AIN SHAMS UNIVERSITY
NINTH INTERNATIONAL CONGRESS
FOR
STATISTICS, COMPUTER SCIENCE, SOCIAL
AND DEMOGRAPHIC RESEARCH
31 MARCH — 5 APRIL 1984

THE IMPACT OF GOVERNMENT POLICIES ON EFFICIENCY OF MILK PRODUCTION SYSTEMS IN EGYPT

By
Ibrahim Soliman* and Taher Abd El-Zaher**

Introduction

Domestic production of milk (4% fat) has been increasing slowly over the last decade (less than 2% a year), as can be seen in Table 1. Therefore, per capita consumption from domestic production has been decreasing. The government increased imports of milk products from 51,000 tons in 1970 to approximately 215,000 tons in 1979 (milk equivalent, 4% fat), to face the increasing deficit. Though imports of milk products have increased at an annual rate of more than 13%, total per capita consumption was almost constant. On the other hand, milk prices have increased at an annual rate of more than 12% (Table 1).

The dairy buffalo is the main milk animal in Egypt. Buffaloes provide 65 percent of total milk productions, while native cattle produce about 34 percent (Table 2 & figure 1). The share of milk produced by foreign cattle and cross bred cattle seems insignificant. Recently, there has been substantial importation of foreign dairy cattle, and there are a few large herds of these animals on state farms, commercial dairies and experiment stations. Egypt has its own breeding program for improving the dairy buffalo, based on selection from existing domestic stock. In this manner, a number of improved herds have been developed such as the one on the Sakha

* Associate professor, Dept. AG. Econ., Zagazig University.
** Graduate student, Dept. AG. Econ., Ain-Shams University.

SUMMARY

THE IMPACT OF GOVERNMENT POLICIES ON EFFECIENCY OF MILK PRODUCTION SYSTEMS IN EGYPT

By

Ibrahim Soliman* and Taher abd El-Zaher**

This analysis appears to show that Egypt is on the borderline of comparative advantage in milk production. It is easy to imagine some changes in the various production systems which might move the country into a position of true comparative advantage. To be sure, the productivity of animals on the traditional farms and buffaloes in commercial dairy herds is low by international standards. In countries with vell developed dairy herds it is common for cows to produce 4000 kg. or more of milk per year. It does not seem unrealistic to expect that yields from traditional and commercial herds in Egypt could be increased substantially. Over-feeding in Egypt appears to be quite high, among commercial dairy buffaloes. Improvement in this area could also alter the comparative advantage picture. Nevertheless, milk production from buffaloes under the traditional system appears to be the lowest cost source and is closer to international prices than any other system at present.

---

* Associate professure, Dept. AG. Econ., Zagazig Univ.
** Graduate student, Dept. Ag. Econ., Ain-Shams Univ.

Experiment station. Egypt's artificial insemination program is very weak and limited, however, and it is safe to say that the buffalo improvement program has yet to make any significant impact on the genetic makeup of Egypt's buffalo herd.

Milk is produced in Egypt under several different systems. The major system is the traditional mixed agriculture farming system (buffaloes and native cows) which is characterized by very small herd sizes-typically just one or two animals (Soliman et al., 1982). The traditional system still accounts for an estimated 82 percent of total milk production (Figure 2). The other principal production system is the commercial dairy herd. These units, known commonly as "Zaraba herds" or "flying herds", are located on the outskirts of major urban centers. They consist mainly of buffaloes. Normally, there is no breeding or production of replacement animals from within these herds themselves. Rather, lactating buffalo cows are purchased from outlying rural villages, and these animals are sold for slaughter once they have completed lactation. Recently, another transaction system has been raised. The dairy buffalo operator replaces his buffalo cow during the year, through agents, in order to keep his milk supply stable over the entire year. The culled buffalo usually returns to traditional herd again, where the breeding system is found. The share of these herds in the total domestic supply of milk is about 17 percent (Table 2). The public sector has a very minor role in domestic milk supply (less than 1 percent).

Recently, under the umbrella of the Food Security Program, several herds of foreign breeds (mainly Holstein Fresian) have been established. These are either private projects or joint ventures with public companies. One such joint venture project was surveyed as a part of the

present study.

Objectives of the Present Study:

The benefits of expanding milk production in Egypt are obvious. Not only would this reduce or eliminate the need to import and thus save scarce foreign currency, but expanded milk supplies would provide a relatively inexpensive source of animal protein, particularly for lower income families in rural areas where the need for more animal protein is critical. As a recent study by one of the authors demonstrates, Egypt's diet suffers more from lack of protein than lack of energy (Soliman and Shapouri, 1983).

While the benefits of expanded milk production are clear, there have been few, if any, attempts to examine the economics feasibility of expanded milk production. Therefore, the present study has undertaken to examine the following economic questions:

(1) Does Egypt has a comparative advantage in milk production?

(2) Which of the currently available milk production systems appears to offer the greatest economic advantages?

(3) What is the impact of current subsidy policies for livestock inputs on milk production?

Sampling and Sample Data:

A sample survey covering two systems of dairy production units described above was conducted in 1981, as a part of a doctoral research program (Abd-El-Zaher, 1982). Traditional system survey was conducted by Soliman in 1981 under ADS project program in Egypt. The essential details of the sample units are as follows:

COMMERCIAL DAIRY HERDS. To represent the so-called "Zareba herds", 20 farms were selected from Giza District, Giza Governorate. The total number of buffalo cows in the sample was 627, which constituted 15.5% of the dairy animals in the district. The sample also included 12 head of foreign cattle and 2 native cows. The herd size ranged between 13 and 70 head. Twelve of the herds contained less than 30 head, three had from 30 to 50 head, and five ranged from 51 to 70 head. Milk yield per head ranged 1000-2200 kg. per year with the average 1565 kgs. Green fodder was found to be available to these herds in summer as well as in winter.

FOREIGN BREED JOINT VENTURE. Here, one unit was sampled, a big project in Abo Gride village, Faraskour District, Domiatta Governorate. The farm has an area of 6100 feddans of reclaimed land. There are green fodder areas cultivated and also some other crops. This is a joint venture between Egypt and Holland, with an investment of about $ 500,000 dollars. The Egyptian share is some 82 percent. The Holland share is actually a long-term loan at a 6 percent interest rate. The farm was designed to support 450 cows, but with only 235 cows and 13 bulls at the time of the survey, it was operating at only 55 percent of capacity. This was taken into consideration in calculating the average costs, because the farm is still new and has not reached the full capacity yet. There is green fodder available for 10 months a year and clover hay for the remaining two months. Rice straw, which is much cheaper than wheat straw, is used as roughage. Average milk yield of 13.7 kg. per head per day extended over a 300 day lactation period. Yields ranged from 11 to 16 kg. per day.

TRADITIONAL HERDS. A sample of sixteen farms from Kafer Morien Village, Menoufia Governorate, were selected

randomly. While this village was selected because it was thought to be a "typical" village in a "typical" dairy region, there can be no pretense that it is a valid representation of traditional milk production for all of Egypt. Land holdings for the sample farms ranged from zero to 10 feddans. The buffalo and cattle holdings ranged from 1 to 3 heads per holding. The total village herd was 61 head. The survey visits were made in May 1981 covering the production year 1980-81.

Methodology and Analytical Procedures:

Using the survey data, a comparative static analysis was made of the production costs for each system. The analysis generated estimates of adjusted average costs per kilogram of milk at international equivalent prices and compared these with adjusted average costs at domestic prices. To arrive at international equivalents, adjustments were made for feed subsidies, and a shadow price was used for berseem.

Adjusted costs mean total average costs less the value of non-milk livestock outputs (animal work, calf crop for sale, net inventory change of the entire herd value and manure production). Non-milk livestock outputs per head are shown in Table 3. Calf crop is the share per dairy cow of calves (males and females) for sale, included fed calves, if any, after deduction of related costs of production. Net inventory change includes the growth value per dairy cow and net value added of replacement heifers. All calculations were made on per year basis as a share of a dairy cow. In the case of commercial buffalo herds (Zaraba), the net inventory change per year is a negative value. The replacement operation during a year of dairy buffaloes, in order to keep milk supply stable causes a loss between purchase price of a culled animal and purchase price of a new dairy one. The average loss is L.E. 125 per head per year.

The shadow price of berseem is calculated as the income foregone due to diverting land from wheat to berseem, with wheat valued at its international price, Table 4. The subsidy in feed concentrates was calculated as the difference between the local market price, Table 5, and the international price for each ingredient, Table 4. Current prices of straws, summer fodders and some other crop by-products were considered at their shadow prices.

Average Productive Performance of Dairy Systems:

The production characteristics of each of the various types of herds sampled are shown in Table 6. It is important to mention that variability in fat percent required to adjust total milk yield per head to be 4% fat corrected milk. "Jeans Equation" was used for such purpose:

$$Q' = Qo\ (0.4 + 0.15\ d)$$

where, Q' is the adjusted milk quantity (kg.) 4% fat

Qo denotes actual produced quantity of milk

d represents actual fat percent figure

The joint venture Fresian intensive system appear to be the most efficient one with respect to milk production, while traditional system seems to be the lowest efficient one. But what about costs of production on a comparable milk quality basis. It should be mentioned that the commercial milk yield per head per year required further adjustment for productive efficiency and comparative advantage measures. As mentioned earlier, the operator of a such system replaces the animals during the year to keep his production stable over the entire year (7.8 kg. per head per day as the sample average). Therefore, over the entire year the grand total adjusted milk supply per head (4% fat) is, in fact 4759.5 kg. While fat percentage for commercial herds (Frisian and Buffalo) was reported in survey data, it was taken from the references

for traditional system herds as a national herd average (Ragab, M.T., and A.A. Asker, 1969).

Costs of Production Per Head Per Year:

Feed costs per head per year at current prices are presented in Table 7, and depend upon the values in Table 5. The costs per head for the commercial buffalo herd seems to be much higher than other systems. It is, mainly, due to high maintenance requirement (fixed costs) stems from replacing animals during the year to keep the milk supply stable, as presented earlier.

Table 8 shows costs of production other than feed costs per head per year. Under the umbrella of the food security program joint venture projects obtain credit at the low interest rate of 6 percent, per year. Imputed capital opportunity costs were calculated at 12 percent interest per year (the market interest rate in 1981). The capital invested included the average annual value of the herd. As shown from Table 6, the traditional herd is not under the livestock insurance program because of very small holding size (1-2 heads). Therefore, costs of risk due to probable death of animals was imputed for traditional system only. Imputed costs for the land of the commercial system was calculated as equivalent to land rent per head per year. It did not include cultivated fodder areas because fodder values were included in feed costs. Since family labor represents most of the labor used for livestock on traditional farms and more than 50% of the work of commercial buffalo farms, imputed costs were calcuated for family labor on basis of the 1981 market wage rate for hired labor.

For commercial herds, average labor hours per head were 1.26, and 51 percent was family labor. Average costs

per hour of hired labor for commercial buffalo herds were about P.T. 31.25 in 1981.

For the traditional system, average labor hours per head were 2.47. 81.2% was family labor. In the village market average hourly costs of hired labor was P.T.21.8.

To obtain costs per 1 kg. milk, each cost item in Tables 7 and 8 was divided over 3977 kg. for Frisian, 4759.5 kg. for commercial buffaloes, 1784 kg. for traditional buffaloes and 833 kg. for native cattle. These quantities represent the estimated average annual adjusted milk (4% fat) per head.

Productive Efficiency of Various Dairy Systems in Egypt:

Table 9 summarizes costs per kilogram milk, adjusted to a 4 percent butterfat basis, for each of the systems covered in the survey. This shows that, at domestic costs, the net cost for a kilo of buffalo milk produced under the traditional system is the lowest (less than 11 piasters). It is much cheaper than the next cheapest source, fresien milk (14.25 piasters). Milk derived from native cattle is the most costly.

At international prices, Table 10, adjusted costs of production for buffalo milk produced by traditional farms is still the lowest at 15 piastres per kg. Costs of fresien milk and commercial buffalo milk now fall closer together, but they are much higher at 22.5 and 24.3 piasters per kilo, respectively. Costs of native cow milk is the highest at 38.1 piasters. It should be pointed out, however, that this milk is really a by-product of the native cow which is kept primarily as a source of meat animals (note the calf crop value).

It should mentioned that the main source of feed subsidy is different among systems. It is mainly for

concentrate feeds under foreign joint venture system. In the case of traditional farming system, the main source of subsidy is derived from the artificially low cost of berseem which results from prices for alternative crops (wheat) being kept below their international values. The equivalent international value for berseem (shadow price) was derived by valuing land costs based on the return to land if wheat received its full international trade value (Table 4).

Comparative Advantage of Egypt in Milk Production:

To determine whether or not Egypt has a comparativ advantage in milk production requires a comparison between imported equivalents, valued at true costs in international currencies, and the international-equivalent cost of domestically produced milk. Table 11 shows that milk which is reconstituted from powder purchased under concessional terms from the EEC is the cheapest at an estimated cost of 12 piasters per kilo, while milk derived from powder purchased at full international prices costs 15 piasters per kilo. This is about the same as the cheapest source of domestically produced milk, that which is derived from buffaloes on traditional farms. Even this cheapest source of domestically produced milk does not compete with the concessional terms Egypt benefits from under the EEC powder imports.

REFERENCES

Abd El-Zaher, Taher, "An Economic Study for Milk Production in Arab Republic of Egypt," Ph.D. Thesis, Faculty of Agriculture, Ein Shams University, 1982.

Ragab, T.M. & A.A. Askar, "Milk Production from Cattle and Buffaloes, Ain-Shams Univ. press, 1969 (in Arabic).

Soliman, Ibrahim, J.B. Fitch and N. Abd El-Aziz, "The Role of Livestock production on the Egyptian Farm, Research Bulletin No. 625, Faculty of Agriculture, Zagazig Univ. Sept., 1482.

Soliman, Ibrahim, and Shahla Shapouri, "Nutritional Status in Eghpt and the Impact of Change in Wheat Price Policy, "Staff Paper, ERS, USDA, draft, December, 1983.

Table 1. Milk Production, Imports and Consumption in Egypt (1970-1979)

Year	Domestic * Production (000) Tons	Imports** (000) Tons Liquid Milk Equivalents	Total Consumption (000) Tons	% Imports of Total Consumption	Per Capita Annual Consumption (kg.)			Market Price of Liquid Milk		Margin Between Retail & Whole-Sale
					Domestic Production	Imports	Total Consumption	Whole-Sale	Retail	
								(Piasters/kg)		
1970	1503	51.3	1634.3	3.1	47.0	1.5	48.5	7.0	9.1	2.1
1979	1831	214.9	2095.9	10.2	45.8	5.2	51.0	22.4	27.7	5.3
% Annual Change	1.9	15.0	2.8	13.2	0.3-	13.7	0.6	12.9	12.4	10.8

* Including buffalo, cattle and goats milk

** The weighted average of imported powder milk, condensed milk, white cheese and processed cheese in terms of liquid milk equivalent (4% fat).

Source: Calculated from:

1. (Egypt): Central Agency for Public Mobilization and Statistics: Livestock Statistics 1980. Ref. No. 17-21*21/82. February 1982

2. Monthly Bulletin for Foreign Trade of A.R.E., Several issues.

3. Statistical Year Book of A.R.E., several issues.

TABLE 2. Milk Production in Egypt in 1990, by Type of Animal and Type of Production Unit

	Milking Heads (000) H.	Average Annual Yield Kg/H.	Total Annual Milk Production Tons
Buffaloes:			
Traditional Mixed Farming Farms	951,246	1,079	919,495
State & Public Sector Farms	1,593	1,407	2,241
Commercial "Flying" Herds	232,597	1,407	327,264
Total Milking Buffalo	1,085,436	1,150	1,248,000
Native Cattle:			
Traditional Mixed Farming Farms	962,180	674	649,760
State and Public Sector Farms	248	968	240
Total Milking Native Cows	962,428	674	649,000
Foreign Breeds Cattle:			
State and Public Farms	3,396	2,626	8,919
Farm Bred Cattle:			
State and Public Farms	2,359	1,640	3,868
Total Non-Native Cattle	5,755	2,222	12,787
Grand total of Buffaloes and Cattle	2,053,619	929	1,909,787
Goats Milk	888,280	9	8,000
Total Milk Production in Egypt (Tons)			1,917,787

Source: Herd Structure and average annual yields are based on the estimated presented in CAPMAS, Livestock Statistics 1990, Ref. No. 17-21*21/92, February 1992, where both the number of milking animals and their estimated average yield depend upon the expected number of animals in each age class on milk. The number of buffalo held in commercial heads is based upon the number of dairy animals over three years which are covered by insurance. Commercial buffalo yields are assumed to match yields reported for buffaloes in state farms. The number and yield of milk goats is based on estimates of the Ministry of Agriculture, Institute of Agricultural Economic Research. This procedure parallels the process normally followed by FAO and CAPMAS in making national production estimates, except that here commercial herds and state farm herds have been separated from the national herd as a whole, and separate yields based on CAPMAS statistics for State Farms have been applied to these.

Figure 1. Domestic Milk Production in 1980, by Type of Animal.

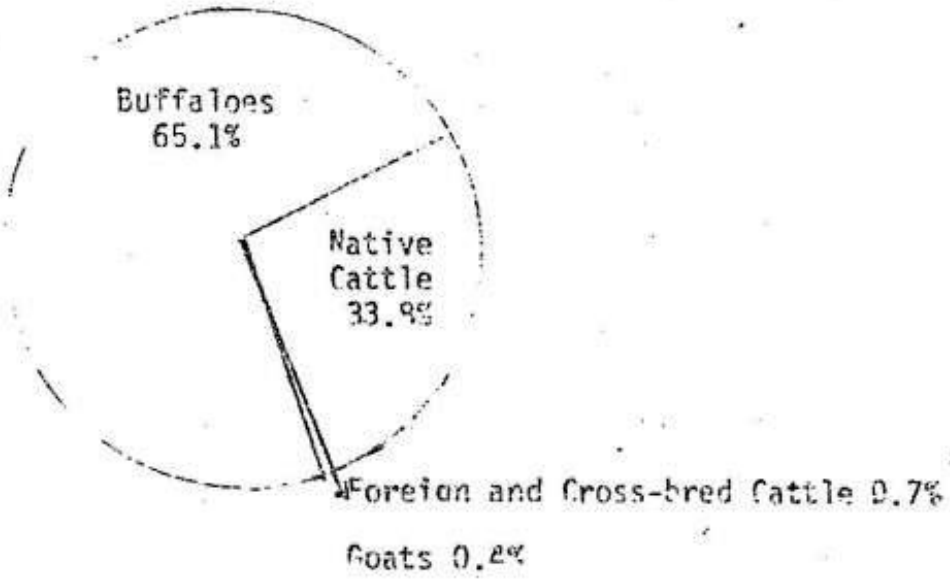

Figure 2. Domestic Milk Production in 1980, by Type of Production Unit.

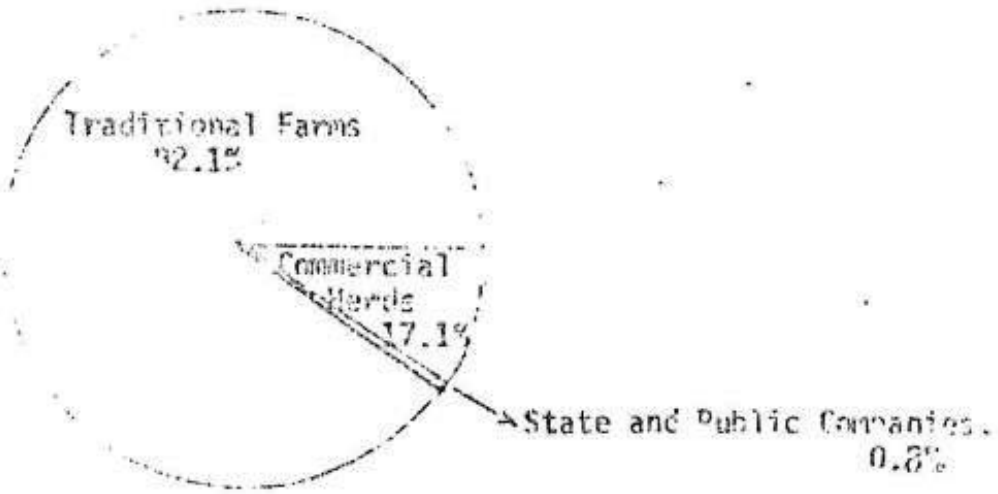

Table 3: Non-Milk Outputs per Head per Year (L.E.) For Each Milk Production System in Egypt, in 1981.

Output Item	Commercial System		Traditional System	
	Foriegn Breeds	Buffaloes	Buffaloes	Native Cattle
Calf Crop	121.18	00.0	80.49	91.60
Net Inventory change	198.30	00.0	90.85	81.25
Manure Production	18.00	7.15	12.34	7.27
Animal Work	00.0	00.0	52.32	34.18

Source: Calculated from:
The Sample surveys conducted by This study in 1981

Table 4: Shadow Price of Berseem and International Prices of Feed Concentrates at Bank Exchange rate and Shadow Exchange Rate in 1981

Feed Item	At Bank Exchange Rate	At Shadow Exchange Rate
Berseem	0.9	1.2
Concentrate Feed Mix for Milk	11.8	14.2
Concentrate Feed Mix for General Livestock Purposes	11.1	13.4
Yellow Corn	8.9	10.7
Wheat Bran	7.4	8.9
Cake Meals	13.2	15.9
Bread and Wheat Flower(1)	14.7	17.7

Source:

Soliman, I & M.A. El-Azlem: An Appraisal of Livestock Concentrate Feed Policy in Egypt, ADS Project Working Paper No. 138, March, 1983.

(1) Richard G.D., Gardener B.D., Daya A. & Rasmia M.: A Welfare Analysis of Price Policy for Wheat and Weat Products in Egypt, ADS Economics, Working Paper No. 45, November, 1981.

Table 6: The Productive Performances of Dairy Production Systems in Egypt, 1981 Sample per Head

Performance	Commercial Herds		Traditional Herds	
	Foriegn	Buffaloes	Buffaloes	Cattle
Avg. Daily Milk Yield, Kg.	13.7	7.8	6.0	5.0
Milking Days per year	300	201	200	150
Dry period (Days)	60	---	232	270
Total Milk Yield (Kg.)	4100	1565	1370	754
Average fat percent	3.8%	8.5%	7.5%	6.2
Adjusted Total Milk Yield (Kg.)	3077	2821	1784	844

Source: Our sample Surveys conducted by this study in 1981.

Table 7: Current Feed Costs per Head per Year of Different Milk Production Systems in Egypt, 1981

Cost Item (L.E.)	Friesien Farm	Commercial Buffalo Farm	Traditional Farm	
			Buffalo	Native Cattle
Berseem	22.5	59.44	87.74	84.34
Summer Fodder	50.7	43.85	9.16	8.04
Berseem Hay	14.4	00.0	10.48	13.20
Straws	13.14	156.48	53.84	59.07
Concentrate Feed-Mix	123.05	50.83	9.82	14.04
Wheat Bran	00.0	65.72	8.14	9.96
Corn	00.0	26.58	0.56	00.0
Cake Meals	00.0	9.70	00.0	00.0
Bread	00.0	16.77	00.0	00.0
Wheat Flower	00.0	3.24	00.0	00.0
Corn Germ Meal	00.0	23.97	00.0	00.0
Wheat Germ	00.0	8.33	00.0	00.0
Bean Flower	00.0	1.32	00.0	00.0
Sweet Potato	00.0	12.44	00.0	00.0
By-Products of (Beer Industry)	00.0	23.76	00.0	00.0
Bean Shell	00.0	35.60	00.0	00.0
Lentils Shell	00.0	1.32	00.0	00.0
Wheat Shell	00.0	0.83	00.0	00.0
Molasses	00.0	0.84	00.0	00.0
Total	223.82	543.27	179.74	188.65

Table 8: Current Costs of Production Other than Feed Costs per Head per Year For each Milk Production System in Egypt in 1981

Cost Item (L.E.)	Commercial System		Traditional System	
	Foriegn Breeds	Buffaloes	Buffaloes	Native Cattle
Hired Labor	145.99	36.46	10.12	10.12
Veterinary Service	18.00	2.97	1.26	2.10
Equipments & Machines Depreciation	89.10	1.56	00.0	00.0
Building Depreciation	51.85	6.57	00.0	00.0
Interst for Credits	79.86	00.0	00.0	00.0
Imputed capital opportunity costs	229.28	51.64	71.08	53.50
Costs of replacement	00.0	125.0	00.0	00.0
Imputed Costs due to death	00.0	00.0	5.8	4.5
Imputed Land Rent	0.85	4.07	00.0	00.0
Managment Costs	51.06	28.17	00.0	00.0
Imputed family labor Costs	00.0	59.47	159.59	159.59
Total	681.99	315.73	247.85	229.81

Source: Calculated from:
The sample surveys conducted by This Study in 1981.

Table 9: Average Costs of Production Per 1 Kg. of Milk (4% fat) For Each Production System Under Domestic prices in 1981 In Egypt.

Cost Item	Piasters Per Kg. Milk			
	Commercial System		Traditional System	
	Foriegn Breeds	Buffaloes	Buffaloes	Native Cattle
Feeds	5.62	11.37	10.08	22.65
Hired Labor	1.67	0.77	0.57	1.21
Veterinary Service	0.45	0.05	0.07	0.25
Depreciation	1.55	0.17	00.0	00.0
Interest for Credits (6% per year)	2.0	00.0	00.0	00.0
Imputed Capital opportunity Costs	5.75	1.08	3.98	6.42
Others	1.71	3.36	0.32	0.54
Imputed Costs for Family Labor	00.0	1.25	8.9	19.16
1) Total Average Costs	22.75	18.06	23.92	50.23
2) Less Credits for:				
Manure Production	0.45	0.15	0.69	0.87
Calves for Sale	3.05	00.0	4.51	11.00
Net Inventory change	5.00	00.0	5.09	9.75
Animal Work	00.0	00.0	2.93	4.10
3) Adjusted Average Costs at Current prices (1-2)	14.25	17.91	10.70	24.51

Source: Calculated from
Tables 5, 7 and 8.

Table 10: Adjusted Average Costs of Production Per 1 Kg. of Milk (4% fat) For Each Production System Under International Prices in 1981 in Egypt.

Cost Item	Piasters Per Kg. Milk			
	Commercial System		Traditional System	
	Foriegn Breeds	Buffaloes	Buffaloes	Native Cattle
djusted Average Costs at Current Prices	14.25	17.91	10.70	24.51
djustment for:				
Berseem Shadow Price	0.34	0.52	2.95	6.08
Conc. Feed Mix Subsidy	7.89	2.72	0.90	2.75
Wheat Bran Subsidy	000	0.85	0.28	0.74
Yellow Corn Subsidy	000	0.36	0.02	000
Cake Meals Subsidy	000	0.13	000	000
Bread & Wheat Flower Subsidy	000	0.93	000	000
djusted Costs at International Prices	22.48	23.42	14.85	34.08

Source: Calculated from:

1. Tables 4,5 and 9
2. Soliman, Ibrahim, M. Abd El-Azim "An Appraisl of livestock Concentrate feed Policy in Egypt" ADS-project (Egypt): Economic working paper, No. 138, March, 1983.