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THE ROLE OF LIVESTOCK PRODUCTION
ON THE EGYPTIAN FARM

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CONTENTS

LIST OF TABLES

# APPENDIX TABLES

A. Coeficients for Labor Requirements per Feddan, 10 Village Sub-sample, 1977 Farm Management Survey

B. Percentage of Farms Reporting Holdings of Animals, by Type of Animal and by Farm Size Class

C. Percentage of Farms Reporting Production of Dairy and Poultry Products, by Farm Size Class

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# THE ROLE OF LIVESTOCK PRODUCTION ON THE EGYPTIAN FARM

by Ibrahim Soliman and James B. Fitch
with Nesreen Abd El Aziz

> Intensive animal production has never been imporatnt in the agriculture of the world's less developed countries, basically because animals compete with man for land on which to produce crops (Ward 1975, p.117).

## INTRODUCTION

Livestock production has become a cause for national concern in recent years since meat and dairy prices have tended to rise more rapidly than the prices of other foods. Sharp increases in expenditures of foreign currency to import livestock products and feeds have also raised concern. Livestock production is thought to account for about 30 percent of the gross product of agriculture, and it is a very important source of nutrition and income. Yet livestock production is one of the least understood aspects of Egyptian agriculture. This lack of understanding derives partly from the fact that the livestock data base is one of the weakest aspects of the country's agricultural statistics. Available national-level livestock statistics and policy issues have been discussed in an earlier paper (Fitch and Soliman, 1981). The present study examines the situation at the farm level.

Attention to livestock on the traditional farm represents a departure from the common tendency in Egyptian research which has been to focus on large scale feedlots and dairy herds. Indeed, it was long the case that the only technical coeficients which were available for traditional production were those which had been derived from national aggregate, secondary data and not from empirical study. A recent exception to this tendency was the Winrock report (1980), but this study involved farmers in just two villages. It included no explicit evaluation of costs and returns to livestock production, nor was there a comparison of the productivity or efficiency of small farms versus large farms.

Clarifying the role of livestock on the farm and understanding the techniques used in livestock production are

essential in order to see how the performance of the livestock sector can be improved. The traditional farming system in Egypt can be categorized as "mixed farming", meaning that crops and livestock are produced jointly. Thus, in order to understand livestock production one must understand how it relates to crop production, and vice versa. There are a wide variety of livestock products and by-products. Some of these are marketed, many are utilized within the farm household, and some, such as animal work and manure, are used as inputs to crop production. Crops and crop residues are, in turn, important sources of livestock feed. These interreationships must be examined in order to understand how both crop and livestock production can be altered or improved.

An issue of particular concern in livestock production is what happens on farms of different sizes and how feed inputs and products vary as farm size changes. It is normally recognized that livestock production is very important to small farmers, but does this mean that government policy should give special attention to them? Is livestock production on small farms more important merely, as the Winrock study (1980) suggests, because there are many more small farms than large farms in Egypt? Hopkins (1980) noted that a very high proportion of the livestock products of small farms is used for home consumption? Does this mean that small farms should not be viewed as a possible source of surplus livestock products for the country's growing rural and urban non-farm populations? Clearly, livestock production is critical to the economic well-being of small farmers. Survey data presented by Richards and Martin (1981) found that livestock production generates a higher proportion of income on small farms than on large farms, and the same study showed that small farmers devote more labor to livestock than to crops.

Another important issue is the amount of crop area which is devoted to the production of livestock feeds, particularly to berseem clover. The land devoted to berseem rose from 21 percent of the total crop land in the early sixties to 30 percent by the late seventies (Habashy and Fitch, 1981, Figure 1). This was accompanied by a corresponding decline in the area devoted to cotton, the country's main export crop. Many planners and public officials have concluded that the only way to reverse this trend is to mechanize crop production, thus eliminating the need to keep work animals and reducing the need to raise so much berseem. Richards and Martin contend, however, that "The hope that mechanization alone will free land now devoted to fodder crops (e.g. birsim) is almost certainly in vain" (1981, p.13). Dyer and Imam (1981) made a statistical comparison of highly mechanized farms to less mechanized farms and showed that the more mechanized farms in Upper Egypt had a greater percentage of their crop area in berseem. The pattern was the opposite, however, for Lower Egypt farms.

It has often been observed that the greatest obstacle to efficient livestock feeding is that there is a shortage of summer feedstuffs. Berseem is a winter crop, and during the period when it is available the livestock feed ration is usually found to be adequate. The Winrock study found, for example, that farm animals received in excess of their protein and energy requirements during the berseem season, but that they received only half or less of required protein during the months when berseem is not available (1980, p. 7). Due partly to the fact that adequate feed is not available during the summer months, and also due to the fact that milk and milk products spoil easily during this warmer period without refrigeration, relatively little is produced during the summer. It should also be noted that the drop in dairy production activity during the summer frees family labor for use in crop production.

It is now generally recognized that much of the work associated with livestock production is done by women. Some of this work--particularly the processing fo milk products--can be carried out within the confines of the farmhouse compound, rather than in the open fields. It is thus more socially acceptable for women. In general, it is the capacity which livestock production has for utilizing available family labor and for generating extra farm income from a limited land area which has caused some observers to conclude that livestock production should increase in proportion to crop production as human farm population densities rise. A recent study by Walters found that this may not occur in Egypt, however; based on a survey of livestock producers in one village near Kafr El Sheikh, Walters could find no evidence of any tendency for livestock population density to increase as the farm family population density increases (Walters, 1981).

The specific objectives of the present study are to identify the production structure and technical coeficients for livestock on tradtional farms, to examine feeding practices and patterns of feed availability, to examine output quantities and distribution, and to measure economic costs, benefits and returns. Particular attention will be paid to the interface of crop production with livestock production and to the role of family and hired labor. Finally, it is of particular concern to identify how these factors vary by farm size and to consider the implications which this has for national policy. The study draws mainly upon data from the 1977 Farm Management Survey to address these and other issues.

## THE FARM MANAGEMENT SURVEY

The Farm Management Survey provides a variety of useful

insights into the role of livestock. For the present study, 10 of the survey villages were selected for detailed examination, two from each of five major farming regions of the country. Each village contained from 16 to 18 farmers which had been selected in random fashion so as to represent five different farm size strata. Thus, the entire sample includes 175 different farmers with farms ranging in size from a fraction of a feddan to over 60 feddans. Of the 175 farms, 10 were eliminated due to problems with missing observations on critical variables. One farm in Giza Governorate was found to have a relatively large, unrepresentative dairy herd, and it was separated from the rest of the sample for individual analysis. The various farm size strata are all well represented in the sample, with numbers in each ranging from 17 to 69 farmers. Nevertheless, the sample strata were not proportional, and weights were therefore applied to derive valid averages. The weights which were used (shown in Table 1) were taken from a 1975 Ministry of Agriculture study of farm holdings.

With only two villages from each region in the sample, far less confidence can be placed in the resulting regional breakdown. Rather, regional differences identified here should be viewed as only indicitive of what may actually exist. Weights were not available to derive weighted averages for regions.

The Farm Management Survey has its strengths and weaknesses (Goueli and Hindi, 1979). In its favor is the fact that data was collected in the course of three separate interviews spread throughout the 1976-77 crop year. A weakness for the purposes of the present study is that the survey was designed more in the interest of collecting cropping data than livestock data. It was particularly weak with regard to measuring production or sale of meat and live animals by farmers. About all that could be done here was to estimate sales of live animals and poultry from the value of farmers' net inventory changes of these items.

Egyptian farmers--particularly small farmers--usually operate a so-called confinement system for their livestock. This means that animals are kept in buildings or pens, or at least under the close supervision of the farmer and his family. Feed is carried to animals in the pen, or if they are taken to the field they are not normally permitted to graze at will. Especially on the smallest farms, there is a tendency to feed animals of different types together; thus, it is often difficult for the farmer to say how much feed a specific type or age of animal received. In the Farm Management Survey it was thus often only possible to indicate that feed inputs went to a farmer's entire group of animals rather than to a specific type. This occurred so frequently that for analysis of feeding

it was decided to work on the basis of aggregate animal units rather than by type.

Measurement of quantities of feed inputs posed a different type of problem. Farmers normally measure only the area of berseem which they feed to their animals. This is in terms of small kirat-cuts, where the small kirat represents 1/24th of a feddan in area and the s.k.-cut is one cutting of berseem from such an area. Farmers generally do not know the weight of berseem which comes from an s.k.-cut, so here it was estimated that this was equal to 250 kg. Normally, Ministry of Agriculture studies have found that a feddan of berseem will yield about 24 tons (wet-weight) of forage; since there are four cuts a year, each s.k.-cut would thus weigh 250 kg. Similar problems were faced with forage maize, which farmers also measure in s.k. of area (here assumed to be equivalent to 500 kg.), with camel loads of straw (assumed to be 250 kg. each) and man loads of maize tops and leaves (assumed to be 10 kg. each). While a more direct measurement of weights would have been prefereable, it was just not possible to obtain from the Farm Management Survey.

Problems also occurred in measuring outputs. It was found that cattle and buffaloes are often kept together in the same pens and milked together. Consequently, farmers could often not say how much of their milk was derived from one type or the other. Therefore, here it was decided to treat milk cows as a single entity, even though it is known that there are significant differences in the quantity, qualitiy and value of the milk which is produced by the two types of animals.

Women, who play an important role in livestock production, were normally not interviewed, nor was their work activity in the home observed directly. This would be expected to lead to problems in the accurate measurement of milk production, in particular, since women do the in-household milk processing in many regions.

Both with respect to livestock products and feed inputs, many enumerators in the Farm Management Survey made extensive use of so-called seasonal codes; this meant that the product or the input was recorded as so much per day or week for the duration of a season and that the total production for the season thus had to be estimated by multiplying the daily or weekly rate by so many assumed days or weeks per season. Annual production or useage was in turn derived by adding up the different seasonal totals. The problem with this is that the concept of season and the length of the production period probably vary from farm to farm, and certainly from region to region. Furthermore, some farmers divided the year into just two seasons, winter and summer, while others divided it in to three, winter, summer and Nili.

In editing and summarizing the data, an effort was made to overcome these differences as much as possible through paying careful attention to what was happening, farm by farm.

## LIVESTOCK OWNERSHIP, COMPOSITION, AND SPECIALIZATION

The number of livestock owned per farm varies, as would be expected, with farm size. By assigning each type and age of animal a specific weighting factor--in this case, an adult camel equals 1.0, a buffalo of 3 years or older equals 0.8, and so forth--it was possible to calculate the number of ANIMAL UNITS owned by each farm. On this basis, farms of less than 1 feddan in size held an average of 1.26 animal units whereas farms of greater than 10 feddans in size held an average of 3.80 animal units (Table 1). in other words, LARGER FARMS TEND TO HAVE MORE LIVESTOCK THAN SMALLER FARMS.

On a PER FEDDAN BASIS, however, the picture changes markedly. Farms of less than a feddan in size averaged 1.52 animal units per feddan of area, whereas farms in the next largest size category, 1 to 3 feddans, averaged only 0.72 animal units per feddan, and farms with more than 10 feddans in size averaged only 0.18 animal units per feddan. Values varied in a similar fashion: for example, farms in the one to three feddan size class had an average value of LE 228 per feddan in livestock, compared to only LE 63 per feddan for farms in the over 10 feddan size. Nevertheless, it is clear that SMALLER FARMS ARE FAR MORE INTENSIVE IN LIVESTOCK PRODUCTION THAN LARGER FARMS.

It must be noted that not all farms own livestock, but the vast majority do own animals of one kind or another. As Appendix B shows, 89 percent of the farms surveyed reproted holdings of some animals (not including poultry), 72 percent reported holdings of work animals including donkeys and camels, 52 percent reported having cattle, 50 percent had buffaloes, but only 20 percent reported ownership of sheep and goats. In the subsequent analysis, however, averages and other statistics are based on all (sample) farms, and not just on those who own some livestock of a particular type. This explains how farms of a certain class can have average holdings of 0.5 cows.

Herd composition was found to vary with to farm size. SMALL FARMS TENDED TO FAVOR BUFFALOES OVER CATTLE. In the smallest (less than 1 feddan) size class, there was an average of 0.74 buffaloes per farm, compared to only 0.51 head of cattle (Table 2). On these farms, 16 percent of the animal units were found to be in cattle, compared to 36 percent in buffaloes (Table 1). In the next size class, there were slightly more cattle than buffaloes, and cattle far exceeded

TABLE 1. NUMBER AND VALUE OF ANIMALS PER FARM AND PER FEDDAN, BY FARM SIZE CLASS.

| | FARM SIZE | | | | | ALL FARMS | WEIGHTED |
|---|---|---|---|---|---|---|---|
| | 0 TO 1 | 1 TO 3 | 3 TO 5 | 5 TO 10 | >10 | IN SAMPLE | AVERAGE |
| FARMS IN SAMPLE (N) | 33 | 69 | 23 | 17 | 23 | 165 | |
| AVERAGE SIZE (FEDDANS) | .83 | 1.97 | 4.06 | 6.56 | 21.63 | 5.22 | 2.13 |
| TOTAL ANIMAL UNITS PER FARM | 1.26 | 1.42 | 2.59 | 1.70 | 3.80 | 1.91 | 1.54 |
| AVERAGE ANIMAL UNITS/FEDDAN | 1.52 | 0.72 | 0.64 | 0.26 | 0.18 | 0.37 | 0.63 |
| PERCENT OF ANIMAL UNITS IN: | | | | | | | |
| CATTLE | 16 | 30 | 25 | 33 | 34 | 29 | 24 |
| BUFFALOES | 36 | 26 | 35 | 15 | 18 | 26 | 31 |
| SHEEP AND GOATS | 15 | 5 | 5 | 2 | 5 | 6 | 9 |
| DONKEYS | 19 | 23 | 17 | 20 | 16 | 20 | 20 |
| CAMELS | 12 | 9 | 8 | 10 | 5 | 9 | 10 |
| OTHER WORK ANIMALS | 2 | 6 | 10 | 19 | 20 | 10 | 6 |
| PERCENT OF ALL ANIMALS HELD BY FARMS OF THIS SIZE: | 29.7 | 34.4 | 19.8 | 5.3 | 1.1 | | |
| VALUE OF LIVESTOCK: | EGYPTIAN POUNDS (L.E.) | | | | | | |
| TOTAL ANIMAL VALUE PER FARM | 433 | 450 | 846 | 509 | 1359 | 634 | 502 |
| AVERAGE VALUE PER FEDDAN | 522 | 228 | 208 | 78 | 63 | 121 | 236 |
| WEIGHTS FOR AVERAGES: | | | | | | | |
| PROPORTION OF FARMS IN CLASS: | .400 | .411 | .130 | .054 | .005 | 1.000 | |
| PROPORTION FARM AREA IN CLASS: | .124 | .337 | .198 | .158 | .183 | 1.000 | |

TABLE 2. AGE AND SEX STRUCTURE OF CATTLE AND BUFFALOES, AND COMPOSITION OF WORK ANIMALS, BY FARM SIZE CLASS.

| | FARM SIZE | | | | | ALL FARMS | WEIGHTED |
|---|---|---|---|---|---|---|---|
| | 0 TO 1 | 1 TO 3 | 3 TO 5 | 5 TO 10 | >10 | IN SAMPLE | AVERAGE |
| CATTLE PER FARM (HEAD) | .51 | .94 | 1.35 | 1.41 | 2.78 | 1.21 | 0.86 |
| % FEMALE OVER THREE YEARS | 37 | 41 | 55 | 42 | 53 | 46 | 41 |
| % FEMALE 1 TO 3 YEARS | 37 | 34 | 22 | 33 | 30 | 31 | 33 |
| % FEMALE LESS THAN 1 YEAR | 17 | 19 | 10 | 8 | 8 | 13 | 16 |
| % MALE 1 TO 3 YEARS | 6 | 6 | 3 | 0 | 8 | 6 | 5 |
| % MALE LESS THAN 1 YEAR | 4 | 1 | 10 | 17 | 1 | 5 | 4 |
| BUFFALOES PER FARM (HEAD) | .74 | .72 | 1.22 | .41 | 1.30 | .84 | 0.78 |
| % FEMALE OVER THREE YEARS | 45 | 53 | 80 | 71 | 57 | 58 | 54 |
| % FEMALE 1 TO 3 YEARS | 35 | 36 | 17 | 29 | 33 | 31 | 33 |
| % FEMALE LESS THAN 1 YEAR | 9 | 8 | 3 | 0 | 0 | 6 | 8 |
| % MALE 1 TO 3 YEARS | 3 | 1 | 0 | 0 | 3 | 2 | 2 |
| % MALE LESS THAN 1 YEAR | 7 | 1 | 0 | 0 | 7 | 3 | 4 |
| SHEEP+GOATS PER FARM (HEAD) | 1.15 | .45 | .78 | .24 | 1.22 | .72 | 0.77 |
| WORK ANIMALS PER FARM(HEAD) | .67 | .98 | 1.40 | 1.43 | 2.60 | 1.24 | 0.94 |
| % OXEN | 3 | 0 | 6 | 13 | 5 | 4 | 3 |
| % CATTLE | 0 | 9 | 6 | 22 | 30 | 15 | 6 |
| % BUFFALOES | 0 | 4 | 6 | 0 | 2 | 2 | 3 |
| % DONKEYS | 73 | 72 | 62 | 52 | 50 | 63 | 70 |
| % CAMELS | 24 | 14 | 16 | 13 | 8 | 14 | 18 |
| % HORSES | 0 | 0 | 3 | 0 | 5 | 2 | .4 |

buffaloes in the two largest size classes. Farms of more than 5 feddans averaged more than twice as many cattle as buffaloes. As Table 1 shows, farms of less than a feddan tend to have a much higher proportion of their total animal units in sheep and goats than do the larger farms. The average NUMBER of sheep and goats per farm in the less-than-feddan class is greater than the number of either cattle or buffaloes (Table 2), but cattle and buffaloes exceed sheep and goats for all of the larger farm size categories.

The age and sex structure of farm herds also vary with farm size (Table 2). Like the type of work animals, this structure appears to relate to different functions which different types and ages of animals serve. The buffalo is known as a milk animal which also does some work. Young male buffaloes and females which are not saved as cow replacements are usually slaughtered for veal rather than being fed out as beef animals. In contrast, cattle are used more as meat and work animals, with milk often viewed as a by-product. These differences relate to basic genetic traits. Not only does milk from the buffalo cow contain almost twice as much butter fat as that of the native cow (8% rather than about 4 %), but most farmers find the buffalo to produce larger quantities. In terms of weight gain for meat production, however, most farmers think that buffaloes are inferior to native cattle. This explains why more native cattle, rather than buffaloes, are fed for meat production.

A higher proportion of the herds of larger farmers (3 feddans and larger) are made up of productive female milk animals (Table 2). This is particularly true of farms in the 3 to 5 feddan size class. These same farms also tend to have a greater proportion of their herds made up of productive-aged meat animals--that is, male cattle of 3 years' age or less, but not male buffaloes. Farms of three feddans and under tend to have a higher proportion of younger cow replacement animals, as evidenced by their large number of female buffaloes of 3 years and less. As might be expected, the work animals on smaller farms tend to be donkeys: 73 percent of the work animals on farms of less than one feddan are donkeys, compared to 50 percent donkeys on farms in the over 10 feddan category. Larger farms tend to have more work cows and oxen. Furthermore, larger farms (5 feddans and greater in size) keep a much higher proportion of their total animal units in work animals; as Table 1 shows, between 40 and 50 percent of their herds are made up of specialized work animals (donkeys, camels, and others), compared to only 36 percent for all farms on average.

On a REGIONAL basis, the four villages located in the Delta governorates of Dakahlia, Domiatta and Sharkia tended to have relatively high overall animal populations per farm, and

they were found to have a high proportion of cattle relative to buffaloes. Menoufia and Giza, on the other hand, had relatively high proportions of buffaloes, and of these, milk animals (females over 3 years) accounted for a high proportion (Table 3). Sheep and goats were present in high numbers in the two Upper Egypt villages in Kena and Sohag Governorates.

## LABOR USE, FAMILY SIZE, AND THEIR RELATION TO LIVESTOCK PRODUCTION.

On average, for all farms in the 10 village sample, farm families worked 442 days on their farms during the 1977 survey year, and they hired an additional 112 days of outside labor. Even more interesting than the averages, however, are the differences in labor use as farm size varies. Table 4 shows these differences. It is noteworthy that some labor is hired even on the smallest farms, although the greatest bulk of work comes from family members. Farms in the under 1 feddan category averaged 369 days of family labor, compared to 25 days of hired labor. Both family and hired labor increase as farm size increases, but hired labor use increases more rapidly than family labor use. Even for farms of greater than 10 feddans in size, however, average family labor use (1498 days) exceeds average hired labor use (1270 days).

Total labor use for livestock production exceeds labor use for crop production on smaller farms. For sample farms in the under 1 feddan category, total annual labor use for livestock was 286 days, compared to only 108 days for crop production. As farm size increases, however, crop labor use rapidly surpasses that for livestock, as Table 4 demonstrates. Even for the largest (over 10 feddan) farms in the sample, total labor use for livestock was less than twice as much as for the average for the smallest (under 1 feddan) farms, whereas average crop labor on the largest farms was 14 times as high as for the smallest farms. This is another clear indication of the VITAL IMPORTANCE OF LIVESTOCK PRODUCTION TO SMALL FARMERS. The data are quite consistent with the contention that on smaller farms livestock production is used as a means of absorbing available family labor and circumventing the land availability constraint.

The association between FAMILY LABOR and livestock production can be seen by noting the difference in use of family and hired labor. On survey farms of the 1 to 3 feddan size class, for example, only 2 percent of the total labor used for livestock was hired, and 4 percent of livestock-related labor for all farms was hired. For crop production, in contrast, some 35 percent of total labor was hired for all farms on average, and farms of less than a feddan averaged 23 percent hired labor.

TABLE 3. REGIONAL VARIATION IN HERDSIZE AND COMPOSITION.

| | REGION | | | | | |
|---|---|---|---|---|---|---|
| | 1 DAKAHLIA-DOMIATTA | 2 SHARKIA | 3 MENOUFIA | 4 GIZA | 5 SOHAG-KENA | ALL FARMS IN SAMPLE |
| NUMBER OF FARMS IN SAMPLE | 31 | 33 | 35 | 33 | 33 | 165 |
| TOTAL ANIMAL UNITS PER FARM | 2.09 | 2.38 | 1.55 | 2.02 | 1.55 | 1.91 |
| TOTAL CATTLE PER FARM | 1.97 | 1.94 | 0.50 | .94 | .85 | 1.21 |
| FEMALES OVER 3 YEARS | .61 | 1.13 | .28 | .48 | .48 | .58 |
| MALES 3 YEARS AND LESS | .26 | .12 | .11 | .15 | 0 | .13 |
| TOTAL BUFFALOES PER FARM | 0.58 | .91 | 1.49 | 1.06 | .36 | 0.89 |
| FEMALES OVER 3 YEARS | .38 | .73 | .37 | .78 | .33 | .52 |
| MALES 3 YEARS AND LESS | .03 | .07 | .15 | 0 | 0 | .05 |
| SHEEP AND GOATS PER FARM | 0.20 | .72 | .54 | .88 | 1.25 | .72 |
| OXEN PER FARM | .07 | .15 | 0 | 0 | .06 | .05 |
| WORK CATTLE PER FARM | 0.20 | 0 | 0 | .39 | .39 | .19 |
| WORK BUFFALOES PER FARM | .13 | 0 | 0 | 0 | .06 | .03 |
| CAMELS PER FARM | 0 | .31 | .11 | .03 | .39 | .17 |
| DONKEYS PER FARM | .99 | 0.70 | 1.0 | .94 | .22 | .77 |
| HORSES/MULES PER FARM | 0 | 0 | 0 | .09 | .06 | .03 |
| TOTAL VALUE OF ANIMALS PER FARM (L.E.) | 715 | 829 | 548 | 702 | 387 | 634 |

TABLE 4. LABOR USE FOR LIVESTOCK AND CROP PRODUCTION, VARIOUS MEASURES, BY FARM SIZE CLASS.

| | FARM SIZE | | | | | ALL FARMS | WEIGHTED |
|---|---|---|---|---|---|---|---|
| | 0 TO 1 | 1 TO 3 | 3 TO 5 | 5 TO 10 | >10 | IN SAMPLE | AVERAGE |
| FARMS IN SAMPLE (N) | 33 | 69 | 23 | 17 | 23 | 165 | |
| AVERAGE SIZE (FEDDANS) | .83 | 1.97 | 4.06 | 6.56 | 21.63 | 5.22 | 2.13 |
| AVERAGE FAMILY SIZE,PERSONS | 6.4 | 7.7 | 9.2 | 7.9 | 7.5 | 7.7 | 7.38 |
| PERSONS PER FEDDAN | 7.71 | 3.91 | 2.27 | 1.20 | 0.35 | 1.48 | 5.05 |
| TOTAL LABOR PER FARM: | DAYS PER FARM PER YEAR | | | | | | |
| FAMILY LABOR | 369 | 426 | 589 | 648 | 1498 | 611 | 442 |
| HIRED LABOR | 24.5 | 98 | 251 | 426 | 1270 | 301 | 112 |
| TOTAL | 393.5 | 524 | 840 | 1074 | 2768 | 912 | 554 |
| FOR CROPS: FAMILY | 84 | 221 | 339 | 505 | 1239 | 382 | 202 |
| HIRED | 24 | 94 | 231 | 410 | 1107 | 272 | 106 |
| TOTAL | 108 | 315 | 570 | 915 | 2346 | 654 | 308 |
| LIVESTOCK: FAMILY | 285 | 205 | 250 | 143 | 259 | 229 | 240 |
| HIRED | .5 | 4 | 20 | 16 | 163 | 29 | 6 |
| TOTAL LSTOCK | 286 | 209 | 270 | 159 | 422 | 258 | 246 |
| LABOR PER FEDDAN: | DAYS PER FEDDAN PER YEAR | | | | | | |
| FAMILY LABOR | 445 | 216 | 145 | 99 | 69 | 117 | 207 |
| HIRED LABOR | 30 | 50 | 62 | 65 | 59 | 58 | 53 |
| TOTAL | 474 | 266 | 207 | 164 | 128 | 175 | 260 |
| (FOR CROPS) | 130 | 160 | 140 | 139 | 108 | 125 | 144 |
| (FOR LSTOCK) | 344 | 106 | 67 | 24 | 20 | 49 | 115 |
| LABOR PER ANIMAL UNIT: | | | | | | | |
| HOURS PER A.U. PER DAY | 4.05 | 2.28 | 1.71 | 1.47 | 1.73 | 2.21 | 2.63 |
| DAYS PER A.U. PER YEAR | 246 | 138 | 104 | 89 | 105 | 134 | 160 |
| SOURCE OF CROP LABOR: | PERCENT OF CROP LABOR | | | | | | |
| HIRED | 23 | 30 | 41 | 45 | 47 | 42 | 35 |
| FAMILY:MEN | 53 | 43 | 39 | 27 | 32 | 35 | 40 |
| WOMEN | 2 | 2 | 1 | 1 | 1 | 1 | 2 |
| CHILDREN | 4 | 5 | 5 | 7 | 6 | 6 | 5 |
| ELDERS | 17 | 21 | 14 | 20 | 14 | 16 | 18 |
| SOURCE OF LIVESTOCK LABOR: | PERCENT OF LIVESTOCK LABOR | | | | | | |
| HIRED | 0 | 2 | 7 | 10 | 39 | 11 | 2 |
| FAMILY:MEN | 46 | 30 | 37 | 50 | 37 | 38 | 40 |
| WOMEN | 40 | 41 | 42 | 24 | 17 | 34 | 40 |
| CHILDREN | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| ELDERS | 13 | 27 | 13 | 16 | 7 | 17 | 18 |

TABLE 4. (CONTINUED) LABOR USE.

| | FARM SIZE | | | | | WEIGHTED AVERAGE |
|---|---|---|---|---|---|---|
| | 0 TO 1 | 1 TO 3 | 3 TO 5 | 5 TO 10 | >10 | |
| LABOR DISTRIBUTION BETWEEN CROP AND LIVESTOCK ACTIVITY BY WORKER TYPE: | | | | | | |
| | PERCENT OF TOTAL DAYS WORKED BY EACH TYPE OF WORKER | | | | | |
| HIRED | | | | | | |
| CROP | 98 | 96 | 92 | 96 | 87 | 95 |
| LIVESTOCK | 2 | 4 | 8 | 4 | 13 | 5 |
| FAMILY: MEN | | | | | | |
| CROP | 28 | 68 | 69 | 74 | 83 | 55 |
| LIVESTOCK | 72 | 32 | 31 | 26 | 17 | 45 |
| WOMEN | | | | | | |
| CROP | 2 | 6 | 6 | 13 | 16 | 5 |
| LIVESTOCK | 98 | 94 | 94 | 87 | 84 | 95 |
| CHILDREN | | | | | | |
| CROP | 88 | 93 | 93 | 98 | 99 | 94 |
| LIVESTOCK | 12 | 7 | 7 | 2 | 1 | 6 |
| ELDERS | | | | | | |
| CROP | 31 | 53 | 70 | 87 | 92 | 55 |
| LIVESTOCK | 69 | 47 | 30 | 13 | 8 | 45 |
| TOTAL LABOR: | | | | | | |
| CROP | 27 | 60 | 68 | 85 | 85 | 56 |
| LIVESTOCK | 73 | 40 | 32 | 15 | 15 | 44 |

The division of labor within the farm family is far different for livestock than for crop production. As Table 4 demonstrates, WOMEN DO A VERY HIGH PROPORTION OF THE WORK OF LIVESTOCK PRODUCTION, and they appear to do a much smaller share of crop production work than do men and other family members. For all farms on average, women were found to do 40 percent of the livestock production work, compared to only 2 percent of that for crop production. For larger farms--those bigger than 5 feddans--men appear to take over some of the livestock production chores from the women. As will be seen below in the section on production, this is probably related to the fact that production of milk and milk products to declines somewhat on these larger farms. Surprisingly, children and elders play a lesser role in livestock production than in crop production.

An alternative way to view the division of labor is to examine the percentage of the total effort devoted to livestock production by each labor type. Table 4 shows that whereas hired laborers devote only 5 percent of their total efforts to livestock production, and farm family men devote only 45 percent of their total efforts in this way, fully 95 percent of the "productive" activities of farm family women are for livestock. This disregards normal household work, of course, although that type of work is also productive.

A final way to show the greater labor intensity of livestock production on small farms is to measure the labor used per animal unit rather than per farm. Table 4 shows the calculation of number of hours spent per day for each animal unit on farms of the various sizes. In calculating this figure, it was assumed that a "day" consittuted 6 hours. On this basis, livestock on farms of less than a feddan took 4.05 hours per animal unit per day, compared to only 2.28 hours on farms in the 1 to 3 feddan class and less than 1.75 hours on farms larger than 5 feddans.

## THE RELATIONSHIP BETWEEN HUMAN AND LIVESTOCK POPULATION DENSITIES

The importance of livestock production also varies with family size. There are some reasons for expecting that there is a COMPETITIVE relationship between livestock numbers and the farm population. In other words, livestock density might tend to decline as human population density increases. One reason for this would be that livestock depend, to some extent, on the same food crops as humans. Thus, as human food demands increase, there would be less food remaining for livestock. On the other hand, there are also reasons to expect a

COMPLEMENTARY relationship between the human and livestock populations. One reason to expect complementarity is that animals often subsist on the by-products of human food crops. In Egypt, they are often fed wheat straw and maize stocks, for example. Furthermore, if there is ample human labor available, as is true when population increases and farm size decreases, it is presubably possible for available labor to be devoted to reclaiming a higher proportion of crop residues for use as feed, in addition to tending to livestock in other ways.

Data from the Farm Management Survey indicate that, on balance, there is a posititive relationship between the human and animal population. This can first be illustrated by considering what happens as family size changes for farms within a given size class. Table 5 is based on the example of 1 to 3 feddan farms from the 1977 survey, subdividing them by family size category. Farms with families larger than 7 persons averaged 1.62 head of livestock, compared to only .99 head for farms with families of 4 or fewer members. The main increase in livestock holdings appears to come in native cows rather than in buffaloes.

Labor use changes dramaticly as family size increases. Although family labor devoted to both crop and livestock production rises along with family size (farm size held constant), the increased use in livestock expands at a much higher rate. This can be seen in Table 5: while average crop labor per farm was 66 percent higher (253 days versus 154 days) for families with more than 7 members as compared to families with less than 5 members, labor use for livestock was 104 percent higher (242 days compared to 118).

The complementarity can also be seen in another way. In Table 6, data have been categorized according to total number of animal units. Here also, the positive association between family size and animal units is quite clear. For those farms with less than 0.5 animal units, the average family size was 5.9 members, whereas for farms with more than 4 animal units, the average family size was 10.7 members. The table also shows animal units per feddan and persons per feddan for each holding size category. These numbers, each based on an average of 13 or more farm units, are clearly posititvely associated. A correlation was made between animal units per feddan of farm area and farm family members per feddan. The simple correlation statistic was 0.63, which is statistically significant at the 0.01 level. On balance, the human and livestock populations are complementary. Thus, data from the Farm Management Survey are clear in showing a positive association between the human and livestock population densities. Since these data are from a much larger sample of farmers and from a substantial number of villages, this finding would appear to replace Walters' (1981) inconclusive results on

TABLE 5. EFFECT OF FAMILY SIZE ON LIVESTOCK HOLDINGS AND LABOR USE, EXAMPLE OF FARMS IN THE 1 TO 3 FEDDAN SIZE CLASS.

| | .....FAMILY SIZE..... | | | ALL FARMS OF |
|---|---|---|---|---|
| | 1 TO 4 | 5 TO 7 | >7 | 1 TO 3 FED SIZE |
| NUMBER OF OBSERVATIONS | 19 | 27 | 32 | 69 |
| TOTAL ANIMAL UNITS PER FARM | .99 | 1.34 | 1.62 | 1.42 |
| TOTAL ANIMAL VALUE PER FARM | 269 | 465 | 539 | 450 |
| TOTAL CATTLE PER FARM | .4 | .7 | 1.3 | .9 |
| FEMALES OVER 3 YEARS | .2 | .3 | .5 | .4 |
| FEMALES 1 TO 3 YEARS | .1 | .3 | .6 | .4 |
| TOTAL BUFFALOES PER FARM | .6 | .9 | .8 | .7 |
| FEMALES OVER 3 YEARS | .4 | .4 | .3 | .4 |
| FEMALES 1 TO 3 YEARS | .2 | .4 | .3 | .3 |
| TOTAL SHEEP+GOATS PER FARM | .6 | .3 | .8 | .5 |
| TOTAL WORK ANIMALS PER FARM | .7 | 1.2 | 1.0 | .9 |
| DONKEYS | .4 | .8 | .8 | .7 |
| TOTAL FAMILY LABOR USE,DAYS | 296 | 464 | 537 | 470 |
| FOR CROPS | 154 | 188 | 253 | 221 |
| FOR LIVESTOCK | 118 | 227 | 242 | 205 |
| TOTAL HIRED LABOR USE, DAYS | 127 | 88 | 70 | 98 |
| FOR CROPS | 114 | 87 | 69 | 94 |
| FOR LIVESTOCK | 13 | 0 | 0 | 4 |

TABLE 6. HERD SIZE, FAMILY SIZE, AND RELATED VARIABLES.

| | TOTAL ANIMAL UNITS | | | | | ALL FARMS |
|---|---|---|---|---|---|---|
| | 0-0.5 | 0.5-1.0 | 1 - 2 | 2 - 4 | >4 | IN SAMPLE |
| NUMBER OF OBSERVATIONS | 29 | 25 | 58 | 40 | 13 | 165 |
| AVERAGE FAMILY SIZE,PERSONS | 5.9 | 7.3 | 7.6 | 9.0 | 10.7 | 7.7 |
| AVERAGE FARM SIZE, FEDDANS | 5.2 | 2.6 | 2.6 | 5.8 | 20.0 | 5.2 |
| ANIMAL UNITS PER FARM | 0.20 | .86 | 1.50 | 2.66 | 7.27 | 1.91 |
| DENSITIES: A.U. PER FEDDAN | 0.04 | 0.33 | 0.58 | 0.46 | 0.36 | 0.37 |
| PERSONS PER FEDDAN | 1.13 | 2.81 | 2.92 | 1.55 | 0.54 | 1.48 |
| CATTLE PER FARM, HEAD | .02 | .6 | .9 | 1.8 | 4.7 | 1.2 |
| BUFFALO PER FARM, HEAD | .1 | .6 | .8 | 1.0 | 3.0 | .8 |
| TOTAL VALUE OF ANIMALS, LE | 46 | 342 | 510 | 805 | 2543 | 634 |
| MILK: HOME CONSUMED, KG | 21 | 102 | 249 | 158 | 87 | 151 |
| SOLD | 103 | 10 | 132 | 70 | 3215 | 337 |
| TOTAL | 124 | 113 | 381 | 228 | 3302 | 488 |
| CHEESE: HOME CONSUMED, KG. | 189 | 176 | 150 | 121 | 14 | 143 |
| SOLD | 5 | 36 | 94 | 279 | 22 | 109 |
| TOTAL | 194 | 212 | 244 | 400 | 36 | 252 |
| EGGS: HOME CONSUMED, KG. | 386 | 695 | 544 | 723 | 1485 | 656 |
| SOLD | 134 | 480 | 367 | 187 | 92 | 278 |
| TOTAL | 520 | 1024 | 911 | 910 | 1577 | 934 |

this matter.

Earlier, it was shown that livestock densities tend to increase as farm size decreases. Since the increase in human population density is one of the main underlying forces behind the decrease in average farm size in Egypt, it can be seen that these two factors are undoubtedly related.

The implications of these findings for the future of Egyptian agriculture are somewhat startling. If the rural farm population continues to grow--and this seems inevitable for the next two to three decades--then the resulting increase in the man-to-land ratio and reduction in average farm size will probably lead to further increases in livestock populations and production. Indeed, it seems quite probable that it is the increase in human population and the decrease in farm size which have contributed heavily to the increase in livestock population which Egypt has already experienced in the past several decades (Fitch and Soliman, 1981).

Naturally, the upward trend in livestock population might be reversed if there were a major change in farming technology or in market structure--these possibilities will be discussed later. But it appears that changes of sufficient magnitude in such factors are unlikely. Assuming then that the livestock population will continue to grow, it is vital to understand the implications of this for production, and particularly for the marketable surplus of production. These issues will be considered in the following sections.

## MILK AND DAIRY PRODUCTION, AND HOW IT VARIES FROM FARM TO FARM.

The handling and processing of milk (lebn) in the Egyptian farm household is still often carried out much as it was centuries ago. There is no refrigeration. Thus, milk which cannot soon be consumed or sold must be processed for conservation. It is placed into earthenware crocks until the cream (ishta) rises and can be separated. Cream is rarely used as such but is normaly used for butter (zibda) making. In most villages there are few if any improved implements available for cream separation or butter churning.

Some butter is used or sold as an end product, but most of it is further processed into ghee (samna), the clarified butter oil which is used for cooking. Ghee is either sold, or with care it can be stored for a fairly long time without turning rancid. The skimmed milk which is left after the cream is taken is normally processed into fatless white cheese (gibna beyda) in the same earthenware crock, simply by adding a clabbering agent. After the milk is fully clabbered, the whey is drained off and the cheese is stored in a clean clay crock, in a cool place to prevent spoilage. Sometimes salt is added

to the white cheese to prevent its spoiling, and it can thus be saved for a longer time. With alternative care and treatment, the cheese can be aged without spoiling. As such it is called gibna adeema. This can be saved even into the summer, if it is not sold.

The measurement of milk and dairy products poses certain difficulties. First of all, much is consumed directly in the home, without counting or weighing. Even when items are marketed, they are often not measured accurately because of the lack of scales and standard volume measures in most rural market places. The potential for double counting also arises, and there is danger that milk which is processed into cheese or butter will also be reported as liquid milk and will thus be counted twice. These and other problems were addressed in a variety of ways in the 1977 Farm Management Survey.

Where possible, difficulties were identified and dealt with by survey supervisors in the field. Great care was taken in editing milk production data to insure that liquid milk reported represented only that milk which was liquid in its end use and not milk which was processed into some other form. One large dairy farm (10 milk cows and 7 milk buffaloes) was encountered in the 3 to 5 feddan strata for the sample from Giza, near Cairo. Since this farm was considered to be highly unrepresentative, the data from it was separated from the rest of the farms in that size class, and it is reported separately here.

Table 7 shows the average annual production, home consumption and sale of milk and dairy products for farms in each size category. A summary of the percentage of farms reporting some production of the various milk and dairy products is shown in Appendix C. On average, 44 percent of the farms produced some liquid milk, i.e. milk which was used or sold in liquid form rather than being used for processing into milk products. The nature and use of production clearly varies with farm size. Farms in the 3 to 5 feddan size category appear to specialize more in the production of liquid milk than farms of other sizes: almost 70 percent of the farms in this category reported sales or use of some liquid milk. Cheese production was important to farms of less than 5 feddans, but much less so on larger farms: 50 percent of the 5 feddan and under farms reported some cheese processing, compared to only about 25 percent of larger farms. Ghee production was reported by almost 75 percent of farms in the one feddan and under size category, but its importance declined sharply for successively larger farm size categories (Appendix C).

Table 7 shows total production, broken down into home consumption and sale, for each of the various dairy products.

TABLE 7. ANNUAL DAIRY PRODUCTION AS RELATED TO FARM SIZE.

| | FARM SIZE | | | | | ALL FARMS | WEIGHTED | LARGE |
|---|---|---|---|---|---|---|---|---|
| | 0 TO 1 | 1 TO 3 | 3 TO 5 | 5 TO 10 | >10 | IN SAMPLE | AVERAGE | DAIRY |
| FARMS IN SAMPLE (N) | 33 | 69 | 22 | 17 | 23 | 164 | | 1 |
| AVERAGE SIZE (FEDDANS) | .83 | 1.97 | 4.07 | 6.56 | 21.63 | 5.22 | 2.13 | 3.92 |
| LIQUID MILK PRODUCTION: | | | | | | | | |
| HOME CONSUMED, KG. | 57 | 176 | 276 | 184 | 79 | 151 | 141 | 0 |
| SOLD, KG. | 60 | 113 | 37 | 179 | 414 | 142 | 87 | 32400 |
| TOTAL PROUCED, KG. | 117 | 289 | 313 | 363 | 493 | 293 | 228 | 32400 |
| % HOME CONSUMED | 49 | 61 | 88 | 51 | 16 | 52 | 62 | 0 |
| CHEESE PRODUCTION: | | | | | | | | |
| HOME CONSUMED, KG. | 233 | 195 | 96 | 3 | 11 | 143 | 186 | 0 |
| SOLD | 65 | 150 | 206 | 32 | 15 | 109 | 116 | 0 |
| TOTAL PRODUCED | 298 | 345 | 302 | 35 | 26 | 252 | 302 | 0 |
| % HOME CONSUMED | 78 | 57 | 32 | 9 | 42 | 57 | 62 | - |
| BUTTER PRODUCTION: | | | | | | | | |
| HOME CONSUMED, KG. | .4 | 2.1 | 1.7 | 1.1 | 3.4 | 1.8 | 1.9 | 0 |
| SOLD | 2.9 | 3.7 | 8.7 | 1.9 | 4.1 | 3.7 | 3.7 | 0 |
| TOTAL PRODUCED | 3.3 | 5.8 | 10.4 | 3 | 7.5 | 5.5 | 5.6 | 0 |
| % HOME CONSUMED | 12 | 36 | 16 | 37 | 45 | 33 | 34 | - |
| GHEE PRODUCTION: | | | | | | | | |
| HOME CONSUMED, KG. | 32.3 | 6.3 | 21.1 | 1.4 | 2.9 | 20.8 | 15.2 | 0 |
| SOLD | .9 | 19.5 | 7.1 | 10.9 | 0 | 10.4 | 9.8 | 0 |
| TOTAL PRODUCED | 33.2 | 25.8 | 28.2 | 12.3 | 2.9 | 31.2 | 25 | 0 |
| % HOME CONSUMED | 97 | 24 | 75 | 11 | 100 | 67 | 61 | - |
| CREAM: HOME CONSUMED, KG. | 0 | 0 | 3.1 | 0 | 0 | .4 | .4 | 0 |

On average, about 62 percent of liquid milk and similar proportions of cheese and ghee were home consumed, whereas only 34 percent of the butter was home consumed. As would be expected, home consumption is more important on smaller farms in most cases. Farms of less than a feddan in size consume almost 80 percent of the cheese they produce and close to 100 percent of their ghee.

As farm size increases, the changes in total production and the proportion of home consumption varies from product to product, and the patterns are not always regular. Liquid milk production increases steadily with farm size, and the proportion home consumed drops off rapidly for farms greater than 5 feddans. Cheese production per farm peaks in the 1 to 3 feddan farm size group and drops off regularly for larger size groupings. As a general rule, both the production of dairy products per farm (other than liquid milk) and the proportion which is home consumed appear to drop off as farm size increases beyond 5 feddans, but there are some oddities in this pattern, such as for ghee, where both home consumption and production appear to rise again for the very largest farms.

The patterns of production, home consumption and sale are much more uniform when viewed in terms of the values of all products produced. In most cases for the information shown in Table 8, the value stated by the farmer was used as a means of evaluating home consumption; in cases where the farmer could not state a value, however, the enumerator used the average price prevailing in the village market. As Table 8 demonstrates, the total value of all milk and dairy production per farm is low (LE 124) for the small 0 to 1 feddan size farms, it rises sharply (to LE 199) for 1 to 3 feddan size farms and it declines, on average, for larger-sized farm classes. The proportion of total production (value) which is home consumed is greatest (average 77 percent) for the smallest size class, and it declines uniformly for larger farm size classes, reaching less than one quarter of production for farms in the largest (over 10 feddan) size category.

The value of product per farm is perhaps less interesting, from a national point of view, than is the VALUE PER FEDDAN. This measure is also shown in Table 8. Surprisingly, it is THE VERY SMALLEST FARMS WHICH HAVE THE HIGHEST VALUE OF PRODUCTION PER FEDDAN.

The value of product which is MARKETED PER FEDDAN is also very important. Table 8 shows that it is again THE SMALLER FARMS which MARKET THE HIGHEST VALUE OF MILK AND DAIRY PRODUCTS PER FEDDAN. Here there is very little difference between the average LE 35 per feddan which the smallest (1 feddan and less) class markets and the LE 37 marketed by the next (1 to 3 feddan) size category. For larger farm sizes, the value of

TABLE 8. VALUE OF DAIRY PRODUCTION AS RELATED TO FARM SIZE.

| | FARM SIZE | | | | | ALL FARMS | WEIGHTED | LARGE |
|---|---|---|---|---|---|---|---|---|
| | 0 TO 1 | 1 TO 3 | 3 TO 5 | 5 TO 10 | >10 | IN SAMPLE | AVERAGE | DAIRY |
| VALUE OF PRODUCTS BY TYPE: | EGYPTIAN POUNDS (LE) PER FARM | | | | | | | |
| MILK | 18.69 | 42.90 | 39.25 | 51.70 | 80.50 | 80.05 | 33.40 | 6048 |
| CHEESE | 58.25 | 66.30 | 62.20 | 7.37 | 6.90 | 48.76 | 59.07 | 0 |
| CREAM | 0.00 | 0.00 | 4.81 | 0.00 | 0.00 | 0.64 | 0.63 | 0 |
| BUTTER | 4.67 | 9.00 | 12.54 | 3.90 | 8.80 | 6.71 | 7.45 | 0 |
| GHEE | 41.95 | 80.40 | 35.03 | 15.43 | 5.40 | 52.71 | 55.24 | 0 |
| GRAND TOTAL | 123.56 | 198.60 | 153.83 | 78.40 | 101.60 | 188.87 | 155.79 | 6048 |
| PERCENT OF TOTAL VALUE IN: | PERCENT OF TOTAL VALUE | | | | | | | |
| MILK | 15 | 22 | 26 | 66 | 79 | 42 | 21 | 100 |
| CHEESE | 47 | 33 | 40 | 9 | 7 | 26 | 38 | 0 |
| CREAM | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 |
| BUTTER | 4 | 5 | 8 | 5 | 9 | 4 | 5 | 0 |
| GHEE | 34 | 40 | 23 | 20 | 5 | 28 | 35 | 0 |
| TOTAL | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| PERCENT HOME CONSUMED | 77 | 64 | 58 | 39 | 23 | 50 | 66 | 0 |
| OTHER MEASURES OF DAIRY OUTPUT: | | | | | | | | |
| | VALUE IN EGYPTIAN POUNDS (L.E.) | | | | | | | |
| VALUE OF SALES PER FEDDAN | 35 | 37 | 16 | 7 | 4 | 18 | 25 | 1543 |
| TOT. PRODUCTION PER FEDDAN | 149 | 101 | 38 | 12 | 5 | 36 | 73 | 1543 |
| TOTAL PRODUCTION PER COW | 199 | 245 | 141 | 89 | 46 | 172 | 199 | 356 |

product marketed per feddan drops off rapidly, reaching only LE 4 per feddan, on average, for farms greater than 10 feddans.

The means which smaller farms use to increase the value of production is clear: they process more milk into other dairy products and use or sell correspondingly less in the liquid form. Only 15 percent of the total value of production is derived from liquid milk on the smallest farms, and the remaining 85 percent is all processed into higher valued products. The proportion of milk which is processed (i.e. the proportion of total value which is derived from milk products rather than liquid milk) declines steadily as farm size increases, to the point where it is only 21 percent processed, on average, for the largest size category (Table 8).

It is possible to estimate the total milk production in liquid milk equivalent by working back from the end product production which farmers reported. This was done, using rule of thumb technical coeficients for processed products. These coeficients are as follows. On average, it is expected that a kilo of liquid milk will yield 150 grams of cream and 850 grams of skimmed milk. The skimmed milk will, in turn, yield 500 grams of fatless cheese and 350 grams of whey. The 150 grams of cream will produce 110 grams of butter and 40 grams of buttermilk. The butter, if further processed, will yield 70 grams of ghee. (The residue from refining the butter to ghee is combined with the buttermilk to make a home consumed product called mish, but this has no commercial value.)

Following the guidelines outlined in the preceding paragraph, it was possible to estimate the total milk production for each farm and cow. This is shown in Table 9. This shows that the smallest farms prcoessed 84 percent of their total milk into milk products and that the percentage of processing declined steadily as farm size increased. The largest farm size category had an average of only 18 percent processing.

Table 9 also shows estimates for total milk production per cow. Here it must be recalled that buffalo and native cow milk production could not be separated. Therefore, buffalo cows and native cows were combined to derive these estimates. Milk production per cow is highest on the 1 to 3 feddan farms, although production on the less than one feddan farms is higher than for farms over three feddans in size. As was true in value terms (Table 8), per cow production declines as farm size increases above three feddans. The estimated overall production per cow is 1028 kg. per year. This is certainly low by international standards, but it is higher than the estimates made by the Winrock study (1980). It should be observed, however, that the Winrock findings were based on just two villages. It found that native cows averaged from 578 to 756

TABLE 9. ESTIMATED PROCESSING, HOME CONSUMPTION AND SALE OF MILK, LIQUID EQUIVALENT BASIS.

| | FARM SIZE | | | | | WEIGHTED |
|---|---|---|---|---|---|---|
| | 0 TO 1 | 1 TO 3 | 3 TO 5 | 5 TO 10 | >10 | AVERAGE |
| **LIQUID USE VERSUS PROCESSING:** | | | | | | |
| | KILOGRAMS PER FARM | | | | | |
| LIQUID MILK (END-USE) | 117 | 289 | 313 | 363 | 493 | 228 |
| MILK PROCESSED, LIQUID EQUIVALENT | 596 | 690 | 604 | 203 | 110 | 612 |
| TOTAL PRODUCTION, LIQ.EQUIVALENT | 713 | 979 | 917 | 566 | 603 | 840 |
| | PERCENT OF TOTAL | | | | | |
| PROPORTION PROCESSED: | 84 | 70 | 66 | 36 | 18 | 73 |
| **HOME CONSUMPTION VERSUS SALE:** | | | | | | |
| | KILOGRAMS PER FARM | | | | | |
| EST. HOME CONS., LIQ. EQUIVALENT | 542 | 551 | 488 | 210 | 143 | 512 |
| EST. SALES, LIQUID EQUIVALENT | 171 | 428 | 429 | 356 | 460 | 328 |
| TOTAL PRODUCTION, LIQ.EQUIVALENT | 713 | 979 | 917 | 566 | 603 | 840 |
| | PERCENT OF TOTAL | | | | | |
| PROPORTION HOME CONSUMED | 76 | 56 | 53 | 37 | 24 | 61 |
| PROPORTION SOLD | 24 | 44 | 47 | 63 | 76 | 39 |
| **MEASURES OF PERFORMANCE:** | | | | | | |
| | KILOGRAMS OF MILK | | | | | |
| PRODUCTION PER COW | 997 | 1209 | 843 | 643 | 272 | 977 |
| PRODUCTION PER FEDDAN | 859 | 497 | 225 | 86 | 28 | 394 |
| SALES PER FEDDAN | 206 | 217 | 105 | 54 | 21 | 154 |

kg. per lactation, and that buffaloes averaged from 960 to 990 kg.

Home consumption and processing are also estimated on a liquid equivalent basis in Table 9. This was done by using an average of the consumption coeficients for the individual products. The results here indicate a somewhat lower proportion being home consumed than did the calculations based on value of product shown in Table 8, but the percentage is still above 60 percent.

There are some clear regional differences in the dairy production patterns found in the survey. As Table 10 shows, the two Giza Governorate villages were found to be heavy producers of liquid milk, averaging almost twices as much production as farms in other areas. Giza Governorate is directly adjacent to the Cairo urban area and thus offers easy marketing access for milk. Cheese and ghee production per farm were highest in the villages of Menoufia Governorate; this region is more distant from Cairo than Giza but still is not far away. Although the sub-sample of Farm Management Survey data used here was not large enough to provide a very accurate description of regional differences, the differences which were found were nevertheless substantial. Clearly, it is not safe to make very broad generalizations about livestock production patters for Egypt as a whole. Future research will have to pay more attention to regional variations.

OTHER LIVESTOCK PRODUCTS.

While milk and dairy products are very importatnt to the Egyptian farmer, his livestock provide many other valuable products. Table 11 shows eggs and poultry, live animals, work and manure output per farm.

Egg production varies relatively little with farm size when compared to milk output. The value of eggs produced averaged from LE 11 to LE 27 per farm for the various size classes. No regular association with farm size could be established. The same was true of poultry production, which averaged from LE 3 to LE 24 per farm, depending upon farm size class. For all farms, the average value of eggs (LE 24) was more than twice the value of poultry (LE 10).

The value of meat animals produced rises rather uniformly with farm size, but not in direct proportion to the increase in land area. Farms of more than 10 feddans produced an average of LE 184 in live animals per farm, just under three times as much as farms of a feddan or less in size. As noted earlier, however, the value of live animal sales was derived from inventory change data and should not be considered highly

TABLE 10. REGIONAL VARIATION IN CONSUMPTION AND PRODUCTION OF DAIRY PRODUCTS.

| | | REGION 1 DAKAHLIA-DOMIATTA | 2 SHARKIA | 3 MENOUFIA | 4 GIZA | 5 SOHAG-KENA | ALL FARMS IN SAMPLE |
|---|---|---|---|---|---|---|---|
| NUMBER OF FARMS IN SAMPLE | | 31 | 33 | 35 | 32 | 33 | 164 |
| TOTAL ANIMAL UNITS PER FARM | | 2.09 | 2.38 | 1.55 | 1.66 | 1.55 | 1.91 |
| MILK: | HOME CONSUMED, KG. | 94 | 37 | 127 | 428 | 83 | 151 |
| | SOLD | 301 | 55 | 0 | 376 | 0 | 142 |
| | TOTAL PRODUCED | 395 | 92 | 127 | 804 | 83 | 293 |
| | TOTAL VALUE, LE | 49.24 | 9.27 | 13.70 | 122.20 | 11.71 | 80.05 |
| CHEESE: | HOME CONSUMED, KG. | 2 | 18 | 598 | 32 | 29 | 143 |
| | SOLD | 0 | 19 | 461 | 37 | 1 | 109 |
| | TOTAL PRODUCED | 2 | 37 | 1059 | 69 | 30 | 252 |
| | TOTAL VALUE, LE | 0.50 | 7.30 | 199.40 | 4.25 | 9.89 | 48.76 |
| BUTTER: | HOME CONSUMED, KG. | 0 | 7.9 | 0 | 1.0 | 0 | 1.8 |
| | SOLD | 0 | 12.9 | 0 | 7.7 | 0 | 3.7 |
| | TOTAL PRODUCED | 0 | 20.8 | 0 | 7.7 | 0 | 5.5 |
| | TOTAL VALUE, LE | 0 | 22.27 | 0 | 9.48 | 0 | 6.71 |
| GHEE: | HOME CONSUMED, KG. | 0 | 6.1 | 84.5 | .1 | 8.4 | 20.8 |
| | SOLD | 0 | 0 | 43.2 | 5.7 | .6 | 10.4 |
| | TOTAL PRODUCED | 0 | 6.1 | 127.7 | 5.8 | 9.0 | 31.2 |
| | TOTAL VALUE, LE | 0 | 8.40 | 203.70 | 7.44 | 13.81 | 52.71 |
| EGGS: | HOME CONSUMED, NO. | 339 | 299 | 1101 | 1089 | 440 | 656 |
| | SOLD | 174 | 79 | 636 | 489 | 0 | 278 |
| | TOTAL PRODUCED | 513 | 378 | 1737 | 1578 | 440 | 934 |
| | TOTAL VALUE, LE | 30.79 | 12.82 | 26.80 | 43.88 | 10.30 | 24.42 |
| POULTRY: | TOTAL VALUE | 13.39 | 34.28 | 0.30 | 21.55 | 0.00 | 14.11 |

TABLE 11. QUANTITY AND VALUE OF OTHER LIVESTOCK PRODUCTS: POULTRY, MEAT, WORK, AND MANURE, ACCORDING TO FARM SIZE CLASS.

| | FARM SIZE | | | | | ALL FARMS | WEIGHTED |
|---|---|---|---|---|---|---|---|
| | 0 TO 1 | 1 TO 3 | 3 TO 5 | 5 TO 10 | >10 | IN SAMPLE | AVERAGE |
| FARMS IN SAMPLE (N) | 33 | 69 | 22 | 17 | 23 | 164 | |
| AVERAGE FARM SIZE, FEDDANS | .83 | 1.97 | 4.07 | 6.56 | 21.63 | 5.22 | 2.13 |
| EGGS: HOME CONSUMED, NUMBER | 603 | 611 | 696 | 413 | 718 | 656 | 609 |
| SOLD | 401 | 299 | 389 | 0 | 136 | 278 | 335 |
| TOTAL PRODUCED, NO. | 1004 | 910 | 1085 | 413 | 854 | 934 | 943 |
| VALUE, L. E. | 27.09 | 24.00 | 22.30 | 11.20 | 23.00 | 24.42 | 24.32 |
| POULTRY PRODUCED, VALUE, LE | 3.25 | 16.30 | 6.70 | 24.10 | 20.80 | 14.11 | 10.28 |
| LIVE ANIMALS PRODUCED, LE | 62.00 | 78.21 | 120.66 | 116.16 | 184.54 | 97.50 | 79.83 |
| ANIMAL WORK: (HOURS) | | | | | | | |
| OWN FARM: CATTLE OR BUFF. | 118 | 145 | 265 | 283 | 368 | 202 | 158 |
| OTHER ANIMALS | 577 | 720 | 983 | 905 | 1277 | 825 | 710 |
| SUB-TOTAL | 695 | 865 | 1248 | 1188 | 1645 | 1027 | 868 |
| OFF FARM: CATTLE OR BUFF. | 0 | 2 | 47 | 0 | 35 | 12 | 7 |
| OTHER ANIMALS | 25 | 64 | 0 | 49 | 12 | 38 | 39 |
| SUB-TOTAL | 25 | 66 | 47 | 49 | 47 | 50 | 46 |
| TOTAL HOURS | 720 | 931 | 1295 | 1237 | 1692 | 1077 | 914 |
| VALUE, LE | 98.68 | 128.38 | 163.52 | 158.30 | 214.30 | 142.36 | 123.11 |
| MANURE: (LOADS) | | | | | | | |
| PRODUCED AND USED ON FARM | 406 | 585 | 939 | 536 | 834 | 629 | 558 |
| PRODUCED AND SOLD OFF FARM | 2 | 1 | 1 | 21 | 0 | 22 | 2 |
| TOTAL MANURE PRODUCED | 408 | 586 | 940 | 557 | 834 | 651 | 560 |
| TOTAL VALUE OF MANURE, LE | 41.83 | 59.95 | 96.16 | 56.93 | 85.32 | 66.55 | 57.37 |

accurate.

The total number of hours of animal work per farm also rises with farm size (Table 11). On a per feddan basis, however, the farms of a feddan or less in size utilize more than twice as much animal work as farms in the next larger size category. They use more than ten times as much as farms over ten feddans. This difference in reliance in animal work obviously reflects the relatively lower intensity of farm mechanization on small farms.

Surprisingly little off-farm work (hiring out of animals to other farmers) was reported. At 46 hours overall average per year per farm, off-farm work represented only about 5 percent of the average 868 hours worked on farm by animals. Relatively speaking, however, off-farm work was a more important use of animals for small farmers than for large farmers.

In overall value terms, animal work, at an average LE 123 per farm, was substantially MORE important than live animal production. It should be noted, however, that since there is a relatively "thin" market for animal work, the value placed on own-farm work may be somewhat misleading.

Manure is less important in value than animal work, but at an overall average of LE 57 per farm its value is still substantial. On a per feddan basis, manure use is also far more important to smaller farmers than larger farmers. It declines steadily with farm size. Farms in the feddan and under size class averaged 439 loads of manure per feddan on their own farm, compared to only 39 loads per feddan on farms more than 10 feddans in size.

## VALUE OF PRODUCTS

Table 12 summarizes all livestock (animal plus poultry) products in value terms. The total value of animal production per farm increases as farm size increases. Poultry production also increases, but at a lower rate. The value of all livestock products averages LE 356 for farms of less than a feddan and increases to LE 630 for farms greater than 10 feddans. In Table 12, it is seen that total value of crop production was LE 247 on farms of a feddan and less, and this increased to an average of LE 3989 for the over 10 feddan size category. As a proportion of total product value livestock products averaged 43 percent for all farms. This proportion varied from 63 percent of the total for farms in the smallest size category to only 14 percent for those in the largest category.

TABLE 12. VALUE OF ALL LIVESTOCK PRODUCTS, COMPARISON TO CROP PRODUCTION VALUES, AND VARIOUS MEASURES OF PRODUCTIVITY, BY FARM SIZE CLASS.

| | FARM SIZE | | | | | ALL FARMS | WEIGHTED |
|---|---|---|---|---|---|---|---|
| | 0 TO 1 | 1 TO 3 | 3 TO 5 | 5 TO 10 | >10 | IN SAMPLE | AVERAGE |
| ALL ANIMAL PRODUCTS, VALUE | EGYPTIAN POUNDS (LE) PER FARM | | | | | | |
| DAIRY PRODUCTS | 123.56 | 198.60 | 153.83 | 78.40 | 101.60 | 188.87 | 155.79 |
| LIVE ANIMALS | 62.00 | 78.21 | 120.66 | 116.16 | 184.54 | 97.50 | 79.83 |
| ANIMAL WORK | 98.68 | 128.38 | 163.52 | 158.30 | 214.30 | 142.36 | 123.11 |
| MANURE | 41.83 | 59.95 | 96.16 | 56.93 | 85.32 | 66.55 | 57.37 |
| TOTAL ANIMAL PRODUCTS | 326.07 | 465.14 | 534.17 | 409.79 | 585.76 | 495.28 | 416.10 |
| VALUE OF POULTRY PRODUCTS | 30.34 | 40.30 | 29.00 | 35.30 | 43.80 | 38.53 | 34.59 |
| TOTAL, ALL LIVESTOCK PRODS. | 356.41 | 505.44 | 563.17 | 445.09 | 629.56 | 533.81 | 450.69 |
| PROPORTION OF TOTAL IN: | PERCENT OF TOTAL VALUE | | | | | | |
| DAIRY PRODUCTS | 35 | 39 | 27 | 18 | 16 | 35 | 35 |
| LIVE ANIMALS | 17 | 15 | 21 | 26 | 29 | 18 | 18 |
| ANIMAL WORK | 28 | 25 | 29 | 36 | 34 | 27 | 27 |
| MANURE | 12 | 12 | 17 | 13 | 14 | 12 | 13 |
| POULTRY PRODUCTS | 9 | 8 | 5 | 8 | 7 | 7 | 8 |
| | EGYPTIAN POUNDS (LE) | | | | | | |
| VALUE OF CROP PRODUCTION | 205 | 619 | 1094 | 1862 | 3989 | 1210 | 599 |
| CROP PRODUCTION PER FEDDAN | 247 | 314 | 269 | 284 | 184 | 232 | 281 |
| LIVESTOCK PROD. PER FEDDAN | 429 | 257 | 138 | 68 | 29 | 102 | 211 |
| OTHER MEASURES OF PRODUCTIVITY | EGYPTIAN POUNDS PER UNIT | | | | | | |
| TOT.ANIMAL PROD./AN.UNIT | 259 | 328 | 256 | 241 | 154 | 259 | 281 |
| TOT.POULTRY PROD./BIRD | 1.72 | 1.50 | 1.39 | 1.74 | 1.08 | 1.51 | 1.59 |

As shown in Table 12, dairy products averaged 35 percent of total livestock product value and the proportion was larger for smaller farms than larger farms. Live animal sales accounted for an average of 18 percent of total livestock product value, and this proportion increased for larger farm sizes. Animal work accounted for an average 27 percent of value, and this proportion increased with farm size. The value of manure and poultry products averaged 13 and 8 percent of total livestock production value, respectively, and this proportion varied relatively little with farm size.

FEEDSTUFF UTILIZATION AND VALUE.

Production, purchase, and total utilization of feedstuffs are shown in Table 13. The most striking feature of the table is the relatively high prportion of feedstuffs which is purchased. Nevertheless, berseem, the most important single livestock feed, is not subject to a high degree of outside purchase. On average, some 13 percent of berseem which is fed is purchased from outside the farm. Farms of less than a feddan are evidently more dependent on outside purchases, however, since they procure 18 percent from off farm. Table 14 shows feed use on a per animal unit basis. Viewing feed use in this way, it is seen that farms of one feddan and less in size use far less feed than larger farms.

Starch equivalency, a measure of total energy available, and protein availability have also been estimated on a per animal unit basis. The relative importance of the various feed sources does not change much from farm size to farm size.

The low level of feed inputs reported by farms in the feddan and under size class is quite evident from the starch equivalent and digestible protein per animal unit, as shown in Table 14. At 1308 kg. of starch equivalent, for example this class receves only about 68 percent of the energy which animals were found to receive for the survey as a whole. This figure is considerably less than the 2000 or more kg. of starch equivalent thought to be necessary for the maintenance of a large animal in Egypt. As discussion below will verify, animals on farms in this smallest size class appear to be quite productive. It will be recalled from Table 1 that 15 percent of the animal units for farms of this size--a much higher proportion than for larger farms--are made up of sheep and goats. Undoubtedly, much of the feed for these sheep and goats is gathered from ditch banks and roadsides. It would have been virtually impossible for farmers to have quantified and reported such feed inputs. Considering the labor available and utilized for livestock production for farms of this size, it is likely that much feed is even carried to larger animals from ditchbanks and roadsides.

TABLE 13. AVERAGE FEEDS PRODUCED AND PURCHASED PER FARM, ACCORDING TO FARM SIZE CLASS.

| | FARM SIZE | | | | | ALL FARMS | WEIGHTED |
|---|---|---|---|---|---|---|---|
| | 0 TO 1 | 1 TO 3 | 3 TO 5 | 5 TO 10 | >10 | IN SAMPLE | AVERAGE |
| FARMS IN SAMPLE (N) | 33 | 69 | 22 | 17 | 23 | 164 | |
| AVERAGE FARM SIZE, FEDDANS | .83 | 1.97 | 4.07 | 6.56 | 21.63 | 5.22 | 2.13 |
| TOTAL ANIMAL UNITS PER FARM | 1.26 | 1.42 | 2.09 | 1.70 | 3.80 | 1.91 | 1.47 |
| BERSEEM PRODUCED, S.K.-CUTS | 20.9 | 48.2 | 78.9 | 99.6 | 147.6 | 70.1 | 44.54 |
| PURCHASED | 4.5 | 6.7 | 13.7 | 5.3 | 30.1 | 11.1 | 6.77 |
| TOTAL | 25.4 | 54.9 | 92.6 | 104.9 | 177.7 | 81.2 | 51.32 |
| PERCENT PURCHASED | 18 | 12 | 15 | 5 | 17 | 14 | 13 |
| CONCENTRATE PURCHASED, KG. | 129 | 168 | 455 | 412 | 781 | 308 | 206 |
| BRAN PRODUCED, KG. | 30 | 82 | 7 | 9 | 0 | 4 | 47 |
| PURCHASED | 38 | 99 | 293 | 100 | 12 | 10 | 99 |
| TOTAL | 68 | 181 | 300 | 109 | 12 | 14 | 147 |
| PERCENT PURCHASED | 56 | 55 | 98 | 92 | 100 | 70 | 68 |
| GRAIN+LEGUMES PRODUCED, KG. | 100 | 196 | 178 | 12 | 351 | 175 | 146 |
| PURCHASED | 61 | 137 | 311 | 132 | 560 | 204 | 131 |
| TOTAL | 161 | 333 | 489 | 144 | 911 | 379 | 277 |
| PERCENT PURCHASED | 38 | 41 | 64 | 92 | 61 | 54 | 47 |
| STRAW PRODUCED, LOADS | 5.7 | 5.7 | 10.4 | 6.8 | 20 | 8.4 | 6.44 |
| PURCHASED | 3.4 | 6.6 | 4.9 | 3.6 | 5.6 | 5.6 | 4.93 |
| TOTAL | 9.1 | 12.3 | 15.3 | 10.4 | 25.6 | 14 | 11.37 |
| PERCENT PURCHASED | 37 | 54 | 32 | 35 | 22 | 40 | 43 |
| HAY PRODUCED, KG. | 360 | 330 | 1000 | 1350 | 1300 | 670 | 489 |
| PURCHASED | 210 | 450 | 130 | 1470 | 700 | 500 | 369 |
| TOTAL | 570 | 780 | 1130 | 2820 | 2000 | 1170 | 858 |
| PERCENT PURCHASED | 37 | 58 | 12 | 52 | 35 | 43 | 43 |
| MAIZE FORAGE PRODUCED, S.K. | 1.4 | 4.4 | 8.5 | 4.6 | 4.7 | 4.4 | 3.8 |
| PURCHASED | .5 | 3.5 | .1 | 7.7 | 7.7 | 4.9 | 2.1 |
| TOTAL | 1.9 | 7.9 | 8.6 | 12.3 | 12.4 | 9.3 | 5.9 |
| PERCENT PURCHASED | 26 | 44 | 1 | 63 | 62 | 53 | 36 |
| MAIZE TOPS+LEAVES,MAN LOADS | 124 | 227 | 156 | 110 | 161 | 181 | 170 |

TABLE 14. AVERAGE TOTAL FEED INPUTS, STARCH AND PROTEIN EQUIVALENTS, PER ANIMAL UNIT.

| | FARM SIZE | | | | | ALL FARMS IN SAMPLE | WEIGHTED AVERAGE |
|---|---|---|---|---|---|---|---|
| | 0 TO 1 | 1 TO 3 | 3 TO 5 | 5 TO 10 | >10 | | |
| TYPE OF FEED: | KILOGRAMS PER ANIMAL UNIT | | | | | | |
| BERSEEM | 5040 | 9665 | 11077 | 15426 | 11691 | 10628 | 8726 |
| CONCENTRATE FEED MIX | 102 | 118 | 218 | 242 | 206 | 161 | 140 |
| BRAN | 54 | 127 | 144 | 64 | 3 | 7 | 100 |
| GRAINS AND LEGUMES | 128 | 235 | 234 | 85 | 240 | 198 | 189 |
| STRAW | 1806 | 2165 | 1830 | 1529 | 1684 | 1832 | 1934 |
| HAY | 452 | 549 | 541 | 1659 | 526 | 613 | 583 |
| MAIZE FORAGE (DARAWA) | 754 | 2782 | 2057 | 3618 | 1632 | 2435 | 2007 |
| MAIZE TOPS AND LEAVES | 984 | 1599 | 746 | 647 | 424 | 948 | 1156 |
| TOTAL STARCH EQUIVALENT, KG | 1308 | 2190 | 2119 | 2792 | 1989 | 2053 | 1911 |
| PROPORTION DERIVED FROM | PERCENT OF TOTAL | | | | | | |
| BERSEEM | 31 | 35 | 42 | 44 | 47 | 41 | 37 |
| CONCENTRATE MIX | 4 | 3 | 6 | 5 | 6 | 4 | 4 |
| BRAN | 2 | 3 | 3 | 1 | 0 | 0 | 2 |
| GRAINS & LEGUMES | 7 | 8 | 8 | 2 | 9 | 7 | 7 |
| STRAW | 30 | 22 | 19 | 12 | 19 | 20 | 22 |
| HAY | 11 | 8 | 8 | 20 | 9 | 10 | 10 |
| MAIZE FODDER | 14 | 21 | 14 | 16 | 11 | 17 | 18 |
| TOTAL DIGEST. PROTEIN, KG. | 221 | 407 | 419 | 610 | 398 | 399 | 358 |
| PROPORTION DERIVED FROM | PERCENT OF TOTAL | | | | | | |
| BERSEEM | 50 | 52 | 58 | 56 | 65 | 59 | 54 |
| CONCENTRATE MIX | 6 | 4 | 7 | 5 | 7 | 5 | 5 |
| BRAN | 3 | 4 | 4 | 1 | 0 | 0 | 3 |
| GRAINS & LEGUMES | 6 | 6 | 6 | 1 | 6 | 5 | 5 |
| STRAW | 3 | 2 | 2 | 1 | 2 | 2 | 2 |
| HAY | 16 | 11 | 10 | 22 | 11 | 12 | 13 |
| MAIZE FORAGE | 16 | 22 | 13 | 14 | 10 | 17 | 18 |

Berseem is the largest source of both protein and energy, providing an estimated 54 and 37 percent of these two nutrient categories overall. This underscores the critical role which berseem plays in Egypt's agricultural system. The fact that berseem, which is available only from late December through May, provides more than half of the protein available would seem to be a reflection of the imbalance in protein availability. Aside from this, however, it is not possible to deduce much about the seasonal distribution of feedstuffs from the survey data utilized here.

Concentrate feed mix is produced by publicly owned feed mills and is all purchased from off the farm. The average price paid for this feed mix during the 1976-77 survey year was over LE 60 per ton, well above the official price of LE 35 per ton which prevailed at that time (Soliman, 1981). Obviously, much of the feed mix which was purchased was procured at higher black market prices. Soliman's paper discusses the distribution policies for this feed mix. His study shows that government policies are geared toward providing most of the concetrate to large feedlot and dairy operations. Evenso, the low proportions of total starch equivalent (4 percent) and protein (5 percent) provided to traditional farms by the feed mix are surprising. In 1977, about 800,000 tons of the feed mix were produced and distributed, whereas the government was reporting 1,250,000 tons per year by 1981. Thus, the relative importance of concentrate mix should be somewhat greater at present than at the time of the survey.

Some 68 percent of the bran and 47 percent of the grains and legumes which are fed are procured from outside the farm. In both cases, there is a tendency for larger farmers to procure a higher proportion from outside than do smaller farmers (Table 13). The most common grains to be fed are imported yellow maize, locally produced white maize, and broad beans. Bran is derived from both wheat and rice. The bran produced by the farmer is either what is derived from the grain which he grinds into flour himself, or that which is returned to him when he takes his grain to a local miller for grinding. Bran and grains, when taken together, provide more than twice as much starch equivalent and protein as the feed concentrate (Table 14).

Straw utilized is mainly from the farms themselves, but 43 percent is procured from off the farm. Farms in the 1 to 3 feddan size class are evidently far more dependent on outside purchases than are smaller farms. Most straw which is utilized is from wheat, although bean and other legume straws are utilized when available, and there is now an increasing use of rice straw for feeding, something which almost was unheard of in the past. Straw provides about 22 percent of the energy

(starch equivalent) available to the animals, and in this it is second in importance only to berseem. However, straw provides an almost insignificant amount of protein (2 percent).

Of the hay which is utilized, 43 percent also comes from off the farm. Most hay is from berseem which is dried in the latter part of the berseem season. The amounts of hay which were found to be utilized are perhaps somewhat surprising. In general, it has been felt that the Egyptian farmer is not prone to make hay, and the introduction of hay making is often suggested as a means of solving the shortage of summer feeds. The Winrock study (1980) found no hay being produced in either of the two villages which were surveyed. Hay was found to supply 10 percent of the total available starch equivalent and 13 percent of the protein. Hay was relatively more important to farms in the 5 to 10 feddan size class. Most if not all hay is made from berseem. Thus, it is seen that winter-grown berseem is also contributing in a significant way to summer feeding.

Maize is the source of two different types of animal fodders and is thus an important source of summer green fodder. On the one hand, a part of the maize area is often set aside specifically for forage production, and the entire plant is removed for feeding as it is needed. Egyptian farmers often remove the leaves and tops of maize plants prior to the grain harvest, in order to derive extra forage. This practice of "stripping and topping" is thought to reduce grain yields and is discouraged (Fitch, 1982). Taken together, the two types of maize forage supply an estimated 18 percent of total available starch equivalent and 18 percent of the protein (Table 14). As such, it is seen that maize fodder is a very important source of feed. In making this assessment, the measurement problems discussed earlier must be kept in mind.

As noted previously, it was not possible to keep track of feed inputs for each different type of animal. To help shed some light on the relative importance of the various feeds to the different animal types, animal numbers for each farm were correlated with feed inputs. Results are shown in Table 15. While some of the results are not too convincing--e.g. the high correlation between straw use and poultry numbers--others may be of interest. Certainly, the high correlation between berseem use and the numbers of virtually all animal types seems to support the notion that berseem is one of the most versitile feeds used in Egypt.

## COSTS AND RETURNS TO LIVESTOCK PRODUCTION.

Costs of production, entailing feedstuffs, hired labor and miscellaneous purchased inputs (e.g. veterinary fees and medicines), are given in Table 16. While the cost of hired

TABLE 15. SIMPLE CORRELATIONS BETWEEN LIVESTOCK NUMBERS AND QUANTITIES OF FEED USED.

| FEED VARIABLE: | | LIVESTOCK VARIABLE: TOTAL ANIMAL UNITS A1 | POULTRY A2 | GOATS AND SHEEP A3 | TOTAL DRAFT ANIMALS A4 | TOTAL MEAT ANIMALS A5 | TOTAL MILK ANIMALS A6 |
|---|---|---|---|---|---|---|---|
| MAIZE FORAGE | F1 | .72 | .09 | .07 | .55 | .12 | .75 |
| HAY | F2 | .33 | .24 | .29 | .54 | .72 | .20 |
| STRAW | F3 | .98 | .84 | .63 | .94 | .65 | .96 |
| CONCENTRATE FEED MIX | F4 | .92 | .46 | .35 | .92 | .73 | .73 |
| GRAINS AND LEGUMES | F5 | .91 | .73 | .56 | .82 | .4 | .95 |
| PURCHASED BERSEEM | F7 | .97 | .79 | .77 | .89 | .73 | .95 |
| SHORT SEASON BERSERSEEM | F8 | .85 | .74 | .78 | .94 | .89 | .77 |
| TOTAL FULL TERM BERSEEM | F9 | .80 | .71 | .36 | .97 | .87 | .81 |

TABLE 16. COSTS OF FEEDSTUFFS AND OTHER INPUTS, BY FARMSIZE CLASS, 1977 FARM MANAGEMENT SURVEY.

| | FARM SIZE | | | | | ALL FARMS | WEIGHTED |
|---|---|---|---|---|---|---|---|
| | 0 TO 1 | 1 TO 3 | 3 TO 5 | 5 TO 10 | >10 | IN SAMPLE | AVERAGE |
| COSTS: | | | | | | | |
| PURCHASED INPUTS: | EGYPTIAN POUNDS (LE) PER FARM | | | | | | |
| BERSEEM CLOVER | 8.00 | 11.80 | 31.70 | 5.30 | 48.70 | 18.50 | 12.70 |
| FEED CONCENTRATE MIX | 4.04 | 9.90 | 19.30 | 20.00 | 46.86 | 18.15 | 9.51 |
| BRAN | 0.54 | 5.70 | 10.30 | 7.50 | 1.40 | 4.84 | 4.31 |
| GRAINS AND LEGUMES | 4.09 | 13.10 | 23.86 | 12.30 | 18.90 | 14.28 | 10.88 |
| STRAW | 15.24 | 25.20 | 33.50 | 14.50 | 28.00 | 23.69 | 21.73 |
| HAY | 4.30 | 11.30 | 3.90 | 53.70 | 19.00 | 14.32 | 9.87 |
| MAIZE FORAGE | 1.69 | 8.10 | 5.30 | 16.50 | 23.20 | 9.44 | 5.70 |
| MISCELLANEOUS COSTS | 3.84 | 1.28 | 0.40 | 1.49 | 4.23 | 2.20 | 2.22 |
| HIRED LABOR | .37 | 2.93 | 14.64 | 11.71 | 119.32 | 20.50 | 4.48 |
| TOTAL PURCHASED | 42.11 | 89.31 | 142.90 | 143.00 | 309.61 | 125.92 | 81.40 |
| INPUTS FROM FARM: | | | | | | | |
| BERSEEM CLOVER | 31.93 | 80.49 | 131.50 | 166.00 | 246.49 | 109.77 | 73.14 |
| BRAN | .94 | 4.40 | .38 | .48 | 0 | .21 | 2.26 |
| GRAINS AND LEGUMES | 4.38 | 13.78 | 12.52 | .84 | 24.68 | 12.58 | 9.21 |
| STRAW | 24.09 | 24.09 | 43.95 | 28.74 | 84.53 | 35.50 | 27.23 |
| HAY | 9.72 | 8.91 | 0.00 | 36.45 | 35.10 | 18.09 | 9.69 |
| MAIZE FORAGE | 2.71 | 8.51 | 16.45 | 8.90 | 9.09 | 8.51 | 7.25 |
| MAIZE TOPS AND LEAVES | 2.08 | 3.81 | 2.62 | 1.85 | 2.70 | 3.04 | 2.85 |
| TOTAL FROM OWN FARM | 75.85 | 143.99 | 207.42 | 243.26 | 402.59 | 187.70 | 131.63 |
| TOTAL COST OF INPUTS: | 117.96 | 233.30 | 350.32 | 386.26 | 712.20 | 313.62 | 213.03 |
| IMPUTED RESOURCE COSTS: | | | | | | | |
| FAMILY LABOR | 184 | 132 | 161 | 92 | 167 | 148 | 155 |
| LSTOCK INVESTMENT CHARGE | 43 | 45 | 61 | 51 | 136 | 63 | 47 |

labor is included as a purchased item, the cost of family labor is NOT included as an "on-farm" cost. Imputed charges for family labor and investment are both shown separately at the bottom of Table 16. Family labor use was charged at the average hired labor rates prevailing during the survey year. The cost of investment was calculated as the interest which the farmer forewent by investing his funds in livestock rather than putting them in a savings account. The interest rate used for calculating this investment cost was 10 percent, the interest which could have been received from savings at a private bank during the time of the survey.

Table 16 shows that, on average, some 62 percent of total production costs were attributed to the value of inputs from the farmers' own farms. Purchased inputs accounted for the remainder. The cost of berseem accounted for 42 percent of total feed costs.

Table 17 summarizes costs on a per animal unit basis, according to farm size. In general, it is seen that the average total cost of inputs per animal unit was LE 144 for the year of the survey. Of this amount, LE 50 (35 percent) represented purchased feeds, LE 89 (62 percent) was for feeds from the same farm, and the remaining LE 4.53 represented other purchased inputs. Imputed costs of family labor and livestock investment were not included. In general, the per animal cost was higher for larger (5 feddan and greater) farms, particularly in terms of feed used from the farmer's own farm. Farms in the smallest size class had much lower costs than larger farms, and it is thought that this reflects the fact that farmers in this class collect much of their feeds "free" from roadsides and ditchbanks.

Table 18 summarizes various dimensions of costs and returns which were presented in more detail in previous tables. There is always some doubt about the meaning of net returns that include items which are consumed on or obtained from within the farm. While such goods as manure from the farm were counted as costs and animal work performed on the farm was included as a return, it is doubtful that such goods are fully marketable at the same prices which are recevied for the relatively small proportion of these items which is marketed. The same can be said of maize tops and leaves, which are marketed only on a very limited basis. To avoid problems such as these, net "cash" returns were also calculated. Net cash returns include only those outputs and inputs which were actually sold, purchased, or traded off the farm.

The results shown in Table 18 are somewhat surpirsing, particularly for large farmers. They show that farms in the over 10 feddan category suffered net losses, on average, for the survey year. Even on a net "cash" return basis, these

TABLE 17. AVERAGE COSTS PER ANIMAL UNIT AND COST DISTRIBUTION.

| | FARM SIZE | | | | | ALL FARMS IN SAMPLE | WEIGHTED AVERAGE |
|---|---|---|---|---|---|---|---|
| | 0 TO 1 | 1 TO 3 | 3 TO 5 | 5 TO 10 | >10 | | |
| AVERAGE COSTS: | EGYPTIAN POUNDS (LE) PER ANIMAL UNIT | | | | | | |
| PURCHASED FEEDS | 30.08 | 59.93 | 61.18 | 76.35 | 48.96 | 54.04 | 50.47 |
| OTHER PURCHASED INPUTS | 3.34 | 2.96 | 7.20 | 7.76 | 32.51 | 11.88 | 4.53 |
| TOTAL PURCHASED INPUTS | 33.42 | 62.89 | 68.37 | 84.12 | 81.48 | 65.93 | 55.00 |
| FEEDS FROM OWN FARM | 60.20 | 101.40 | 99.24 | 143.09 | 105.94 | 98.27 | 88.94 |
| TOTAL COSTS | 93.62 | 164.30 | 167.62 | 227.21 | 187.42 | 164.20 | 143.94 |

TABLE 18. AGGREGATE COSTS AND RETURNS TO LIVESTOCK PRODUCTION, BY FARM SIZE CLASS.

| | FARM SIZE | | | | | ALL FARMS | WEIGHTED |
|---|---|---|---|---|---|---|---|
| | 0 TO 1 | 1 TO 3 | 3 TO 5 | 5 TO 10 | >10 | IN SAMPLE | AVERAGE |
| FARMS IN SAMPLE (N) | 33 | 69 | 22 | 17 | 23 | 164 | |
| AVERAGE FARM SIZE, FEDDANS | .83 | 1.97 | 4.07 | 6.56 | 21.63 | 5.22 | 2.13 |
| RETURNS: | | | | | | | |
| PRODUCTS SOLD: | EGYPTIAN POUNDS (L.E.) PER FARM | | | | | | |
| MILK AND DAIRY PRODUCTS | 27.04 | 72.00 | 64.45 | 47.87 | 78.50 | 89.50 | 51.76 |
| EGGS | 8.52 | 5.90 | 6.87 | 0.00 | 4.00 | 5.00 | 6.75 |
| LIVE ANIMALS | 62.00 | 78.21 | 120.66 | 116.16 | 184.54 | 97.50 | 79.83 |
| ANIMAL WORK | 3.58 | 10.28 | 0.94 | 7.84 | 2.62 | 5.98 | 6.22 |
| MANURE | 0.34 | 0.10 | 0.10 | 2.10 | 0.00 | 2.20 | 0.30 |
| TOTAL SALES | 101.48 | 166.49 | 193.02 | 173.97 | 269.66 | 200.18 | 144.85 |
| CONSUMED OR USED ON FARM: | | | | | | | |
| MILK AND DAIRY PRODUCTS | 96.52 | 126.60 | 89.40 | 30.53 | 23.10 | 90.10 | 104.03 |
| EGGS | 17.50 | 18.10 | 28.60 | 11.20 | 19.00 | 18.10 | 18.86 |
| POULTRY | 4.32 | 16.30 | 11.62 | 24.10 | 20.80 | 13.30 | 11.34 |
| ANIMAL WORK | 95.10 | 118.10 | 162.58 | 150.46 | 211.68 | 130.26 | 116.90 |
| MANURE | 41.49 | 59.86 | 96.90 | 54.85 | 85.34 | 61.91 | 57.18 |
| TOTAL ON-FARM USE | 254.93 | 338.96 | 389.10 | 271.14 | 359.92 | 313.67 | 308.31 |
| TOTAL RETURNS | 356.41 | 505.45 | 582.12 | 445.11 | 629.58 | 513.85 | 453.16 |
| NET RETURNS | 238.45 | 272.15 | 231.80 | 58.85 | -82.62 | 200.23 | 240.13 |
| NET "CASH" RETURNS | 59.37 | 77.18 | 50.12 | 30.97 | -39.95 | 74.26 | 63.46 |
| | EGYPTIAN POUNDS (L.E.).PER UNIT | | | | | | |
| NET RETURNS PER FEDDAN | 287 | 138 | 57 | 9 | -4 | 38 | 113 |
| NET "CASH" RETURNS PER FED. | 72 | 39 | 12 | 5 | -2 | 14 | 30 |
| NET RETURNS PER ANIMAL UNIT | 189 | 192 | 111 | 35 | -22 | 105 | 162 |
| NET "CASH" RETURNS PER A.U. | 47 | 54 | 24 | 18 | -11 | 39 | 43 |
| RETURNS TO BASIC RESOURCES: | | | | | | | |
| RETURN ON INVESTMENT (%) | 13 | 31 | 12 | -7 | -18 | 8 | 18 |
| RET.TO FAM.LABOR (LE/DAY) | 1.06 | 1.72 | 1.06 | 0.09 | -1.31 | 0.93 | 1.25 |

farms posted losses. Smaller farms appear to have higher and positive net returns to animal production. Farms in the smallest size category (one feddan and less) had average net returns of LE 238 from their livestock for the survey year, compared to LE 272 for 1 to 3 feddan farms and successively lower figures for farms in larger size categories. On a Net "Cash" Return basis, the 1 to 3 feddan farms averaged LE 77, which was again higher than for farms in all other categories.

Returns per animal unit and per feddan are also shown in Table 18. On a per animal unit basis, the 1 to 3 feddan farm size class also rates higher than other classes, although all farms of less than 5 feddans in size appear to do well. On a per feddan basis, the smallest size class (one feddan and under) shows much higher net returns to animal production, on average, than do larger farms.

In the preceding returns analysis no allowance was made for the cost of the two basic resources, labor and investment capital. Rather, at the bottom of Table 18, calculations are shown for the net returns attributable to each of these resources. In the return on investment calculation, the cost of family labor, as shown in Table 16, is first deducted from net returns. Similarly, to arrive at the return to labor, the imputed investment cost is first deducted. Based on these calculations, livestock production is seen to have done quite well overall during the 1976-77 survey year. The overall rate of return on investment was 18 percent, compared to a then prevailing bank savings account rate of 10 percent. The return to family labor was a surprisingly high LE 1.25, compared to a prevailing average farm labor rate of about LE 0.75. Smaller farms appear to do quite well, on average. Farms in the 1 to 3 feddan size class again registered the best overall performance, with an average 31 percent rate of return to livestock investment or a LE 1.72 per day return to family labor.

## SUMMARY AND FINAL CONCLUSIONS

With returns such as those indicated above, it is not surprising that livestock investment has been so popular among Egyptian farmers in recent years. But what are the factors that explain these high returns, and what implications do the findings here have for livestock and crop production in the future?

Productivity and returns are higher on smaller farms than on larger farms. A number of factors appear to contribute to this. Above all, smaller farms devote much more labor per animal unit to animal production. This is predominantly family labor, which smaller farms have in abundance. This labor is used in a number of ways: primarily it is used to add more

value to products through dairy processing. More than 80 percent of the milk produced on very small farms is processed into other dairy products such as cheese, ghee and butter; this proportion declines steadily as farm size increases. Milk production per cow is higher on smaller farms, an apparent result of the extra labor which the smaller sized units devote to their animals. Smaller farms also appear to use family labor to gather "free" forage from roadsides and ditchbanks, thus utilizing a source of feed which would otherwise go to waste. Finally, smaller farms also sell a higher amount of animal work outside the farm. In general, livestock production appears to have the capacity, more than crop production, to absorb the abundance of family labor which becomes available as farm size becomes smaller. This appears to explain much of the profitability as well as the growth and intensification of livestock production in Egypt.

Livestock production thus is seen as providing attractive opportunities for Egypt's farmers, particularly small farmers, to augment farm incomes as well as obtain vital human food nutrients. An estimated 65 percent of all equivalent animal units were found to be on farms of 3 feddans and less. More than 75 percent of the edible milk and dairy products are home consumed on farms of this size. Given the fact that livestock production is so heavily concentrated on these small farms and that they consume such a high proportion of what they produce, it would seem to follow that these farms cannot be counted upon to supply a very significant amount of dairy and other livestock products to Egypt's growing off-farm population. But data presented here appears to indicate the opposite. Because they are so much more productive than larger farms, the amount of livestock products which is marketed by small farms appears to exceed that marketed by larger farms, when measured on either a per feddan or per animal unit basis.

Is the intensification in livestock production which Egypt has experienced during the past two decades a temporary or a long term phenomenon? Ward (1975, p.117) and others feel that livestock intensification cannot normally succeed in developing countries, in the face of high human population denisities and the resultant competition for crop land. Data presented in this study seems to indicate that just the opposite may be true in Egypt during the current epoch. Why? Will the current situation last?

Egypt's farm population has continued to grow on a fixed base of land. The average farm size has become smaller--it is currently estimated to be about 2.4 feddans--and the farm family labor available per farm and per unit area of land has increased (Fitch and Aly, 1982). Evidence presented here indicates that livestock production has a much greater capacity

than crop production for utilizing additional family labor. This factor would appear to favor livestock production, aside from the favorable relative price situation which exists.

Ward's review of historical studies of livestock production finds that livestock production has normally been intensified when "...declines in grain prices...have been the stimulus for a shift from arable to relatively more intensive livestock farming" (1975,p.120). Clearly, due to government policies, grain and other crop prices in Egypt have been held quite low relative to livestock prices (Habashy and Fitch, 1981). Without doubt, this has contributed greatly to livestock intensification. Should the Egyptian government decide to permit crop prices to rise toward their international trading equivalents--and this possibility cannot be ruled out--then the current incentives to produce livestock would be greatly reduced.

Another factor to be taken into account is farm mechanization. Data from the Farm Management Survey shows that about 46 percent of all animal units were reported as being work animals--donkeys, camels, work cows, work buffaloes, and others. In addition to this, it is known that many animals which are kept primarily for milk production are also used periodically for work. Animal work was found to be the second most important source of returns to livestock producers, after milk and dairy products. Additional mechanization will undoutedly remove the need for many work animals. A question thus remains as to what will happen as work animals are no longer needed for work. Will the Egyptian farmer shift the resources which are now devoted to supporting work animals--the labor, the land for feed and fodder crops, and the investment capital--into crop production, or will he shift these resources into other types of livestock production, particularly milk and dairy production? It is beyond the scope of the present study to answer this question. It seems safe to say, however, that the determination of the outcome will depend upon what happens to agricultural price policy, as already discussed, as well as what changes may occur in livestock production technology.

As has been demonstrated, livestock production appears to be profitable in Egypt at present, eventhough levels of productivity are low by international standards. Survey results presented here show that dairy production is about 1000 kg per productive cow per year. This is quite low by international standards. In Europe and North America, it is not uncommon for production to be 6 to 10 times this high. If Egypt were to raise livestock and, in particular, dairy productivity, this could provide great incentives to continue to intensify livestock production.

What are the measures that could permit productivity to be

raised? In this connection, an EEC sponsored dairy project currently underway at Fariskur in Domiatta Governorate is instructive. Farmers enrolled in this project are aided in the purchase of Dutch Fresian dairy cows. Several of the participants have reported production of more than 3000 kg of milk per lactation. In order to attain these levels, they have been assisted in planting improved summer forage crops, and the project helps to insure that concentrate feed supplies are reliable and that good veterinary service is available when needed.

There is little doubt that the quantity and reliability of feed supply are critical factors in improving livestock production. This study has shown that even small farmers rely to a high degree on purchasing feedstuffs from the market place. The supplies of some of these feeds--particularly feed concentrate mix and yellow maize--are often quite erratic. If a milk cow is deprived of adequate feed even for a short period the lactation cycle will often be terminated. To insure that Egypt's large number of small producers have access to reliable year-round feed supplies poses a real challenge to Ministry officials and policy makers.

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APPENDIX A. COEFICIENTS FOR LABOR REQUIREMENTS PER FEDDAN, 10 VILLAGE SUB-SAMPLE, 1977 FARM MANAGEMENT SURVEY.

| | FARM SIZE | | | | | ALL FARMS | WEIGHTED |
|---|---|---|---|---|---|---|---|
| | 0 TO 1 | 1 TO 3 | 3 TO 5 | 5 TO 10 | >10 | IN SAMPLE | AVERAGE |
| | DAYS PER FEDDAN PER YEAR | | | | | | |
| LABOR FOR CROPS: | | | | | | | |
| FAMILY: MEN | 65 | 69 | 55 | 37 | 35 | 44 | 58 |
| WOMEN | 3 | 3 | 2 | 1 | 1 | 1 | 2 |
| CHILDREN | 6 | 7 | 7 | 10 | 7 | 7 | 7 |
| ELDERS | 21 | 33 | 20 | 28 | 15 | 20 | 26 |
| HIRED | 29 | 48 | 57 | 63 | 51 | 52 | 50 |
| TOTAL | 124 | 160 | 140 | 139 | 108 | 125 | 143 |
| LABOR FOR LIVESTOCK: | | | | | | | |
| FAMILY: MEN | 167 | 33 | 25 | 13 | 7 | 19 | 47 |
| WOMEN | 144 | 45 | 28 | 6 | 3 | 17 | 47 |
| CHILDREN | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| ELDERS | 48 | 29 | 9 | 4 | 1 | 8 | 21 |
| HIRED | 1 | 2 | 5 | 2 | 8 | 6 | 3 |
| TOTAL | 360 | 110 | 67 | 25 | 19 | 51 | 119 |

APPENDIX B. PERCENTAGE OF FARMS REPORTING HOLDINGS OF ANIMALS, BY TYPE OF ANIMAL AND BY FARM SIZE CLASS, 10-VILLAGE SUB-SAMPLE, 1977 FARM MANAGEMENT SURVEY.

| | SIZE OF FARM | | | | | WEIGHTED |
|---|---|---|---|---|---|---|
| | 0 TO 1 | 1 TO 3 | 3 TO 5 | 5 TO 10 | >10 | AVERAGE |
| | PERCENT OF FARMS | | | | | |
| FARMS WITH HOLDINGS OF SOME: | | | | | | |
| ANIMALS OF ANY KIND ‡ | 84 | 91 | 100 | 82 | 83 | 89 |
| CATTLE | 58 | 45 | 57 | 53 | 61 | 52 |
| BUFFALOES | 51 | 48 | 61 | 35 | 39 | 50 |
| SHEEP AND GOATS | 19 | 23 | 22 | 0 | 13 | 20 |
| WORK ANIMALS, ANY KIND | 58 | 81 | 83 | 71 | 78 | 72 |
| POULTRY | 72 | 71 | 78 | 53 | 57 | 71 |

‡INCLUDES ALL ANIMALS LISTED ABOVE, BUT NOT POULTRY.

APPENDIX C. PERCENTAGE OF FARMS REPORTING PRODUCTION OF DAIRY AND POULTRY PRODUCTS, BY FARM SIZE CLASS, 10 VILLAGE SUB-SAMPLE, 1977 FARM MANAGEMENT SURVEY.

| | FARM SIZE | | | | | WEIGHTED |
|---|---|---|---|---|---|---|
| | 0 TO 1 | 1 TO 3 | 3 TO 5 | 5 TO 10 | >10 | AVERAGE |
| | PERCENT OF FARMS | | | | | |
| SOME PRODUCTION OF: | | | | | | |
| LIQUID MILK | 33 | 48 | 70 | 35 | 44 | 44 |
| CHEESE | 51 | 51 | 48 | 18 | 26 | 49 |
| BUTTER | 5 | 13 | 9 | 12 | 13 | 9 |
| GHEE | 74 | 35 | 35 | 24 | 13 | 50 |
| EGGS | 49 | 58 | 48 | 41 | 39 | 52 |
| POULTRY | 19 | 41 | 30 | 33 | 30 | 30 |