of the departments of Puno and Cuzco with the lowlands of the departments of Arequipa, Tacna and Moquegua. There are other shorter routes which link different ecological microregions within the departments of Cuzco, Puno and Arequipa. Gallegos Tello (1981) describes a community in the province of Chucuito which trades both with the coastal valleys in the department of Tacna and with the Titicaca basin. Communities in the province of Lampa trade with lowland valleys in the departments of Arequipa and Moquegua (Flores Ochoa, 1977). Within the department of Arequipa, households from the higher zones in the province of Cailloma trade with lower zones within the same province and with the coastal valleys of the department (Casaverde R., 1977). Alpaca meat is also traded from the department

of Puno to Bolivia, both from the provinces of Huancane and Chucuito (West, 1981). There are also trade routes which connect the alpaca-producing regions of the departments of Apurimac and Ayacucho with the temperate and coastal valleys of the departments of Arequipa and Ica (Concha Contreras, 1975).

The main reason for the persistence of barter trade is that in this manner the producers are able to bypass the cash economy. They thus lessen their need for cash and are also able to avoid fluctuations in the prices of the staples that they require. Furthermore, they also avoid the problems caused by the significant rate of inflation which characterizes the national economy. These advantages are particularly important for the poorer households. Direct barter affords these producers access to most of the staples of their diet at a relatively unchanging rate of exchange, regardless of changes in the monetary prices of these items. It is an arrangement which assures long-term survival while minimizing some risks and for this reason it is highly attractive to the poorer households.

The items and terms of exchange tend to vary in different places, but tend to remain the same at any given locality. Changes in the terms of exchange within a community occur slowly. In the short run, producers can assume that last year's terms will be operant during the current year. This type of reassurance presents a great contrast to the constant increases in the prices of food staples in the national economy. Thus, while the producers may at times forfeit potential profits, they also, and more importantly from their point of view, avoid potential shortfalls, which could be disastrous for them.

Alpaca meat is bartered both as red meat and as charqui. In the former case, the producer calculates how much meat he wants to trade and takes along a sufficient number of animals. He then treks the animals to the trade sites and slaughters them just prior to barter. Charqui, on the other hand, is processed at the site of production and is transported to the trades sites.

Some producers apparently prefer trading red meat rather than charqui because the latter is very light in weight and since the terms of barter are expressed in units of weight, trading charqui becomes disadvantageous. However, many households trade both forms of meat, most descriptions of barter trade list charqui as one of the main items of exchange (Flores Ochoa, 1977; Casaverde R., 1977; Concha Contreras, 1975).

Red meat may be exchanged for an equal weight of white or yellow corn or of potatoes; or, one alpaca leg may be traded for 25 lbs of corn ears (West, 1981). However, some items, such as chunu, are valued more than meat and are exchanged at unequal weight ratios. Ten kilograms of chunu may be exchanged for 12 kg of red meat (Gallegos Tello, 1981).

In some cases, households may barter one form of meat and sell the other, or sell and barter both types. Some households in the province of Chucuito barter red meat but sell the charqui (Gallegos Tello, 1981). This is an example of a more complex economic calculus whereby household producers assure both stable access to crop stables through barter and seek cash through sale, in both cases using alpaca meat as the item of exchange.

As we mentioned before, there is no manner of estimating the volume of meat that is exchanged through barter. Not only is it difficult to calculate the number of households that engage in barter and the volume of meat that they trade, but it is also difficult to apportion how much of the meat that is bartered is from alpacas and how much of it is from llamas and sheep.

Long distance barter requires that the producers have a large number of animals, sufficient labor power to manage the treks, and no better alternative means for access to crop staples. This means, that the producers who engage in this form of exchange tend to be specialized livestock producers from the highest habitable zones of the region, zones where agriculture is unfeasible.

Alpaca producers located in the more temperate zones have fewer alpacas but are able to engage more fully in mixed production. They tend to exchange the meat that they produce in other ways. Essentially, these producers either sell their animals live at the farm gate or sell the meat at local markets. They do not engage in long distance barter. If the production units are located in areas that are regularly visited by meat merchants, then they may opt to sell or trade their animals with the merchants.

Production units which are located in the areas around the slaughterhouses of Santa Rosa, Ayaviri, Nunoa, Puno and Sicuani, or around other livestock bulking centers, are often visited by meat traders who offer to buy or trade for live alpacas. In both cases, the animals are valued in monetary terms. The main criteria for determining price are the age and weight of the animal and the length of its fleece. Household producers find it difficult to sell recently-

shorn alpacas to meat merchants, since the latter try to maximize their profits by also selling the wool of the animals that they buy.

If the producer chooses to trade rather than sell his animals then the trade is based on the monetary value of the animal and of the items against which the animal is being traded. The most common trade items are coca leaves, bread, fruits, cooking utensils, plastic ware and horses. Trade works to the benefit of the merchants since the latter usually overprice the items that they bring and underprice the alpacas. Producers are aware of this and are willing to absorb the loss when the alternatives, such as selling the meat at the nearest market, are more costly in terms of time or labor.

Since most households are likely to sell very few animals at a time, sometimes only one, merchants will usually comb an area and assemble a herd from many individual purchases. When he has the desired number of animals, the merchant will trek them to the nearest bulking center or slaughterhouse. These are usually located along the road and rail lines which link the cities of Cuzco and Puno. Animals trekked to bulking centers are usually then shipped to the city of Arequipa.

However, not all households are visited by meat merchants and some that are may be unwilling to trade with them, preferring instead to slaughter their animals and to take the meat or charqui to a neighboring market. In such cases, the volume of meat sold at any given time is very limited. Households may butcher one alpaca, keep one-half of the carcass for their own consumption and only sell the other half. The amount of meat that is sold is usually determined by the cash needs of the household. Often, these needs are for items

which are purchased at the same market where the meat is sold. In some of the smaller markets, producers may bring charqui for exchange against other market items, usually crop staples or cooking vessels. The alpaca meat that is sold at the weekly markets is generally bought by urban consumers or by meat retailers who transport it to the larger urban centers or to the lowlands for resale.

As with the case of long distance barter, it is not possible to estimate the volume of meat that is sold or traded by households either with traders or at the weekly markets. We would guess that the great majority of the alpaca meat produced in the southern zone is exchanged through these trading media. Since households produce most of the alpacas in the southern zone and since most of the meat production is not channelled through the official slaughterhouses, we must assume that the largest volume of alpaca meat is consumed by the rural population of the highlands or is exchanged at the markets where it is channelled towards urban consumers or towards the populations in the tropical lowlands.

The Exchange of Cooperative-Produced Meat

We estimate that in 1980 the cooperatives in the department of Puno culled a total of about 31,000 alpacas for slaughter, these animals yielded approximately 850 m.t. of meat. This volume probably represents a large portion of the legally marketed alpaca meat. Thus, cooperatives have a very strong and direct influence on the behavior of this market.

Most of the alpacas sold by the cooperatives are sold for slaughter, sometimes the cooperatives will also sell young animals as

breeding stock. A small portion of the cooperatives' offtake may not be sold live for various reasons. Very old animals, normally females, are not sold because their meat is unpalatable and tough. These animals are slaughtered within the cooperatives and the meat is processed into charqui, which is consumed by the members and workers of the cooperatives. Some cooperatives slaughter a very small number of younger animals and sell the red meat or charqui to the populations of the small urban centers in their area, in effect functioning as meat retailers. However, by far, the greatest portion of the offtake is sold live.

Cooperatives sell alpacas at the production site and at livestock fairs. In either case, the animals are auctioned in age and sex lots. Most of the cooperatives seem to prefer auctioning their animals within the cooperative. At these auctions, a cooperative may sell anywhere from 100 alpacas up to a thousand or more. As a result, cooperatives hold only two or three auctions each year. Normally, they will sell most of the offtake at the cooperative and the rest at livestock fairs. At the 1982 Santa Rosa livestock fair, for example, a total of 1,652 alpacas were auctioned by four different cooperatives.

The cooperatives try to avoid selling too many animals during the high-supply season, April through July. Instead they attempt to space their auctions throughout the year, especially after August when meat supplies decline and prices may be better. In actual practice, it does not appear that the sales are as rationally spaced as the cooperatives would like them to be. It is our impression that the cooperatives are pressed for cash and cannot often withhold animals for deferred sale; so, they tend to sell most of their animals during the high-supply season.

The cooperatives sell their animals almost exclusively to livestock merchants. Unlike other livestock, alpacas are paid for in full at the time of purchase; there is no credit granted to the buyers. Merchants usually trek their purchases to a slaughterhouse or to one of the railroad stations on the line which connects the region with the city of Arequipa. Almost all the animals bought from the cooperatives are either slaughtered in the region or are shipped live to Arequipa.

The Marketing Systems

The manner in which the alpaca meat produced by the households and cooperatives is marketed depends largely on the type of merchant who buys the meat or live animal from the producer. There are essentially three types of traders and these types correspond loosely with the regional home bases of the traders. For heuristic purposes, we will refer to them as the petty merchants, the Puno merchants, and the Arequipa merchants. These are not clearly distinct types and there is much overlap between them.

The difference between the petty traders and both types of merchants corresponds in general terms with the differences between the illegal and legal marketing channels. Petty traders by and large operate within the illegal system, while the merchants dominate the legal sector. Again, this is not a rigid separation, any trader or merchant may operate in either or both sectors. The distinction between the legal and illegal channels is itself tricky and arbitrary and is sometimes nonexistent (Primov, 1981).

The petty traders are essentially meat middlemen, or more accurately, middlewomen. They do not deal in live animals. They buy

carcasses either at the weekly markets or from producers, or from other traders, or from the slaughterhouses, and transport them to the regions of demand. They normally deal in relatively small volumes of meat, generally no more than a dozen carcasses at a time. As is also true of the merchants, the petty traders do not specialize in alpaca meat, ather, they deal in all types of meat. There are some traders however, who work on commission for makers of charqui and they only buy alpaca meat. Some of the petty traders deal not only in meat but in many other food items, this is especially true of traders from the temperate zones who bring fruits and vegetables to the alpaca producing areas.

Many of these traders are from the lowlands of the department of Cuzco, especially from the provinces of Urubamba and La Convencion; another group comes from Sicuani. The rest are mostly from the small urban centers in the department of Puno, specially from Santa Rosa and Ayaviri.

Perhaps the largest volume of meat that is channelled through the petty traders goes to the city of Arequipa, another important stream goes to the provinces of Urubamba and La Convencion. A smaller stream goes towards the lowland province of Sandia in the department of Puno. Yet another stream is formed by petty traders from the Provinces of Urubamba and La Convencion who purchase meat at the weekly markets in the provinces of Chumbivilcas, Espinar, Canas and Canchis, all in the department of Cuzco. There exist even smaller trade routes; for example, petty traders from the provinces of Chucuito and Lampa, in the department of Puno, buy meat in their communities and take it to the weekly markets in the lowland valleys of the departments of Tacna, Moquegua and Arequipa.

The nucleus of the middlemen that we have labelled the Puno merchants is composed by the 44 members of the meat merchants association of Santa Rosa. In addition to the members of this association, there are other similar merchants based in the other small urban centers of the region, such as Nunoa ard Ayaviri. These merchants tend to specialize in live animals. They buy alpacas and other livestock from household producers or from the cooperatives and trek them to the slaughterhouses, especially to the Santa Rosa slaughterhouse, where they sell the carcasses.

When buying from household producers, these merchants bulk animals bought from several producers and sell them as a single lot. The animals are either simply purchased or are obtained through a process of reciprocal sales. In the latter case, the alpaca producer buys from the merchant food items such as fruits, corn and coca leaves, as well as other goods such as bread, plastic ware, pots and pans, and even horses. In return, the merchant buys the alpacas.

These transactions tend to be particularly profitable for the merchants because they systematically overprice their wares and underprice the livestock. Producers are aware of this but continue to enter into such trades when they wish to avoid the loss of time and the expenses associated with trekking their animals to the market sites, where they know that they can obtain higher prices for their alpacas and lower ones for their purchases.

Although the profits associated with trading with household producers may appear to be attractive, the risks and expenses which are also associated with this type of trade are also higher. Household-produced alpacas tend to be of uneven quality and it is much more

difficult to estimate their carcass yield. It also requires much more time and effort to deal individually with the different households and to assemble a sufficient number of animals. Furthermore, since most household production areas are generally located in isolated regions, trekking the animals to the slaughterhouses is both time consuming and risky; animals often become lame or develop other problems.

Buying from the cooperatives is less risky but usually requires much more capital since the animals are sold in relatively large lots and must be paid for at the time of purchase. Another disadvantage is that the animals are auctioned and thus the merchants have much less control over their price. Since few of these merchants have sufficient capital to bid individually on entire lots, they often enter into temporary partnerships whereby they pool their capital, bid jointly on the animals, and if successful, either divide the animals amongst themselves on the basis of their contribution of capital or sell the lot and split the profits according to the same criterion.

In dealing with the cooperatives, the Puno merchants may obtain less profit per animal but obtain better animals and in larger lots. These features make such deals attractive to them because their profits may be better in the long run.

Once their alpacas are slaughtered, the carcasses are bought either by the petty traders or by Arequipa merchants. In the Santa Rosa slaughterhouse these buyers appear each Thursday, the day when alpacas are slaughtered, and buy the carcasses as soon as they are processed. Since the meat is unrefrigerated, it is very important to the Puno merchants that they sell their carcasses as quickly as possible. Often, the carcasses are sold even before they are rendered.

Many of the Arequipa merchants will close deals for the purchase of the carcasses after inspecting the lives animals.

The Arequipa merchants are few in number and, as the term suggests, are based in Arequipa. Half a dozen or so of these merchants appear to completely control the legal trade in live alpacas and alpaca meat destined for the Arequipa market. These merchants buy live animals from the cooperatives and then ship them live by train to Arequipa as well as buying carcasses from the Puno merchants at the slaughterhouses; sometimes they bypass the Puno merchants even when procuring carcasses, by buying directly from the producers and slaughtering the animals.

The live animals that are shipped to Arequipa are slaughtered almost immediately upon arrival at the La Tomilla slaughterhouse, the only one in Arequipa that slaughters alpacas. The carcasses are then sold to retailers. The carcasses which arrive from Puno usually arrive on Saturday mornings and are sold to the retailers as soon as they are inspected upon arrival. Since the carcasses arrive unrefrigerated, they have a very short shelf life and must be sold out by Monday at the latest. The carcasses rendered at the local slaughterhouse are used to provide meat for the other days of the week, Tuesday through Friday.

The Arequipa merchants appear to be much better capitalized than their counterparts from Puno and their control of the alpaca meat trade seems to extend well into the production zone. While they generally obtain their carcasses from the Puno merchants, they also compete with the latter for live animals from the cooperatives. They do not, as a rule, deal with household producers and thus this source of animals remains in the hands of the Puno merchants. Perhaps the only effective

competition to the Arequipa merchants are the petty traders from the illegal sector who also buy carcasses from the Puno merchants and transport them to Arequipa.

The merchants from Arequipa have been able to successfully resist efforts by both the cooperatives and the Puno merchants to extend their own activities into Arequipa. At least one cooperative has tried to sell alpaca carcasses to retailers in Arequipa. It was not able to find buyers and barely managed to sell the carcasses at reduced prices. It was felt that the retailers had been scared off by the local merchants. This cooperative has given up on any further plans to market carcasses in Arequipa. Similarly, the association of meat merchants of Santa Rosa has discussed the possibility of buying some trucks to transport carcasses to Arequipa for direct sale to the retailers. So far, this idea has been effectively discouraged by the local merchants. We suspect that power of the Arequipa merchants vis-a-vis the Puno merchants and the Arequipa retailers is based not only on their superior economic strength but also on long established casero and compadrazgo relationships with members of both groups as well as with retailers in Arequipa.

The Flow of Meat

We can now turn our attention to discussing how much meat is actually sluiced through the various marketing channels. The data that we have is incomplete and unreliable. It can only be used to generate some notion of where the meat goes and what the minimum levels of supply are. We use the data as a means for establishing that we know that at least this much meat is going from here to there, but with no

real knowledge of how much more may also be going. This problem is compounded when we remember the existence of the parallel illegal market, which, by all accounts, transports more alpaca meat than the official system.

Table 10 presents the volume of alpacas slaughtered in the three most important slaughterhouses, Santa Rosa, Nunoa, and Ayaviri. These slaughterhouses process the great bulk of legally slaughtered alpacas in Puno.

TABLE 10

Alpacas Processed in the Slaughterhouses of Santa Rosa, Nunoa and Ayaviri.

	1978	1979	1980	1981
Ayaviri	356	1,048	466	1,387
Santa Rosa	2,225	1,252	5,901	11,795
Nunoa	1,175	444	1,781	3,955
TOTAL	3,756	2,744	9,318	17,137

The increase in slaughtered animals in 1981 reflects not only an actual increase but also results from more complete documentation. If we compare the total for 1981 with the estimated total departmental offtake, about 110,000 alpacas, we see that it represents a very small percentage of total offtake, about 16 percent. We can use this figure as a basis to estimate that probably no more than 20 percent of the departmental offtake is channelled through the legal slaughterhouses.

In addition to the meat channelled through the legal slaughterhouses, the official marketing sector also exports live animals from the department. Practically all of these animals are shipped to Arequipa. The manager of the La Tomilla slaughterhouse

estimates that in 1981 he slaughtered about 7,500 alpacas from Puno. This represents about 7 percent of the estimated departmental offtake.

We can thus estimate that in 1981 the legal sector handled at least 24,637 alpacas, about 23 percent of the estimated departmental offtake; of this number, about two-thirds were slaughtered in the production area and the other third was exported. In terms of red meat, these figures represent about 471 m.t. slaughtered in Puno and 206 m.t. slaughtered in Arequipa. This leaves around 2,346 m.t. of meat to be disposed through the illegal channels.

An important problem in tracing the flow of meat and determining its volume is the fact that much of the meat is processed into charqui before or during its commercialization. Since it takes anywhere between 2 to 4 kilograms of red meat to make 1 kilogram of charqui, depending on the specific process used, it is difficult to convert units of charqui into units of red meat or into animal units. In our description, we will try to separate red meat and charqui and we will deal with them separately.

Table 11 presents the destination points of legally slaughtered carcasses exported as red meat from the production zone. Some of this meat will have been converted into charqui before sale to the consumer.

Again we would suggest that the general increase in 1981 is due as much to better records as to large actual increases. Although we do think that there was an actual increase in production in 1981. For all practical purposes, red meat is marketed only in the city of Arequipa and to the department of Cuzco. About 60 percent goes to Arequipa and the rest to Cuzco. Most of the meat that goes to the department of Cuzco bypasses the city of Cuzco and goes to the province of Urubamba,

to be converted into charqui which is then taken to the province of La Convencion, where it is consumed.

TABLE 11

Volume and Points of Destination of Carcasses Slaughtered Legally in Various Slaughterhouses in Puno. (In Kilograms of Red Meat.)

Destination	1980	1981
Arequipa	55,055 (56%)	153,841 (63%)
Cuzco	39,565 (40%)	90,179 (36%)
City of Puno	1,250 (1%)	0
Juliaca	2,160 (3%)	3,195 (1%)
Tacna	0	30 (0%)
Azangaro	0	625 (0%)
San Anton	0	60 (0%)
Antauta	0	255 (0%)
TOTAL	98,030	248,185

The two main marketing streams essentially exhaust the legal red meat available in the southern production zone. Both of these markets also receive large volumes of illegal red meat. It seems clear that the biggest proportion of red meat reaching Urubamba is of illegal origin. It should be noted that the legal red meat which is transported to the city of Cuzco and to Urubamba automatically enters the illegal sector because there simply is no legal channel for marketing alpaca meat in the department of Cuzco. This is an important difference between this department and Arequipa.

The focal point in the province of Urubamba for the processing of red meat into charqui is the community of Huayllabamba. This village is situated on the road which links the city of Cuzco with La Convencion. Alpaca meat arrives here not only from the Department of Puno but also from the provinces of Canas, Canchis and Espinar, all in

the department of Cuzco. The processing of the red meat into charqui is done by many households in the village. Each household works independently and relies on a casero for its supply of meat. The household places a request each week for a certain number of carcasses and the casero travels to the production zones, acquires the meat and brings it to Huayllabamba where she sells it to the household. Each household may process anywhere from 10 to 25 carcasses per week. We were not able to obtain reliable estimates on the number of households processing charqui in the community and so we do not have an estimate of the total weekly output of the community.

According to one informant, the village used to process more charqui during the 1970s. He blamed this decline in demand on the introduction of electrical- and kerosene-powered refrigerators in La Convencion. In his view, the ability to refrigerate red meat has lessened the need to rely exclusively on charqui as a source of meat. Another factor which apparently strongly influences the levels of demand for charqui is the price of coffee and coca leaves. Since the economy of La Convencion depends strongly on these products, when their prices are low the local population restricts its consumption of charqui. To some extent then, the demand for legal alpaca red meat from Puno is conditioned by prevailing coffee and coca leave prices in La Convencion.

The time needed to process the red meat into charqui averages about one week. However, it is highly variable because it is possible to elaborate different grades of charqui. One type, cesina, can be done in less than a week; while chalona, a more dehydrated variety, takes more than a week. Once processed, the meat is then sold to

merchants from La Convencion who retail the charqui at weekly markets. The populations of Urubamba and La Convencion consume not only the charqui processed in Huayllabamba and a few other neighboring communities, but also consume large quantities processed in the production sites and transported directly to these areas.

The city of Arequipa is by far the leading market for alpaca meat, both legal and illegal. Its central market receives weekly about 2 m.t. of meat, almost all of it from Puno. In addition, the La Tomilla slaughterhouse processes weekly from 100 to 150 alpacas which yield approximately 3 to 4 m.t. of meat. Combining the two figures results in a total of between 5 and 6 m.t. of alpaca meat supplied weekly to the legal markets of Arequipa.

The manager of the La Tomilla slaughterhouse estimates the total daily consumption for the city at 50 animals, or about 9.6 m.t. weekly. This estimate would give the illegal sector a weekly volume of between 3.6 and 4.6 m.t.; we suspect that the actual volume might be even higher.

Two reasons are generally given to explain the relatively high consumption level of alpaca meat in Arequipa. They are the large number of rural migrants from Puno and the availability of a legal marketing structure.

It is argued that the demand for alpaca meat in Arequipa is generated by the large, and largely poor, population of migrants from Puno. These migrants, already accustomed to eating alpaca meat regularly and reduced to buying the cheapest foodstuffs, constitute a strong and steady source of demand for this meat. Evidence for this argument is provided by the pattern of consumption. Most of the meat

is purchased by the population of the pueblos jovenes, the poorest sectors of town where the rural migrants are concentrated.

It is probably in response to this demand that in 1965 the municipality of Arequipa decided to authorize the sale of alpaca meat in the city's markets, a decision which is still unique. The new policy fostered the development of a legal marketing sector for providing alpaca meat. This is the sector which we labelled the Arequipa merchants.

This sector, although small, has come to dominate much of the legal market in Puno as well as controlling the supply of Arequipa. In real terms, a couple of merchants control the supply of carcasses while another two or three control the supply of live animals for slaughter. As an indication of the monopolistic nature of this sector we can give two illustrations. Municipal records identify 30 different purchasers of alpaca carcasses at the Santa Rosa slaughterhouse in the period between May 1981 and April 1982. During this time, three Arequipa merchants bought 60 percent of the carcasses, the other 40 percent were distributed between the other 27 buyers, most of them petty traders. The 60 percent purchased by the three traders represents 3,394 carcasses, or about a weekly average of 1.8 m.t. of red meat. This constitutes 90 percent of the estimated total weekly supply of legal carcasses to the city of Arequipa.

In the case of the trade in live animals, a similar situation prevails. In mid-1982 one Arequipa merchant bought a total of 3,000 animals from three different cooperatives. The animals are to be delivered to Arequipa in small weekly lots. The manager of the La Tomilla slaughterhouse estimated that this purchase alone would meet

the city's need for live animals for the remainder of 1982.

In addition to the alpacas that Arequipa receives from Puno, it also consumes alpacas produced in the department of Arequipa, specially in the province of Cailloma. In 1980 the department had an estimated 262,265 animals (Ministerio de Agricultura y Alimentacion, 1980a). However, very little of this production is channelled into the legal market. In 1981, only 300 alpacas from Arequipa were slaughtered at La Tomilla; this is out of an estimated annual offtake of about 24,000 animals. We must conclude that the meat yield of this offtake, calculated at around 600 m.t., is directed almost entirely into the illegal sector within the department.

We should also add that some of the red meat that is transported to the city of Arequipa is subsequently exported as charqui. This charqui is sent to the coastal valleys within the department, especially to Camana and Majes, as well as to the department of Moquegua. This trade seems to occur principally during the labor intensive periods of coastal agriculture.

We can now look at the distribution of charqui processed in the production zone and exported legally. Table 12 lists the destinations of charqui shipments. We can see that the great majority of the charqui is sent to the department of Cuzco. The other two important destinations are the city of Arequipa and what we have termed the Puno lowlands, namely the subtropical northern region of the department.

Lima, which in 1980 and 1981 received very little legal charqui, a few years back used to be a very important consumer of legal charqui from Puno. In 1978, for example, the city received 27,056 kg through legal channels. We have no explanation for the apparent decline.

TABLE 12

Points of Destination of Charqui Processed in Puno and Marketed Legally , in Kilograms of Charqui.

Destination	1980	1981
Cuzco	75,595 (76%)	70,944 (70%)
Arequipa	13,321 (13%)	12,145 (12%)
Puno Lowlands	9,209 (9%)	8,716 (9%)
Madre de Dios	1,500 (2%)	3,563 (4%)
Juliaca	250 (0%)	2,639 (3%)
Lima	100 (0%)	1,600 (2%)
Puno	0	670 (0%)
Moquegua	0	450 (0%)
TOTAL	99,975	100,727

Most of the charqui that is shipped to the department of Cuzco is destined either for La Convencion or for the eastern lowlands of the department, especially the area around Quince Mil. Some of this charqui is also transshipped to the department of Madre de Dios, particularly to its capital, Puerto Maldonado. The charqui is transported in relatively small lots by a considerable number of petty traders. Apparently, it is one of the more profitable items which is traded in the lowlands.

Some charqui is also consumed in the city of Cuzco; some of it is produced within the department, mainly in the provinces of Canas, Canchis and Espinar, and then transported to the city. There appears to be a greater acceptance of charqui by the urban population than of red alpaca meat and its consumption is more widespread. However, since charqui can also be made from mutton and llama meat and since it is very difficult to identify the meat, it is seldom clear what kind of charqui is being consumed.

The charqui that goes to Arequipa is also transported primarily by petty traders and it is sold legally as well as illegally. We do not know whether its consumption is also limited to the poor rural migrant population of the pueblos jovenes, we suspect that it is more generalized than that of red meat. Overall, however, Arequipa is not a large consumer of legal charqui.

The third important point of destination in Table 12 are the Puno lowlands. Essentially, this is the northern part of the provinces of Carabaya and Sandia. This area is contiguous with the eastern lowlands of Cuzco and Madre de Dios, the other important regions of charqui consumption . As we mentioned previously, the population of these areas has very limited access to animal proteins and charqui represents the only viable source which can be safely stored unrefrigerated under tropical conditions. We suspect that the relatively high levels of demand from these regions result from the influx of migrants from the highlands who were encouraged to resettle in the jungle under current government programs. The Puno lowlands also receive illegal charqui from the province of Azangaro as well from other highland sources, such as the community of Crucero in the province of Carabaya. This community also ships large volumes of illegal charqui to Juliaca and Arequipa.

The Influence of Wool Prices on Meat Production

We stressed earlier in this report that alpacas are produced principally for their wool. Therefore, we should expect that wool prices will directly influence the supply of alpacas for slaughter. During periods of high wool prices we would expect the producers to

retain their animals for as long as possible in order to maximize wool production. Old or other undesirable animals which normally would be culled for slaughter may be kept for one additional shearing. During periods of low wool prices we would expect the producers to cull at normal levels, still trying to maximize wool production but more willing to cull their herds.

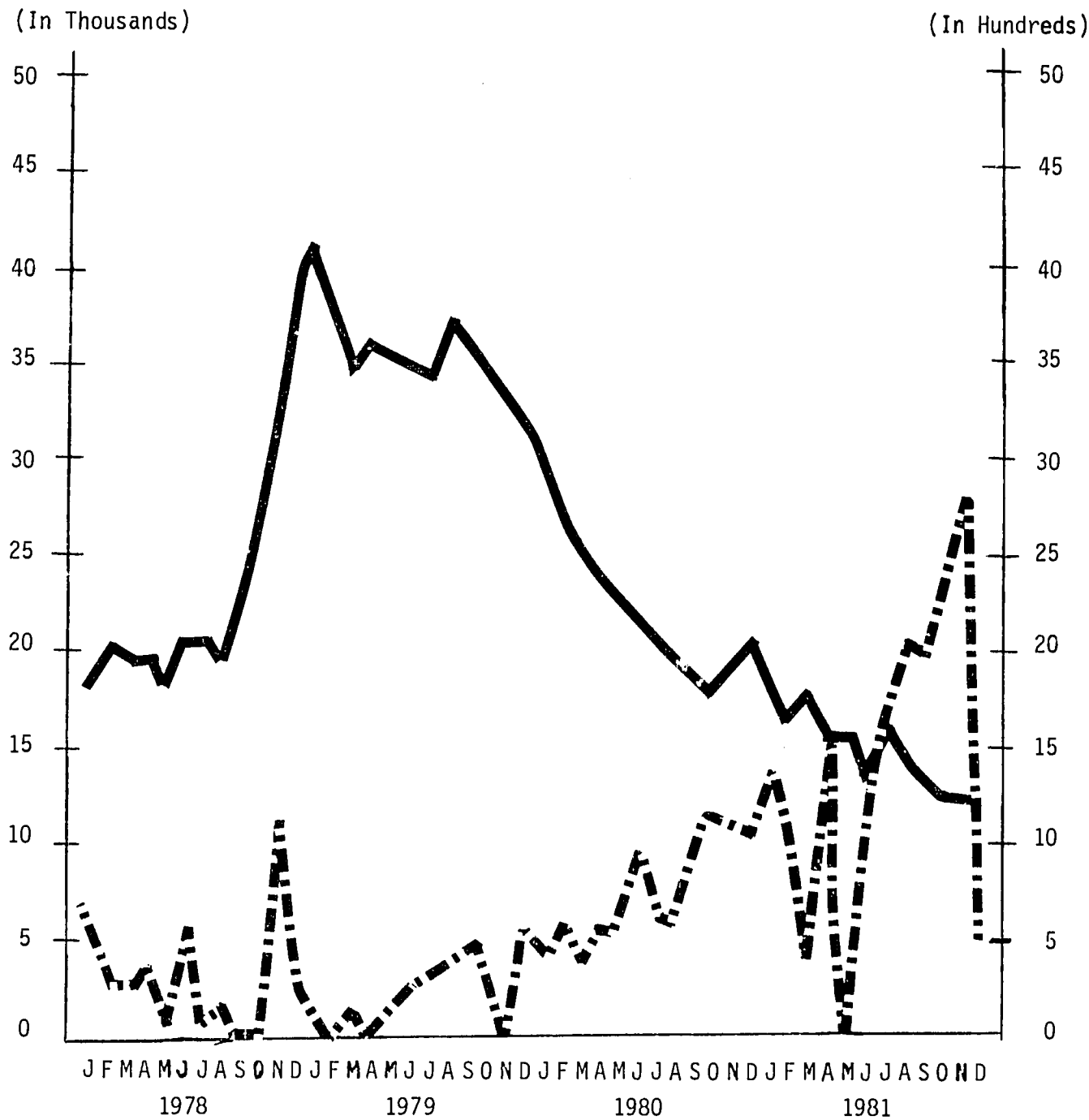
Since alpaca meat prices do not fluctuate significantly, producers do not have to engage in a double calculus based both on wool and meat price fluctuations. For all practical purposes, the producer can consider meat prices as relatively constant in real terms.

In Table 13 we have plotted the prices of white alpaca wool per 50 kg units, in constant December 1977 soles. We also plotted the monthly totals of alpacas slaughtered at the three main slaughterhouses in Puno during the same time period. We can see in this table that there is an identifiable negative relationship between the two functions.

High wool prices had an effect of depressing the levels of slaughter. As the wool prices declined, slaughter levels reacted rapidly and increased significantly. This rapid response in the slaughter level reflects the culling of overextended herds as soon as they are sheared. Having increased their herds as much as possible during the previous season, when wool prices were high, the producers responded to the low wool prices with large offtakes, culling the marginal animals kept from the last season as well as the newer ones.

Table 13 shows that the supply of alpaca meat is clearly subordinated to the fortunes of wool. This means that it is very difficult to rationalize the alpaca meat market on any long-term basis. High wool prices result not only in short and medium term decreases in

Table 13 Adjusted Price Levels of White Alpaca Wool and Number of Alpacas Slaughtered on Ayavire, Nunoa and Santa Rosa, 1978-1981.



Price levels supplied by Alpaca Peru E.P.S. Prices adjusted to December 1977 sales on the basis of correction factors supplied by Ed Letterman (Winrock Economics).

meat, but also in less palatable meat because the animals are kept for longer periods before being slaughtered.

The Economics of Alpaca Meat

In general, prices in the alpaca meat trade tend to be stable in the long run, with relatively minor fluctuations within the short run. The price of live animals for slaughter appears to fluctuate more than the retail price of the meat. We received conflicting information about the seasonal fluctuation in meat retail prices. Some informants stated that retail prices are sensitive to levels of supply, while others reported that the basic price had remained unchanged, in real terms, over the last two years. We would guess that the effects of fluctuations in supply have only a dampened effect on retail prices.

The price range of live animals for slaughter is considerable. During the period of research, prices in Puno ranged approximately from S/10,000 to S/20,000 per animal. The price seems to depend most on the amount of wool on the animal, its age, and its sex, unshorn animals sell for considerably more. Household-produced alpacas tend to command lower prices; invariably, the highest prices are offered only for animals from the cooperatives.

At the 1982 Juliaca livestock fair, Puno's largest, a total of 2,052 alpacas were auctioned for slaughter in 16 different lots. All the animals were sold by cooperatives, except for 400 alpacas that were being offered by the experimental farm of the Universidad Nacional Tecnica del Altiplano. The price per animal ranged from S/13,100 for a lot of 18-month old males to S/20,000 for a lot of unspecified males. The average individual price for all the lots was S/15,087. We suspect

that the alpacas auctioned at this fair were better than the average animal produced by the cooperatives and that, therefore, the prices may have been a bit higher than at a regular auction.

When the alpaca meat reaches the retailer in Arequipa its cost is S/650 per kilogram (prices current at time of research). Thus, the Arequipa merchant is able on the average to recover about S/17,875 from the sale of the carcass alone. If he had bought the animal live, then he also made money from the separate sale of the hide, the head, the feet, and the entrails. On the other hand, he also incurred expenses, principally in slaughtering and transportation costs. The retailer sells the meat at S/800 per kilogram, realizing a 23 percent gross return on her investment.

The market advantage of alpaca meat lies in its competitive price over other types of meat, specifically beef and mutton. Alpaca meat is always cheaper than other types of meat, although the difference may vary at different times and in different areas. It appears that price differences between beef, mutton and alpaca are narrower in the production zones. West (1981) reported differences of 9 and 9.5 percent between alpaca and mutton on two rural markets in Puno. In Arequipa, however, the differences between was on the order of 43 percent, and of 41 percent in relation to beef.

These price differentials suggest that the price advantage of alpaca meat in the urban markets is largely determined by urban consumer preference for beef and mutton. The relatively low price of alpaca meat makes it much more attractive to the poorer urban sectors and creates a strong demand for it.

Chapter 5

CONCLUSIONS

We do not believe that any drastic changes can or should be sought in the production and distribution of alpaca meat in the southern production zone. We do think, however, that improvements are possible and desirable and that they can be achieved without great expense or effort. It must be emphasized strongly that the calculus which must guide any attempts at improving the present patterns of production, exchange and consumption of alpaca meat must rest equally upon a consideration of both economic and social factors. Social costs and benefits must be considered along with their economic counterparts. The primary consideration behind any effort to alter current patterns must be to preserve the easy and cheap availability of alpaca meat to the rural and poor urban sectors of the highlands. This must be so because alpaca meat represents one of the very few sources of animal protein available to these populations.

Any efforts at improving the production and exchange of alpaca meat must take cognizance of this condition and must preserve it. Alternative economic options which might appear to be more profitable should not be implemented if they divert the meat from these urban and rural consumers. This is likely to occur if alpaca meat prices rise in response to increased urban demand; under such circumstances, many household producers will no longer be able to afford to eat the alpaca meat that they produce.

It is our conclusion that the most practical manner of achieving greater economic benefits without sacrificing the interests and welfare of the rural population is to essentially preserve each of the two current spheres of meat exchange. Household-produced meat should continue to meet primarily the needs of the rural populations and of the other poorer sectors within the production zone as well as of the populations of the eastern tropical slopes and the coastal valleys; while cooperative-produced meat should be aimed more efficiently at the urban consumers of the large southern cities, primarily Arequipa and Cuzco. We do not propose that these two productive and distributive structures be maintained isolated from each other; rather, we recommend that household producers have easier access to the marketing structure which distributes cooperative-produced meat so that they can utilize it if they wish. We can discuss these recommendations in some detail.

We do not think that there should be any attempts to suppress or modify drastically the various means by which household-produced meat is marketed. These means are generally quite efficient in distributing the bulk of the alpaca meat to a wide range of consumers at a reasonable cost and in a manner which safeguards the interests of the producers. We suspect that any alternative means of supplying these consumers would result in higher social and economic costs, specially if the state attempts to implement them. The present channels of exchange seem best suited to the needs of the household producers since the latter can control when to sell and how much to sell.

Since households often must sell or slaughter animals in order to meet immediate financial needs, they must have flexibility to sell or slaughter at any time. Under present practices, they need not wait for

the next slaughter day at some distant slaughterhouse; instead, they can slaughter their alpacas any time and take the meat to the nearest weekly market, to the nearest urban center, or sell it within their community. We believe that having such options is crucial to household producers. In fact, we think that they need greater flexibility.

Control by the household producers over how much or how little they sell is also very important. One of the main reasons why these producers avoid taking their animals to the slaughterhouses is that they are unable to control how much or what parts of the carcass they will sell and how much they will retain for their own consumption. In the slaughterhouses they must dispose of everything, while if they do their own slaughtering they can retain the blood, head, feet and viscera and just sell the carcass proper, or only part of it. Obviously, this is much more convenient for them.

There are other compelling reasons why households avoid using the slaughterhouses. One of them is the effort and time required to reach them: most households are located fairly distant from the nearest slaughterhouse. Since these producers sell few alpacas at a time, often only one, it is highly impractical for them to trek them to the slaughterhouse. Furthermore, using the slaughterhouse may represent a net economic loss for them, since they must obtain slaughtering permits and pay slaughtering fees. In return, they may not receive any better prices for their meat. In short, there are many practical reasons why these producers do no use the slaughterhouses.

We would strongly recommend abolishing the current regulations which require all legally sold meat to be slaughtered in the official slaughterhouses, specially mutton and alpaca meat. The rationale for

the current regulations is that they are needed in order to assure proper hygienic slaughtering conditions and to safeguard the consumer by the inspection of the carcasses by a veterinarian pathologist. In reality, neither condition prevails. The Santa Rosa slaughterhouse is not noticeably more hygienic than an average household compound, and as far as veterinarian inspections, we never saw a veterinarian at the Santa Rosa slaughterhouse during the four months of our research; neither did we see one in the Ayaviri slaughterhouse when we visited there.

The putative advantages of the official slaughterhouses are mostly fictional. This is cetainly true in the case of Santa Rosa, which, it must be remembered, is the most important slaughterhouse for alpacas in the entire southern zone, and probably in the entire country. For these reasons, it seems to us that the justifications for collecting slaughtering fees are largely unwarranted. Such fees seem to serve purely revenue-gathering functions and offer few benefits in exchange.

Small wonder then, that the household producers and petty traders try to avoid the official slaughtering channels and are thus forced into an illegal marketing structure - a structure which seems to be more efficient and not necessarily more dangerous to the health of the consumer. In fact, much of the potential danger from the meat marketed allegedly may result from efforts to avoid detection by the authorities, causing the producer or trader to package improperly the meat and to take circuitous routes for its transport. Detection usually results either in the confiscation of the meat or in the payment of fines or bribes.

Government policies should be reversed. Instead of trying to suppress the so-called illegal trade, efforts should be made to foster it and make it more efficient and less risky. If indeed health risks are greater within this sector, which we are not sure of, then the proper course would be to help to alleviate the conditions which cause the higher risks.

It is difficult to assess, and is also beyond our expertise, the actual risks that unregulated meat pose to consumers. It is also difficult to determine whether the risk is less with officially slaughtered meat.

Climatic conditions in the Andes present an unusually benign environment for the preservation of unrefrigerated meat. Thus, exposure is less of a problem than in most parts of the world. This, of course, only holds true for the highland regions; once the meat descends either down to the eastern tropical slopes or to Arequipa and to the coastal valleys, then exposure immediately becomes a critical issue.

It would seem that in the highlands the risks come not so much from exposure, but from infected carcasses. We do know that parasitic infections are common in alpaca carcasses but we do not seem to know exactly how toxic they are and how they react to the cooking procedures most commonly used with alpaca meat. We were not made aware of any endemic health disorders among the populations which consume most of the household-produced alpaca meat which are attributable to the consumption of the meat. We simply do not know what the real risks are in consuming this meat; nor do we know if the risks are any lower with cooperative-produced meat.

Official efforts should be directed towards providing a better infrastructure for marketing the household-produced meat, specially the petty trade. One problem that can be alieviated rather easily is the deplorable state in which the meat is transported in an attempt to avoid detection. If it becomes no longer nece sary to hide the meat, then the petty traders can be encouraged to use better and safer containers, and thus decrease the risks of contamination and spoilage. Facilities could also be provided in the larger cities where the traders can sell their meat to the retailers. These facilities could be very simple and would alleviate current problems, such as the retailers having to buy the meat off trucks in the middle of the night. If such facilities were to exist, then it would also be easier for the authorities to check on the condition of the meat.

In short, we recommend strengthening the petty trade rather than suppressing it. This strengthening process should not take the form of a heavily centralized and bureaucratized control but rather of simple attempts at providing basic support facilities. Under such circumstances, the levying of fees would be appropriate only if they are used to implement and maintain infrastructural facilities.

We would also recommend that the legal marketing of alpaca meat be implemented in the city of Cuzco and that this market be open to the petty traders. There is no valid reason why alpaca meat should be a legal commodity in Arequipa and an illegal one in Cuzco. In fact, there are no valid reasons why it should be illegal anywhere.

If efforts are to be made to improve the efficiency of production and exchange of alpaca meat, they should be focused on the cooperative-produced meat and on the system which markets it. We see two

interrelated aspects which need to be addressed in any such effort. They are: The determination of the best locations for the slaughterhouses, and the improvement in efficiency and cost of carcass and live animal transport. Obviously, these two issues are linked, since the location of the slaughterhouses in relation to the production and consumption zones determines the mix of live animal and carcass transportation.

The current system operates in both modes. One slaughterhouse, Santa Rosa, is located within the production zone and dispatches carcasses to the consumption zone. The other slaughterhouse, La Tomilla, is located in the consumption zone and receives live animals from the production zone. These two modes coexist by a cyclical alternation of their operations, whereby one furnishes meat for part of the week and the other does the same for the other part.

The rationale for this arrangement is based on the fact that the Santa Rosa slaughterhouse only slaughters animals twice a week and thus there exists a need for an alternate source of meat for the other days. It is our understanding that the reason why this slaughterhouse does not slaughter alpacas every day is the government's desire to control the levels of slaughter by placing ceilings on the number of animals that can be slaughtered weekly. This is a worthwhile effort, but it appears to be ineffective because the alpacas are simply slaughtered elsewhere.

We did not undertake any cost effectiveness comparisons between carcass and live animal transportation and thus cannot recommend one over the other. The basic considerations which determine the best locations for slaughterhouses in developing countries cannot be applied

directly in the present case. In general, it is more desirable in developing countries to locate slaughterhouses near the consumption zones. This is so because in most of these countries, the costs of maintaining cold chain operations between the production and consumption zones are rather high, and also because transportation costs also tend to be high. These costs tend to be higher than those incurred in the transportation of live animals, even when losses in the weights of the animals are considered (Mittendorf, 1978).

These general findings cannot be applied uncritically to the southern production zone. One crucial difference is that under the climatic conditions of the highlands, it is not essential to establish a cold chain operation if the animals are slaughtered in the production zone. As we have mentioned, presently the carcasses are transported to Arequipa without refrigeration. Therefore, the high costs of transporting meat under refrigeration are not an important factor here.

The other important factor is the cost of transportation. The southern production zone, considering the Santa Rosa slaughterhouse as its epicenter, is linked with the cities of Cuzco and Arequipa both by road and by rail. The roads are unpaved and very poor during the rainy season. Rail transport is rather slow but relatively reliable. Presently, live animals are generally shipped by rail and carcasses by truck.

We would suggest a close economic comparison of the costs of transporting carcasses and live animals both by road and by rail. This should be an important factor in any attempt to improve the marketing of cooperative-produced meat; or any meat, for that matter. This would help to rationalize the location of any future slaughterhouses and help

to prevent failures such as the slaughterhouse of Cabanillas. We did not try to determine the specific reasons for the failure of this slaughterhouse; however, it was the consensus among most of the merchants that it was caused by a poor location and by poor management.

We think that efforts to improve and make more efficient the marketing of cooperative-produced meat, to provide infrastructural facilities for the marketing of household-produced meat, to legalize the sale of alpaca meat in the city of Cuzco, and most importantly, to abolish the regulations which create the conditions for the present illegal market, are steps which would lead to a better and more efficient utilization of alpaca meat.

These measures must be coupled with a serious concern that the supply of alpaca meat not be diverted from its present consumers. To our mind, this social consideration should be the guiding principle in any attempts at improving the production and exchange of alpaca meat in the southern production zone.

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