Livestock and Small Farmer Labor Supply

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Intensive animal production has never been important in the agriculture of the world's less developed countries, basically because animals compete with man for land on which to produce crops.[1]

INTRODUCTION

Egypt's rural population contains a high proportion of farmers with very small farms. Average farm size, now thought to be less than 2.5 feddans, continues to decline under the pressure of the growing rural population. More than two thirds of the farming units are less than three feddans in size. The literature[2] often asserts that a two to three feddan farm is necessary for "subsistence" or to avoid the need to work for others. Surprisingly, however, recent studies indicate that smaller farmers are not very active participants in hired farm labor markets.[3] How, then, can such farmers survive? We contend that livestock production provides a vital alternative source of employment, food, and income to the small farmer.

Others have suggested that livestock production may represent an important survival strategy for Egypt's small farmers.[4] A recent paper of the authors discusses problems in drawing upon national statistics as a source of information about livestock.[5] Survey data presented by Richards and Martin[6] 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. However, more detailed information on the economics of livestock production has not been available. Is livestock production more rewarding to small farmers than participation in the farm labor market, or does it represent something which they do out of preference to working for others?

The contribution of livestock and milk production to creating year-round employment for farmers and farm families cannot be overlooked. Labor demands for livestock are heaviest in the

winter months when crop production demands are lowest. 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.

Some important sociological aspects of livestock production in the Egyptian farm family must be taken into account. 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 of 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.[7]

The aim of this study is to present indirect evidence on farm labor supply by examining livestock production as a crucial alternative on-farm labor use. Doing so requires us to identify the production structure and technical coefficients for livestock on traditional 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 determine how these factors vary by farm size. 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, ten of the survey villages were selected for detailed examination, two from each of five major farming regions of the country. Each village contained between sixteen and eighteen farmers who 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 sixty feddans. Of the 175 farms, ten were eliminated due to 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

seventeen to sixty-nine 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 indicative of what may actually exist. Weights were not available to derive weighted averages for regions.

The Farm Management Survey has its strengths and weaknesses.[8] 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 primarily to collect cropping data rather than livestock data. It was particularly weak with regard to measuring farmers' production and sales of meat and live animals. 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.

In editing and summarizing the data, an effort was made to overcome these differences as much as possible through careful scrutiny of each farm's livestock activities.

LIVESTOCK OWNERSHIP, COMPOSITION, AND SPECIALIZATION

As would be expected, the number of livestock owned per farm varies with farm size. By assigning each type and age of animal a specific weighting factor--in this case, an adult camel equal 1.0, a buffalo of three 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 smaller than one feddan held an average of 1.26 animal units whereas farms larger than ten feddans 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, however, the picture changes markedly. Farms smaller than a feddan averaged 1.52 animal units per feddan of area, whereas farms in the next largest size category, one to three feddans, averaged only 0.72 animal units per feddan, and farms larger than ten feddans 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 ten feddan size class. 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. Eighty-nine percent of the farms surveyed reported holdings of some animals

(not including poultry), seventy-two percent reported holdings of work animals including donkeys and camels, fifty-two percent reported having cattle, one-half had buffaloes, but only twenty 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 size class can have average holdings of 0.5 cows.

Herd composition was found to vary with farm size. Small farms tended to favor buffaloes over cattle. In the smallest (less than one 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, sixteen percent of the animal units were found to be in cattle, compared to thirty-six percent in buffaloes (Table 1). In the next size class, there were slightly more cattle than buffaloes, and cattle far exceeded buffaloes in the two largest size classes. Farms of more than five 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-one-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 (eight percent compared with about four percent), but most farmers find that the buffalo produces 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 (three feddans and larger) are made up of productive female milk animals (Table 2). This is particularly true of farms in the three to five 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 three 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 three years and less. As might be expected, the work animals on smaller farms tend to be donkeys: seventy-three percent of the work animals on farms of

less than one feddan are donkeys, compared to fifty percent donkeys on farms in the over-ten-feddans category. Larger farms tend to have more work cows and oxen. Furthermore, larger farms (five feddans and greater in size) keep a much higher proportion of their total animal units in work animals; as Table 1 shows, between forty and fifty percent of their herds are made up of specialized work animals (donkeys, camels, and others), compared to only thirty-six percent for all farms.

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

On average, for all farms in the ten 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 3). It is noteworthy that some labor is hired even on the smallest farms, although family members do most of the work. Farms in the under-one-feddan category averaged 369 days of family labor, compared to twenty-five days of hired labor. Both family and hired labor rise as farm size grows, but hired labor use increases more rapidly than family labor use. Even for farms greater than ten feddans, 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-one-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 3 demonstrates. Even for the largest (over ten feddans) farms in the sample, total labor use for livestock was less than twice as much as for the average for the smallest (under one feddan) farms, whereas average crop labor on the largest farms was fourteen times as high as for the smallest farms. This is another clear indication of the vital importance of livestock production for small farmers. The data are quite consistent with the contention that on smaller farms livestock production absorbs available family labor and circumvents the land availability constraint.

The association between family labor and livestock production can be seen by noting the difference in the use of family and hired labor. On survey farms of the one to three feddan size class, for example, only two percent of the total labor used for livestock was hired, and four percent of livestock-related labor for all farms was hired. For crop production, in contrast, some thirty-five percent of total labor was hired for all farms on average, and farms smaller than one feddan averaged twenty-three percent hired labor.

The division of labor within the farm family is far different for livestock than for crop production. As Table 3 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 forty percent of the livestock production work, compared to only two percent of that for crop production. For larger farms--those bigger than five 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 declines somewhat on these larger farms. Surprisingly, children and elders play a smaller 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 3 shows that whereas hired laborers devote only five percent of their total efforts to livestock production, and farm family men devote only forty-five percent of their total efforts to such work, fully ninety-five percent of the "productive" activities of farm family women are for livestock. This disregards normal household work, of course, although such labor 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 3 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" constituted six 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 one-to-three-feddans class and less than 1.75 hours on farms larger than five feddans.

THE RELATIONSHIP BETWEEN HUMAN AND LIVESTOCK POPULATION DENSITIES

There are some reasons for expecting 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. Such reasoning is implicit in assertions that increased population density must lead to an increased supply of hired labor.

There are also reasons to expect a complementary relationship between 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 presumably 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. Such a complementary relationship between animals and humans would imply that small farmers have important alternatives to supplying their labor for hire.

Data from the Farm Management Survey indicate that, on balance, there is a positive 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 4 is based on the example of one-to-three-feddan farms from the 1977 survey, subdividing them by family size category. Farms with families larger than seven persons average 1.62 head of livestock, compared to only .99 head for farms with families of four or fewer members. The main increase in livestock holdings appears to come in native cows rather than in buffaloes.

Labor use changes dramatically 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 4: while average crop labor per farm was sixty-six percent higher (253 days versus 154 days) for families with more than seven members as compared to families with less than five 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 5, 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 four 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 thirteen or more farm units, are clearly positively 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 population are complementary. Thus, data from the Farm Management Survey clearly show 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' inconclusive results on this matter.[9]

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 implication 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 the 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[10]

What are the implications of these findings for the supply of hired labor? Clearly, the fact that so much small farm family labor is now occupied in livestock production helps to explain why hired labor markets have recently been "tighter" than would otherwise have been expected, given Egypt's continued rural population growth. It thus helps to explain why the rural wage rate has tended to rise in real terms, as several observers have documented[11] But will this trend continue into the future?

Naturally, the upward trend in the 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 sufficiently large changes are unlikely. Assuming then that the livestock population will continue to grow and that substantial amounts of farm family labor and other resources will continue to be dedicated to this end, it is vital to understand the implications 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 normally 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 summer, if it is not sold.

Table 6 shows the average annual production, home consumption and sale of milk and dairy products for farms in each size category. On average, forty-four 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 three to five feddan size category appear to specialize more in the production of liquid milk than farms of other sizes: almost seventy percent of the farms in this category reported sales or use of some liquid milk. Cheese production was important for farms of less than five feddans, but much less so on larger farms: fifty percent of the five-feddans-and-under farms reported some cheese processing, compared to only about twenty-five percent of larger farms. Ghee production was reported by almost seventy-five percent of farms in the one-feddan-and-under size category, but its importance declined sharply for successively larger farm size categories.

Table 6 shows total production, broken down into home consumption and sale, for each of the various dairy products. On average, about sixty-two percent of liquid milk and similar proportions of cheese and ghee were home consumed, whereas only thirty-four percent of cheese and ghee were home consumed, whereas only thirty-four percent of the butter was home consumed. As would be expected, home consumption is more important on smaller farms in most cases. Farms smaller than one feddan consume almost eighty percent of the cheese they produce and close to one hundred 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 of home consumption drops off rapidly for farms greater than five feddans. Cheese production per farm peaks in the one-to-three-feddans 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 five 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.

As Table 7 demonstrates, the total value of all milk and dairy production per farm is low (LE 124) for the smallest farms, it rises sharply (to LE 199) for one-to-three-feddans 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 seventy-seven 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 ten feddans) 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 7. 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 7 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 (one-feddan-and-less) class markets and the LE 37 marketed by the next (one-to-three-feddans) size category. For larger farm sizes, the value of product marketed per feddan drops off rapidly, reaching only LE 4 per feddan, on average, for farms larger than ten 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 fifteen percent of the total value of production is derived from liquid milk on the smallest farms, and the remaining eighty-five 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 only twenty-one percent is processed, on average, for the largest size category (Table 7).

Table 8 shows that the smallest farms processed eighty-four 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 eighteen percent processing. This is consistent with the relatively large amount of family labor available on the smaller units.

OTHER LIVESTOCK PRODUCTS

While milk and dairy products are very important to the Egyptian farmer, his livestock provide many other valuable products. Table 9 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 ten feddans produced an average of LE 184 in live animals per farm, just under three times as much as farms of one 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 accurate.

The total number of hours of animal work per farm also rises with farm size (Table 9). On a per feddan basis, however, the farms of one 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 on 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 forty-six hours overall average per year per farm, off-farm work represented only about five 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 one-feddan-and-under size class averaged 439 loads of manure per feddan on their own farm, compared to only thirty-nine loads per feddan on farms larger than ten feddans.

VALUE OF PRODUCTS

Table 10 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 one feddan and increases to LE 630 for farms greater than ten feddans. In Table 10, it is seen that the total value of crop production was LE 247 on farms of one feddan and less, and this increased to an average of LE 3,989 for the over-ten-feddans size category. As a proportion of total product value livestock products averaged forty-three percent for all farms. This proportion varied from sixty-three percent of the total for farms in the smallest size category to only fourteen percent for those in the largest category.

As shown in Table 10, dairy products averaged thirty-five 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 eighteen percent of total livestock product value, and this proportion increased for larger farm sizes. Animal work accounted for an average twenty-seven percent of value, and this proportion increased with farm size. The value of manure and poultry products averaged thirteen and eight 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 feedstuff are shown in Table 11. The most striking feature of the table is the relatively high proportion of feedstuffs which is purchased. Nevertheless, birsim, the most important single livestock feed, is not subject to a high degree of outside purchase. On average, some thirteen percent of birsim which is fed is purchased from outside the farm. Farms of less than one feddan are evidently more dependent on outside purchases, however, since they procure eighteen percent from off-farm. Table 12 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 one-feddan-and-under size class is quite evident from the starch equivalent and digestible protein per animal unit, as shown in Table 12. At 1308 kg. of starch equivalent, for example this class receives only about sixty-eight percent of the energy which animals were found to receive for the survey as a whole. This figure is considerably less than the two thousand 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 smaller size class appear to be quite productive. It will be recalled from Table 1 that fifteen 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.

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 13. While the cost of hired 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 13. 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 ten percent, the interest which could have been received from savings at a private bank during the time of the survey.

Table 13 shows that, on average, some sixty-two 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 birsim accounted for forty-two percent of total feed costs.

Table 14 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 (thirty-five percent) represented purchased feeds, LE 89 (sixty-two 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 (five feddans 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 15 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 received 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 15 are somewhat surprising, particularly for large farmers. They show that farms larger than ten feddans suffered net losses, on average, for the survey year. Even on a net "cash" return basis, these farms posted losses. Smaller farms appear to have higher 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 farms of one to three feddans and successively lower figures for farms in larger size categories. On a Net "Cash" Return basis, the two to three 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 15. On a per animal unit basis, the one-to-three-feddans farm size class also rates higher than other classes, although all farms smaller than five feddans appear to do well. On a per feddan basis, the smallest size class (one feddan and under) shows much higher average net returns to animal production 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 15, 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 13, 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 did quite well overall during the 1976-77 survey year. The overall rate of return on investment was eighteen percent, compared to a then prevailing bank savings account rate of ten 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 one-to-three-feddans size class again registered the best overall performance, with an average thirty-one percent rate of return to livestock investment or a LE 1.72 per day return to family labor.

CONCLUSION

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 eighty 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 provides attractive opportunities for Egypt's farmers, particularly small farmers, to augment farm incomes as well as to obtain vital human food nutrients. An estimated sixty-five percent of all equivalent animal units were found to be on farms of three feddans and less. More than three-quarters of the edible milk and dairy products are home consumed on farms on 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 follows 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 indicates the opposite. Because they are so much more productive than larger farms, the amount of livestock products which is marketed by small farms exceeds 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[12] and others feel that livestock intensification cannot normally succeed in developing countries, in the face of high human population densities 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.[13] Evidence presented here indicates that livestock production has a much greater capacity than crop production for utilizing additional family labor. This factor favors 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."[14] Clearly, government policies have held grain and other crop prices quite low relative to livestock prices.[15] 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.

Farm mechanization should also be considered. Data from the Farm Management Survey show that nearly one-half 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 undoubtedly 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 outcome will depend upon what happens to agricultural price policy, as already discussed, as well as what changes may occur in livestock production technology.

Under prevailing circumstances, many Egyptian small farmers find it more attractive to raise livestock on their own farms than to enter the hired farm labor market to work for larger farmers in crop production. Factors that favor this are the current price structure which is tilted in favor of livestock and feed crops and against production of food and fibre crops; the capacity of livestock production to utilize the labor of female family members in a socially acceptable manner; and the failure of mechanization fully to replace livestock in crop production. While the social desirability of keeping female members out of the hired labor market is not likely to change, mechanization of crop production is proceeding, and there is strong pressure on the government to alter the price structure so that the country will shift its productive mix in favor of its international comparative advantage. These latter two factors could well make livestock production less attractive than it is at present. If so, much labor which is currently engaged in livestock production could enter the hired labor market. If this happens at a time when rural laborers are also returning in large numbers from work abroad, the result could be socially disruptive.

FOOTNOTES

[1] Gerald M. Ward, "Livestock Production on Small Farms as a Contribution to Economic Development", in Biggs and Tinnermeier, eds., Small Farm Agricultural Development Problems, Fort Collins, Colo.: Colorado State University Press, 1975, p. 117.

[2] e.g., Mahmoud Abdel-Fadil, Development, Income Distribution, and Social Change in Rural Egypt: A Study in the Political Economy of Agrarian Transition, Cambridge: Cambridge University Press,1975.

[3] See the preceding chapter by Richards and Martin.

[4] Ilya Harik and Abdel-Basit Hassan, "Socio-economic Profile of Rural Egypt", Mimeo Report, USAID, Cairo, March, 1979.

[5] James Fitch and Ibrahim Soliman, "The Livestock Economy in Egypt", ADS Working Paper No. 29, Cairo, June, 1981.

[6] Alan Richards and Philip Martin, "Rural Social Structure and the Agricultural Labor Market: Sharqiyya Evidence and Policy Implications", ADS Working Paper No. 9, Cairo, May, 1981.

[7] Forest Walters, "The Livestock Enterprise on Survey Farms in Abu-Raia, Kafr el-Sheikh: Selected Implications for Water Distribution and Field Management", Staff Working Paper No. 68, Egypt Water Use and Management Project, Ministry of Irrigation, Cairo, 1981.

[8] Ahmad A. Goueli and Mohammed K. Hindi, "The Egyptian Farm Management Survey: An Approach to Understanding a Complex Agricultural System", paper presented to XVII International Conference of Agricultural Economists, Banff, Canada, September, 1979.

[9] Walters, op.cit.

[10]Fitch and Soliman, op.cit.

[11] Andrew Koval and Ahmed Bahgat, "Ten Horsepower Agriculture", Paper presented to Symposium on Appropriate Mechanization of Small Farms in Africa, Nairobi, Kenya, 1980; Alan Richards and Philip L. Martin, "Changes in Rural Real Wage Rates: A Review of the Evidence and Demand-Side Pressures", ADS Working Paper No. 8, Cairo, May, 1981; James Fitch and Sonia Aly, "Recent Trends in Agricultural Wages and Labor in Egypt: Implications for Agricultural Policy", Ministry of Agriculture, Micro-economic Study of the Egyptian Farm System, Project Research Paper No. 7, Cairo, 1982. See also the chapter by de Janvry and Subbarao in this volume.

[12] Ward, op.cit., p. 117.

[13] Fitch and Aly, op.cit.

[14] Ward, op.cit., p.120.

[15] Nabil Habashy and James Fitch, "Egypt's Agricultural Cropping Pattern: A Review of the System by which It is Managed and Its Relationship to Price Policy", Ministry of Agriculture, Micro-

economic Study of the Egyptian Farming System, Project Research Paper No. 4, 1981.

Table 1. Number and Value of Animals Per Farm and Per Feddan, By Farm Size Class

	....Farm Size....					Weighted
	0-1	1-3	3-5	5-10	>10	Average
Farms/Sample(N)	33	69	23	17	23	
Avg. Size, Feddans	.83	1.97	4.06	6.56	21.63	2.13
Tot. Animal Units/Farm	1.26	1.42	2.59	1.70	3.80	1.54
Avg. Animal Units/Fed.	1.52	0.72	0.64	0.26	0.18	0.63
% Animal Units:						
Cattle	16	30	25	33	34	24
Buffaloes	36	26	35	15	18	31
Sheep & Goats	15	5	5	2	5	9
Donkeys	19	23	17	20	16	20
Camels	12	9	8	10	5	10
Others	2	6	10	19	20	6
% All Animals Held By Farms This Size:	29.7	34.4	19.8	5.3	1.1	
Value of Livestock:		....Egyptian Pounds (LE)....				
Tot. Animal Value/Farm	433	450	846	509	1359	502
Average Value/Feddan	522	228	208	78	63	236
Weights for Avgs:						
Prop. Farms/Class	.400	.411	.130	.054	.005	
Prop. Farm Area/Class	.124	.337	.198	.158	.183	

Table 2. Age and Sex Structure of Cattle and Buffaloes, And Composition Of Work Animals, By Farm Size Class.

	....Farm Size....					Weighted
	0-1	1-3	3-5	5-10	>10	Average
Cattle/Farm (Head)	.51	.94	1.35	1.41	2.78	0.86
% Female >3 Yr	37	41	55	42	53	41
% Female 1 To 3 Yr	37	34	22	33	30	33
% female <1 Yr	17	19	10	8	8	16
% Male 1 To 3 Yr	6	6	3	0	8	5
% Male <1 Yr	4	1	10	17	1	4
Buffaloes/Farm (Head)	.74	.72	1.22	.41	1.30	0.78
% Female >3 Yr	45	53	80	71	57	54
% Female 1 To 3 Yr	35	36	17	29	33	33
% Female <1 Yr	9	8	3	0	0	8
% Male 1 To 3 Yr	3	1	0	0	3	2
% Male <1 Yr	7	1	0	0	7	4
Sheep & Goats/Farm (Head)	1.15	.45	.78	.24	1.22	0.77
Work Animal/Farm (Head)	.67	.98	1.40	1.43	2.60	0.94
% Oxen	3	0	6	13	5	3
% Cattle	0	9	6	22	30	6
% Buffaloes	0	4	6	0	2	3
% Donkeys	73	72	62	52	50	70
% Camels	24	14	16	13	8	18
% Horses	0	0	3	0	5	.4

Table 3. Labor Use for Livestock and Crop Production, Various Measures, By Farm Size Class (Part I)

	....Farm Size....					Weighted
	0-1	1-3	3-5	5-10	>10	Average
Farms in Sample(N)	33	69	23	17	23	
Average Size, Fed.	.8	2.0	4.1	6.6	21.6	2.1
Avg. Fam. Size, Persons	6.4	7.7	9.2	7.9	7.5	7.4
Persons/Feddan	7.7	3.9	2.3	1.2	0.4	5.1
Total Labor/Farm:	....Days Per Farm Per Year....					
Family Labor	369	426	589	648	1498	442
Hired Labor	24.5	98	251	426	1270	112
Total	393.5	524	840	1074	2768	554
Crops: Family	84	221	339	505	1239	202
Hired	24	94	231	410	1107	106
Total	108	315	570	915	2346	308
Lvstk: Family	285	205	250	143	259	240
Hired	.5	4	20	16	163	6
Total	286	209	270	159	422	246
Labor/Feddan:	....Days Per Feddan Per Year....					
Family Labor	445	216	145	99	69	207
Hired Labor	30	50	62	65	59	53
Total	474	266	207	164	128	260
(For Crops)	130	160	140	139	108	144
(For Lvstk)	344	106	67	24	20	115
Labor/Animal U:						
Hours/AU/Day	4.1	2.3	1.7	1.5	1.7	2.6
Days/AU/Year	246	138	104	89	105	160
Source/Crop Labor:	....Percent Of Crop Labor....					
Hired	23	30	41	45	47	35
Family: Men	53	43	39	27	32	40
Women	2	2	1	1	1	2
Child	4	5	5	7	6	5
Elders	17	21	14	20	14	18
Source/Livestock Labor:	....Percent Of Livestock Labor....					
Hired	0	2	7	10	39	2
Family: Men	46	30	37	50	37	40
Women	40	41	42	24	17	40
Child	0	1	1	1	0	0
Elders	13	27	13	16	7	18

Table 3. Labor Use for Livestock and Crop Production Various Measures, By Farm Size Class (Part II)

	.....Farm Size.....					Weighted
	0-1	1-3	3-5	5-10	>10	Average
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
Child						
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

Table 4. Effect Of Family Size On Livestock Holdings And Labor Use, Example Of Farms In The 1 To 3 Feddan Size Class

	....Family Size.... 1-4	5-7	>7	All Farms Of 1-3 Fed Size
Number Of Observ.	19	27	32	69
Tot. Animal Units/Farm	1.0	1.3	1.6	1.4
Tot. Animal Value/Farm	269	465	539	450
Tot. Cattle/Farm	0.4	0.7	1.3	0.9
Females >3 Years	0.2	0.3	0.5	0.4
Females 1-3 Years	0.1	0.3	0.6	0.4
Tot. Buffaloes/Farm	0.6	0.9	0.8	0.7
Females >3 Years	0.4	0.4	0.3	0.4
Females 1-3 Years	0.2	0.4	0.3	0.3
Tot. Sheep/Goats/Farm	0.6	0.3	0.8	0.5
Tot. Work Anim/Farm	0.7	1.2	1.0	0.9
Donkeys	0.4	0.8	0.8	0.7
Tot. Fam. Lab. Use,Days	296	464	537	470
For Crops	154	188	253	221
For Livestock	118	227	242	205
Tot. Hired Lab.Use,Days	127	88	70	98
For Crops	114	87	69	94
For Livestock	13	0	0	4

Table 5. 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
No/Observations	29	25	58	40	13	165
Avg. Fam. Size (Persons)	5.9	7.3	7.6	9.0	10.7	7.7
Avg. Farm. Size (Feddans)	5.2	2.6	2.6	5.8	20.0	5.2
Anim.Units/Farm	0.2	0.9	1.5	2.7	7.3	1.9
Densities:						
AU/Feddan	0.0	0.3	0.6	0.5	0.4	0.4
Persons/Feddan	1.13	2.8	2.9	1.6	0.5	1.5
Cattle/Fm.,Head	0.02	0.6	.9	1.8	.4.7	1.2
Buffalo/Fm.Head	0.1	0.6	0.8	1.0	3.0	0.8
Tot. Vl./An.,LE	46	342	510	805	2543	634
Milk:						
Home Cons., Kg	21	102	249	158	87	151
Sold	103	10	132	70	3215	337
Total	124	113	381	228	3302	488
Cheese:						
Home Cons., Kg	189	176	150	121	14	143
Sold	5	36	94	279	22	109
Total	194	212	244	400	36	252
Eggs:						
Home Cons., Kg	386	695	544	723	1485	656
Sold	134	480	367	187	92	278
Total	520	1024	911	910	1577	934

Table 6. Annual Dairy Production As Related To Farm Size.

	....Farm Size....					Weighted	Large
	0-1	1-3	3-5	5-10	>10	Average	Dairy
Farms in Sample(N)	33	69	22	17	23		1
Avg. Size, Fed.	0.8	2.0	4.1	6.6	21.6	2.1	3.9
Liq. Milk Prod.:							
Home Cons.,Kg	57	176	276	184	79	141	0
Sold	60	113	37	179	414	87	324000
Tot.Produced	117	289	313	363	493	228	32400
% Home Cons.	49	61	88	51	16	62	0
Cheese Prod.:							
Home Cons.,Kg	233	195	96	3	11	186	0
Sold	65	150	206	32	15	116	0
Tot.Produced	298	345	302	35	26	302	0
% Home Cons.	78	57	32	9	42	62	-
Butter Prod.:							
Home Cons.,Kg	0.4	2.1	1.7	1.1	3.4	1.9	0
Sold	2.9	3.7	8.7	1.9	4.1	3.7	0
Tot.Produced	3.3	5.8	10.4	3.0	7.5	5.6	0
% Home Cons.	12.0	36.0	16.0	37.0	45.0	34.0	-
Ghee Produced:							
Home Cons.,Kg	32.3	6.3	21.1	1.4	2.9	15.2	0
Sold	0.9	19.5	7.1	10.9	0	9.8	0
Tot.Produced	33.2	25.8	28.2	12.3	2.9	25.0	0
% Home Cons.	97.0	24.0	75.0	11.0	100.0	61.0	-
Cream Produced:							
Home Cons.,Kg	0	0	3.1	0	0	0.4	0

Table 7. Value Of Dairy Production As Related To Farm Size.

	....Farm Size....					Weighted	Large
	0-1	1-3	3-5	5-10	>10	Average	Dairy
Value of Prod. By Type:	....Egyptian Pounds (LE) Per Farm....						
Milk	18.7	42.9	39.3	51.7	80.5	33.4	6048
Cheese	58.3	66.3	62.2	7.4	6.9	59.1	0
Cream	0.00	0.0	4.8	0.0	0.0	0.6	0
Butter	4.7	9.0	12.5	3.9	8.8	7.5	0
Ghee	41.95	80.4	35.0	15.4	5.4	55.2	0
Grand Total	123.6	198.6	153.8	78.4	101.6	155.8	6048
% Total Value:	....Percent Of Total Value....						
Milk	15	22	26	66	79	21	100
Cheese	47	33	40	9	7	38	0
Cream	0	0	3	0	0	0	0
Butter	4	5	8	5	9	5	0
Ghee	34	40	23	20	5	35	0
Total	100	100	100	100	100	100	100
% Home Consumed	77	64	58	39	23	66	0
Other Measures Of Dairy Output:	....Value In Egyptian Pounds (LE)....						
Value of Sales Per Feddan	35	37	16	7	4	25	1543
Tot. Prod./Fed.	149	101	38	12	5	73	1543
Tot. Prod./Cow	199	245	141	89	46	199	356

Table 8. Estimated Processing, Home Consumption And Sale Of Milk, Liquid Equivalent Basis.

	....Farm Size....					Weighted
	0-1	1-3	3-5	5-10	>10	Average
Liquid Use Vs. Processing:						
		....Kilograms Per Farm....				
Liquid Milk (End Use)	117	289	313	363	493	228
Milk Proc., Liq. Equiv.	596	690	604	203	110	612
Tot. Prod., Liq.Equiv.	713	979	917	566	603	840
		....Percent Of Total....				
% Processed:	84	70	66	36	18	73
Home Cons. Vs., Sale:						
		....Kilograms Per Farm....				
Est. Home Cons.	542	551	488	210	143	512
Est. Sales	171	428	429	356	460	328
Tot.Liq.Equiv.	713	979	917	566	603	840
		....Percent Of Total....				
% Home Cons.	76	56	53	37	24	61
% Sold	24	44	47	63	76	39
Measure of Performance:		....Kilograms Of Milk....				
Production/Cow	997	1209	843	643	272	977
Product./Fed.	859	497	225	86	28	394
Sales/Feddan	206	217	105	54	21	154

Table 9. Quantity And Value Of Other Livestock Products: Poultry, Meat, And Manure, According To Farm Size Class.

	....Farm Size....					Weighted
	0-1	1-3	3-5	5-10	>10	Average
Farms in Sample (N)						
Avg. Farm Size (Feddans)	.8	2.0	4.1	6.6	21.6	2.1
Eggs:						
Home Cons.,No.	603	611	696	413	718	609
Sold	401	299	389	0	136	335
Tot.Prod.,No.	1004	910	1085	413	854	943
Value, LE	27.1	24.0	22.3	11.2	23.0	24.3
Poul.Prod.,LE	3.3	16.3	6.7	24.1	20.8	10.3
Live Animal, LE	62.0	78.2	120.7	116.2	184.5	79.8
Animal Work (Hours)						
Own Farm:						
Cattle,Buffalo	118	145	265	283	368	158
Other Animals	577	720	983	905	1277	710
Sub-Total	695	865	1248	1188	1645	868
Off Farm:						
Cattle,Buffalo	0	2	47	0	35	7
Other Animals	25	64	0	49	12	39
Sub-Total	25	66	47	49	47	46
Total Hours	720	931	1295	1237	1692	914
Value, LE	98.7	128.4	163.5	158.3	214.3	123.1
Manure (Loads)						
Product Used On Farm	406	585	939	536	834	558
Product Sold Off Farm	2	1	1	21	0	2
Tot. Prod.	408	586	940	557	834	560
Tot. Val.,LE	41.8	60.0	96.2	56.9	85.3	57.4

Table 11. Average Feeds Produced and Purchased Per Farm, by to Farm Size Class.

	....Farm Size....					Weighted
	0-1	1-3	3-5	5-10	>10	Average
Farms in Sample (N)	33	69	22	17	23	
Avg. Farm Size (Feddans)	.8	2.0	4.1	6.6	21.6	2.1
Tot.Anim.U/Farm	1.3	1.4	2.1	1.7	3.8	1.5
Birsim Prod./SK-Cuts						
	20.9	48.2	78.9	99.6	147.6	44.5
Purchased	4.5	6.7	13.7	5.3	30.1	6.8
Total	25.4	54.9	92.6	104.9	177.7	51.3
Percent Purchased	18	12	15	5	17	13
Concentrate Purchased, Kg.	129	168	455	412	781	206
Bran Produced, kg.	30	82	7	9	0	47
Purchased	38	99	293	100	12	99
Total	68	181	300	109	12	147
Percent Purchased	56	55	98	92	100	68
Grain + Legumes, Kg.	100	196	178	12	351	146
Purchased	61	137	311	132	560	131
Total	161	161	333	489	144	911
Percent Purchased	38	41	64	92	61	47
Straw Produced, Loads	5.7	5.7	10.4	6.8	20	6.44
Purchased	3.4	6.6	4.9	3.6	5.6	4.93
Total	9.1	12.3	15.3	10.4	25.6	11.37
Percent Purchased	37	54	32	35	22	43
Hay Produced, kg.	360	330	1000	1350	1300	489
Purchased	210	450	130	1470	700	369
Total	570	780	1130	2820	2000	858
Percent Purchased	37	58	12	52	35	43
Maize Forage Produced, S.K.	1.4	4.4	8.5	4.6	4.7	3.8
Purchased	0.5	3.5	0.1	7.7	7.7	2.1
Total	1.9	7.9	8.6	12.3	12.4	5.9
Percent Purchased	26	44	1	63	62	36
Maize Tops + Leaves, Man Loads	124	227	156	110	161	170

Table 12. Average Total Feed Inputs, Starch And Protein Equivalents, Per Animal Unit

	.....Farm Size.....					Weighted
	0-1	1-3	3-5	5-10	>10	Average
Type of Feed:	.....Kilograms Per Animal Unit.....					
Birsim	5040	9665	110077	15426	11691	8726
Concentrate Mix	102	118	218	242	206	140
Bran	54	127	144	64	3	100
Grains & Legumes	128	235	234	85	240	189
Straw	1806	2165	1830	1529	1684	1934
Hay	452	549	541	1659	526	583
Maize For (Darawa)	754	2782	2057	3618	1632	2007
Maize Tops+Leaves	984	1599	746	647	424	1156
Total Starch Equivalent, Kg	1308	2190	2119	2792	1989	1911
Portion From	.....Percent of Total.....					
Birsim	31	35	42	44	47	37
Concentrate Mix	4	3	6	5	6	4
Bran	2	3	3	1	0	2
Grains+Legumes	7	8	8	2	9	7
Straw	30	22	19	12	19	22
Hay	11	8	8	20	9	10
Maize Fodder	14	21	14	16	11	18
Tot. Digest Prot. Kg	221	407	419	610	398	358
Portion From	.....Percent of Total.....					
Birsim	50	52	58	56	65	54
Concentrate Mix	6	4	7	5	7	5
Bran	3	4	4	1	0	3
Grains+Legumes	6	6	6	1	6	5
Straw	3	2	2	1	2	2
Hay	16	11	10	22	11	13
Maize Forage	16	22	13	14	10	18

Table 13. Costs of Feedstuffs and Other Inputs, By Farmsize Class, 1979 Farm Management Survey

	....Farm Size....					All Farms	Wght
	0-1	1-3	3-5	5-10	>10	In Sample	Avg
Costs:							
Purch Inputs:	.....Egyptian Pounds (LE) Per Farm.....						
Birsim	8.0	11.8	31.7	5.3	48.7	18.5	12.7
Concen. Mix	4.0	9.9	19.3	20.0	46.9	18.2	9.5
Bran	0.5	5.7	10.3	7.5	1.4	4.8	4.3
Grains+Legumes	4.1	13.1	23.9	12.3	18.9	14.3	10.9
Straw	15.2	25.2	33.5	14.5	28.0	23.7	21.7
Hay	4.3	11.3	3.9	53.7	19.0	14.3	9.9
Maize Forage	1.7	8.1	5.3	16.5	23.2	9.4	5.7
Misc. Costs	3.8	1.3	0.4	1.5	4.2	2.2	2.2
Hired Labor	.4	2.9	14.6	11.7	119.3	20.5	4.5
Tot. Purch.	42.1	89.1	142.9	143.0	309.6	125.9	81.4
Input from Farm							
Birsim	31.9	80.5	131.5	166.0	246.5	109.8	73.1
Bran	.9	4.4	.4	.5	0	.2	2.3
Grains+Legumes	4.4	13.8	12.5	.8	24.7	12.6	9.2
Straw	24.1	24.1	44.0	28.7	84.5	35.5	27.2
Hay	9.7	8.9	0.0	36.5	35.1	18.1	9.7
Maize Forage	2.7	8.5	16.5	8.9	9.1	8.5	7.3
Maize Tops+Lvs	2.1	3.8	2.6	1.9	2.7	3.0	2.9
Tot.,Own Farm	75.9	144.0	207.4	243.3	402.6	187.7	131.6
Total Cost Of Inputs	118.0	233.3	350.3	386.3	712.2	313.6	213.0
Imputed Resource Costs:							
Family Labor	184	132	161	92	167	148	155
Livestock Investment Charge	43	45	61	51	136	63	47

Table 14. Average Costs Per Animal and Cost Distribution

	....Farm Size....					All Farms In Sample	Wght Avg
	0-1	1-3	3-5	5-10	>10		
Average Costs:	....Egyptian Pounds (LE) Per Animal Unit....						
Purch. Feeds	30.1	59.9	61.2	76.4	49.0	54.0	50.5
Oth. Pur.Input	3.3	3.0	7.2	7.8	32.5	11.9	4.5
Tot. Pur.Input	33.4	62.9	68.4	84.1	81.5	65.9	55.0
Feeds From Own Farm	60.2	101.4	99.2	143.1	105.9	98.3	88.9
Total Costs	93.6	164.3	167.6	227.2	187.4	164.2	143.9

Table 15. Aggregate Costs to Livestock Production, By Farm Size Class

	Size of Farm					All Farms	Wght
	0-1	1-3	3-5	5-10	>10	In Sample	Avg
Farms In Sample (N)	33	69	22	17	23	164	--
Avg Farm Size, Fed	.8	2.0	4.1	6.6	21.6	5.2	2.1
Returns:							
Product Sold	Egyptian Pounds (LE) Per Farm						
Milk Dairy Product	27.0	72.0	64.5	47.9	78.5	89.5	51.8
Eggs	8.5	5.9	6.9	0.0	4.0	5.0	6.8
Live Animals	62.0	78.2	120.7	116.2	184.5	97.5	79.8
Animal Work	3.6	10.3	0.9	7.8	2.6	6.0	6.2
Manure	0.3	0.1	0.1	2.1	0.0	2.2	0.3
Total Sales	101.5	166.5	193.0	174.0	269.7	200.2	144.9
Consumed or Used on Farm:							
Milk Dairy Product	96.5	126.6	89.4	30.5	23.1	90.1	104.0
Eggs	17.5	18.1	28.6	11.2	19.0	18.1	18.9
Poultry	4.3	16.3	11.6	24.1	20.8	13.3	11.3
Animal Work	95.1	118.1	162.6	150.5	211.7	130.3	117.0
Manure	41.5	59.9	97.0	54.9	85.3	62.0	57.2
Tot. On-Farm Use	254.9	339.0	389.1	271.1	359.9	313.6	308.3
Total Returns	356.4	505.5	582.1	445.1	629.6	513.9	453.2
Net Returns	238.5	272.2	231.8	58.9	-82.6	200.2	240.1
Net "Cash" Returns	59.4	77.2	50.1	31.0	-40.0	74.3	63.5
	Egyptian Pounds (LE) Per Unit						
Net Returns/Fed.	287	138	57	9	-4	38	113
Net "Cash" Ret./Fed.	72	39	12	5	-2	14	30
Net Ret./Anim. Unit	189	192	111	35	-22	105	162
Net "Cash" Ret./AU	47	54	24	18	-11	39	43
Returns To Basic Resources:							
Ret./Investment %	13	31	12	-7	-18	8	18
Ret./Family Labor (LE/Day)	1.1	1.7	1.1	0.1	-1.3	0.9	1.3