

MICROFICHE N

République Tunisienne

MINISTERE DE L'AGRICULTURE

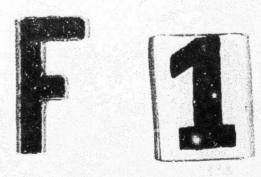
CENTRE NATIONAL DE

COCUMENTATION AGRICOLE

TUNIS

الجيم عُور بية النونس بية وزارة العنالاحة

المركزالقومحي للتوثيق الفلاحي تونسن



CNDA 01135

MINISTERE DE L'AGRICULTURE

CENTRE DE BOCUMENTATION ASRICOLE

13 DEC. 1977



A STUDY OF MILK PRODUCTION IN TUNISIA

by

Dr. BILL F. KELSO

Extension Dairy Specialist

WASHINGTON STATE UNIVERSITY

Sponsored by the

U. S. AGENCY FOR INTERNATIONAL DEVELOPMENT

in cooperation with

THE TUNISIAN OFFICE DE L'ELEVAGE ET DES PATURAGES

APRIL, 1977

Projet E evage
ARRIVEE
Le 2 MAI 1977
N: 463

A STUDY OF MILK PRODUCTION IN TUNISIA

by

Dr. Mill F. Kelso Extension Datry Specialist WASHINGTON STATE UNIVERSITY

Sponsored by the

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

in cooperation with

THE TUNISIAN OFFICE DE L'ELEVAGE ET DES PATURAGES

APRIL, 1977

TABLE OF CONTENTS

SECTION		PAGE
	ACKNOWLEDGEMENTS	3
I.	MAJOR SOURCES OF INFORMATION FOR THE REPORT	4
II.	SUMMARY OF RECOMMENDATIONS	6
III.	THE EFFICIENCY OF THE DAIRY COW AS A PRODUCER OF HUMAN FOOD	12
IV.	TUNISIAN DAIRY SITUATION	15
	a. The Government's Goal Toward Increasing Domestic Milk Production	15
	b. Current Domestic Milk Production	16
	 Cow Population and Composition Volume of Milk Production from Tunisian Cows Methods of Marketing Milk from the Farm 	16 16 17
	c. Imported Milk Products	20
	d. Characteristics of Herds Producing Market Milk	23
	 Location and Size of Herds Breeds of Cows and Their Production Level Current Practices of Herd Management 	23 25 27
	 (a) Feeding (b) Breeding Practices (c) Calf Raising (d) Housing for Cows (e) Herd Health (f) Labor and Mechanization (g) Herd Management Records 	28 30 31 34 35 37 38
	e. Physical Inputs and Services Provided to Farmers by GOT Agencies	39
	1. Commercial Concentrates 2. Artificial Insemination 3. Milk Production Records 4. Cow Replacements	39 41 45 47
	f. Extension Educational Program for Livestock Farmers	48

SECTI	<u>010</u>	PAGE
v.	RECOMMENDATIONS FOR IMPROVING DOMESTIC MILK PRODUCTION	50
	e. Nutrition Improvement	50
	1. Forages 2. Concentrates	50 51
	b. Improve the Genetic Level for Higher Milk Production	53
	c, Improved Housing for Dairy Cows	57
	d. Disease Control	57
	e. Improved Practices for Raising Heifer Calves	58
	f. Develop a Dairy Management Record Program	62
	g. Improve Opportunity for Increased Milk Sales by Small Farmers	64
VI.	INCREASING THE EFFECTIVENESS OF EXTENSION EDUCATIONAL PROGRAM FOR LAIRY FARMERS	66
VII.	GOVERNMENT OWNED AND OPERATED FARMS	69
	APPENDIX A APPENDIX B APPENDIX C APPENDIX D	

ACKNOWLEDGEMENTS

Obtaining the information for this study required the support and assistance of many individuals and the cooperation of several agencies. It is with grateful appreciation that I acknowledge their help and cooperation in this project assignment.

Special thanks are extended to the following individuals who provided guidance and support throughout the study: Dr. Carl E. Ferguson, Agricultural Development Officer, USAID; Dr. Douglas W. Butchart, Project Officer, Livestock Feed Production and Utilization, USAID; and Mr. Jabeur Ammar, Director O.E.P. Integrated Livestock Project.

Grateful appreciation is especially directed to Mr. Youssef
Ferjani and Mr. Salah Allalout for the many hours they devoted in
guiding me to appropriate sources for information and serving as
interpreters. Also, my appreciation is extended to the O.E.P.
Extension agents for their information and assistance while visitating dairy farms in their area. Assistance, whenever requested,
was generously given by Mr. Dalton J. Comeaux, Extension Livestock
Advisor, USAID and by Mr. Mustapha Guellouz, Engineer, O.E.P.
Livestock Project.

In addition, I would like to acknowledge Washington State
University for granting me a six-months sabbatical leave and consequently, the opportunity to accept this interesting assignment
of studying milk production in Tunisia.

I . MAJOR SOURCES OF INFORMATION FOR REPORT

Field observations were personally made on 62 Tunisian dairy farms between November, 1976 and April, 1977. Thirty-nine of these 23 farms were privately owned, while/were owned by the Tunisian Government. Their geographical distribution included the area from Gabes on the southern coast to Bizerte in the north and to the Jendoubs-Le Kef area near the western border. This area contains all the dairy cattle population of Tunisia.

The private operated dairies averaged 23 cows per herd, but ranged between 2 and 64 cows. Fight farms had less than 10 cows and five had between 40 en 64 head. The average herd size on the government owned farms was 54 cows; with a range of 18 to 150 head.

On each herd visit, and attempt was made to observe the general farm setting and its dairy facilities, the physical appearance of the animals and the types of feed being fed.

Questions were asked to the owner or manager regarding milk production level, feeding rates and breeding practices. In addition to these standard observations and questions, a general assessment of management expertise, interest and productivity was made.

In addition to the dairy farm observations, consultations were held with representatives of various GOT agricultural service or marketing agencies. These visits included the concentrate feed mills at Tunis and Sfax; the national Office des Céréales; the forage laboratory of the Institut National de la Recherche Agro-

nomique de Tunisie (INRAT); the government-operated milk processing plants at Tunis and Sfax (STIL); the national artificial insemination center at Sidi Thabet; the "El Louhoum" slaughter plant at Tunis; and the Controle des Performances project of the Office de l'Elevage et des Paturages (OEP).

Other noteworthy visits were made to the Chenchou irrigated alfalfa project near Gabes, the OEP "Fretissa" cross-breeding demonstration farm near Mateur and the 7,000 heifer project farm (OTD) northwest of Tunis. Acquaintances also were made with many of the OEP Extension agents as they accompanied us during the farm visits.

II. SUMMARY OF RECOMMENDATIONS

The following list of recommendations has been condensed from the body of this report. They are based on observations made by the author and his understanding of the current situation related to milk production in Tunisia. It is suggested that the reader refer to the indicated pages in this report for a fuller explanation of each recommendation.

Nutrition:

Pages

1. The nutrient level of forages must be increased. Therefore, earlier harvested forage, preserved in the form of silage, is recommended as the best means to improve forage quality.

(28, 50, 51)

2. Higher levels of concentrates should be given to cows in the early stage of lactation to increase their production.

(29, 51, 52)

3. The protein level of dairy concentrates should be increased from the present level of 11.8 percent to at least 14.0 percent and that OEP should take the necessary steps to work with the Office of Cereals in developing all future concentrate formulae to meet the nutrient needs of dairy (52, cattle on a least-cost basis.

Appendix A)

Genetic Improvement:

1. Import semen from selected A.I. sires in the U.S.

to breed approximately 6,500 Pie-Noir heifers being reared

on the OTD farm north of Tunis, the 900 Pie-Noir cows at the

Tebourba OTD farm, and the swiss cows at the OEP Jendouba

and Fretissa farms. Selected male offspring from these (53, 54)

matings to be placed in natural service.

- 2. Scan the official lactation certificates in the Control
 Performance Office files and select 20 of the highest producing
 cows of the Pie-Noir and Swiss breeds for special mating to
 highly selected A.I. sires from the U.S. The best three male
 offspring from these unions to be placed in the Sidi Thabet
 A.I. center annually for a maximum service of three years. (55, 56)
- 3. A committee of Tunisians be sent to the U.S. to study

 (54, 55,
 their A.I. programs of genetic improvement.

 Appendix B)
- 4. Discontinue the use of Tarentaise bulls in commercial milking herds on the basis of their low genetic level for milk production. This recommendation is directed to government sponsored A.I. and natural service programs. (26, 27, 31, 56)
- 5. Rescind the government policy prohibiting the slaughter of females under 8 years of age so genetically inferior cows can be culled. This move would also allow more efficient use of feed supplies. (53, 56)

Housing of Dairy Cows:

1. The concept of "free-stall" housing be actively promoted when assistance is given to farmers in planning new dairy barns or modifying existing structures for herd (34, 35, 57 expansion.

Disease Control:

1. Continue calfhood vaccinations for Brucellosis and
Tuberculosis in purebred and crossbred cows. When their
numbers have increased to a sufficient level, the slaughter
of infected animals should be imposed starting with cows (35, 36,
of the local breed.

- 2. Impose health regulations on nomadic cattle to reduce spread of diseases and internal parasites from farm to farm. (37, 58)

 Calf Raising:
- 1. Educational programs should promote the practice of disinfecting the umbilical cord of newborn calves. (32, 59)
- 2. Calves should be encouraged to eat concentrates by
 the second week of age so they can be weaned from milk at six
 to eight weeks instead of the customary three to four months
 of age. This would divert more milk for human consumption. (59, 60)
- 3. Inasmuch as powdered milk can be purchased and reconstituted for less than half the price of whole milk, greater use of powdered milk for feeding calves should be promoted. (33, 60)
- 4. The feeding of concentrates until heifers are at least 8 to 10 months of age should be encouraged as a means to (32, 33, compensate for the low level of nutrients in the forages. 60, 61)
- 5. Calf housing facilities should be provided separate
 from the cow barn to improve the sanitation, fresh air and
 light conditions. (32, 61)
- 6. Educational programs need to help farmers recognize
 lice infestation and recommend appropriate insecticides for
 treatment. (33, 61, 62)
- 7. Dehorning dairy heifers at one to three weeks of age,
 with the use of caustic potash, should be promoted to farmers
 as a regular practice. (33, 34, 62)

(63)

Dairy Records:

- 1. The OEP Control Performance record program should be expanded to include herd summary records that can be used by (38, 39, farmers to make herd management decisions.

 46, 63)
- 2. A simplified set of farm enterprise records, which contain both physical and financial data, should be developed for farm use in planning and managing farm enterprises.

 (62, 63)
- 3. An advisory committee, which includes some innovative farmers and farm managers, should be selected to give assistance and guidance in the development of the above two record projects.
- 4. A representative of the control performance record project should be sent to the U.S. on a brief tour to study the computerized dairy herd record system in operation there.

 His mission would be to look for ideas that could be applied to herd records for Tunisian farmers. (46, 63)

Marketing Milk:

1. OEP should initiate a milk collection system that would give more farmers an opportunity to market larger quantities of milk. This project should provide incentives for increased milk production such as arrangements for extra cows, loan credit and educational information on improving production practices. The milk would be transported to STIL for processing. The long-term goal would be for participating farmers to increase their production to a level which would eventually warrant them assuming the transportation costs.

(17, 18, 64, 65)

Pages

2. An in-depth study should be conducted to work out the details of how a milk collection system can be operated most effectively and efficiently. (65)

Extension Educational Program For Dairy Farmers:

- 1. The OEP dairy educational program should be pulled together and placed under the leadership of a person broadly trained in dairy production technology. He should have three specialized assistants: one to be responsible for Genetic

 Improvement and Reproduction; one to be in charge of Dairy (48, 49, 66, 68, Records; and one responsible for Feeding and Management. Appendix D)
- 2. A reasonable number of extension agents should be designated as dairy production agents and given primary responsibility for working with dairy farmers. This would permit the development of greater expertise at the agent level and enhance their effectiveness in working with dairy farmers. (68)
- 3. More emphasis should be given to an in-service training program for agents not only to develop greater knowledge in their subject matter specialty but to become more familiar with extension teaching methods. Their effectiveness in getting farmers to adopt better practices hinges on their ability to use the right methods of disseminating information. (49, 66, 68) Government-Owned and Operated Farms:
- 1. On some OTD farms, the management void between the decision-makers and those who work with the cows is serious.

 The decision-makers are not close enough to the problems to identify their cause, while the farm workers are not in a position to make the needed changes. Therefore, the productivity (69, 70)

from the dairy herd is extremely low. To alleviate this problem, management decisions must be made at the farm level by trained and experienced herd managers.

(69, 70)

2. It is recommended that a group of OTD personnel, those with responsibilities for dairy herd management, be encouraged to tour high producing dairy farms in the western region of the U.S. It is believed by the author that such a tour would be a valuable experience in herd management technology and give them an incentive to strive for higher production upon their return.

(70)

3. Government-operated farms should be strongly encouraged to adopt those practices which are already known to be feasible in Tunisia. They could then be used more extensively as educational units to demonstrate such practices to the private farmers.

III. THE EFFICIENCY OF THE DAIRY COW AS A PRODUCER OF HUMAN FOOD

The dairy cow is a major contributor to the world food supply. Her relatively high efficiency of feed utilization compared to other farm animals and her ability as a ruminant to utilize feed supplies that are not suitable for human consumption enhance her stature as a producer of large quantities of high quality protein.

Table 1 shows the relative efficiencies of the various classes of farm animals in converting feed to human food producta:

TABLE 1 - The relative percentages of feed nutrients converted by animal species to edible products

Animal Product						Product Output as % of feed intake
: . W::::-	:		:		:	
: Milk	:	20 :	:	. 30	:	90
: Chicken meat	:	10	:	25	:	45
: _	:		:		:	
: Eggs	:	15	:	20	:	33
: Pork	:	15	:	20	•	30
:	:		:		:	
: Beef	:	8	•	15	•	10
: Lamb	•	6	:	10	:	7
:	:		:		:	

Reference: Report of 6th FAO International American Conference on Animal Production and Health.

These data indicate, among farm animals, the most efficient way to convert feed nutrients into edible energy and protein is through milk production. Moreover, the protein returned in milk is much more biologically complete (higher nutritional value) than the original feed consumed.

In addition to eating many grain by-products, a major part of the dairy cow ration comes from pasture and harvested forages. These crops are noted for their high yield per hectare. Table 2 shows the average Tunisian yield of protein per hectare of oatvetch silage compared to durum wheat, which is the major cereal crop grown in Tunisia and preferred for making couscous and bread.

TABLE 2 - The Relative Yield of Protein from Oat-Vetch
Silage Compared to Wheat

: Crop	: Yield per : Hectare : (kgs)	Dry Matter per Hectare (kgs)	:	Protein %	Protein p Hectare (kgs)	er:
: :Oat-Vetch Silage	23,000	5,750	:	1 2	690	:
:Durum Wheat	1,100	1 ,1 00	:	13	143	:

Reference: Silage Yield data from FAO/SIDA - Dec. 1967, Wheat Yield from Tunisian Agriculture "A Statistical Brief" USAID Tunis, Jan. 1977.

Using the 30% protein conversion factor shown in Table 1, the dairy cow can convert the 690 kg of oat-vetch protein (Table 2) into 270 kg of milk protein. This is almost twice the quantity of food protein obtained from a hectare of wheat and is 2.6 times as much as would be produced if the oat-vetch silage was used for bull fattening. Thus, as the total need for food increases, more attention needs to be directed to those systems of crop and animal production that will yield the greatest amount of high quality food nutrients. For the most efficient utilization of resources for food

production, the author questions the advisability of some programs which give preferential land to cereal production and preferential feeds to poultry and for bull fattening over that for milk production.

IV. TUNISIAN DAIRY SITUATION

a. The Government's Goal Toward Increasing Domestic Milk Production

The Tunisian Ministry of Agriculture has been actively involved in developing a Five-Year Plan for increasing agricultural production. The plan calls for increasing the annual production 363,850 tons of milk from the present level of 247,800 tons to/by 1981. It is estimated this level will meet 78 percent of the domestic needs in 1981. Importation of 101,000 tons would still be required to meet consumption needs.

The primary methods indicated for increasing milk production are by increasing the number of cows from 410,600 in 1976 to 474,000 in 1981 plus increasing the average net production of local and crossbred cows from the present annual level per cow of 380 kg to 430 kg in 1981.

Table 3 gives the detailed statistics which were extracted from the Five-Year Plan.

TABLE 3 - Five-Year Plan for Increasing Milk Production in Tunisia

1976			
1970	:	1981	:
	:		:•
27,600	:	63,400	:
383,000	:	410,600	:
			:
2,150	9	2,150	:
380	:	430	:
204,880	:	312,868	:
42,920		50,982	:
247,800	:	363,850	:
- Company of the second	2,150 380 204,880 42,920 247,800	383,000 2,150 380 204,880 42,920 247,800	383,000 410,600 2,150 2,150 380 430 204,880 312,868 42,920 50,982

Major emphasis and support will be given to government programs that relate to milk production. These include artificial insemination, purebred bulls for natural service, control performance records, importation of purebred heifers, and increased forage production.

b. Current Domestic Milk Production

1. Cow population and composition

The 1976 cow population in Tunisia is estimated to be 410,600 head. Of this number, only 27,600 are purebred. Approximately 80 - 90 thousand are crossbred and the remaining approximate 300,000 are of locale nondescript breeds unsuitable for commercial milk production.

Based on ratios of purebreds enrolled in the control performance record system, approximately 80 percent of the purebred cows are of the Pie Noir race; a black and white cow of European origin imported mostly from Holland and France. Approximately 13 percent are composed of Drown Swiss imported primarily from Switzerland and Austria. The remaining fraction of seven percent consists of red cows of the Tarentaise breed imported from France. Even though the Tarentaise cows are a distinct minority, the Tarentaise bulls are being used quite heavily in cross-breading on local cows.

2. Volume of Milk Production from Tunisian Cows

It is difficult to accurately estimate the annual volume of milk produced in Tunisia because of the many unregulated market channels. Most of the marketed milk is picked up at the farm

and distributed directly house-to-house by private retailers. It is estimated that approximately five percent of the bovine milk produced in Tunisia is processed and marketed by the government owned "STT." milk plants located at Tunis and Sfax. Thus, the 1976 government estimate of 204,880 tons of bovine milk produced in Tunisia is based on the estimated number of cows multiplied by appropriate production levels derived from control performance records. The government also estimates nearly 43,000 tons of milk produced by sheep and goats.

3. Methods of Marketing Milk from the Farm

Most of the domestic milk supply is sold to the consumer in the form of fresh unpasteurized fluid milk. Very little is converted into other products such as cream, butter or cheese. Private distributors, who pick up the milk at the farms and retail it directly from house to house, provide the typical means of selling milk. The milk is transported in 25 liter cans by motorized carts or pick-ups and dispensed by dipper into the housewives' containers. The price received by farmers is often determined by their individual bargaining ability with the distributor. This generally ranges from 70 to 100 millimes per liter and varies according to seasonal demand. The distributor retails the milk to consumers at a price ranging from 120 to 140 millimes per liter.

In some areas, farmers have formed small-scale marketing associations to plok up and distribute their milk. Also, some farmers who have available labor, transportation, and sufficient volume of milk have developed their own retail delivery routes.

April 18 Miller Trees

In both of these cases, the middle man's profits are eliminated and the farmer is more directly responsible to the consumers'.

need for both quantity and quality of milk.

Approximately 350 farmers in the northern gouvernorats market their milk to the government operated STIL processing ? plant in Tunis. Milk produced in the immediate area is brought directly to the plant. Two milk collection stations, located at Beja and Jedeida, serve the farmers in those areas. The average deily volume of milk sold per farm to the Tunis plant in January, 1977 was 43 liters. Another STIL processing plant located at Sfax serves approximately 50 farmers in that area.

The STR plants blend the fresh milk with reconstituted imported milk powder and wholesale the finished products to major retail outlets throughout Tunisia. Approximately 10 percent of the blended milk input at the STR plants is produced by Tunisian farmers. The price paid to farmers for this milk is 90 millimes per liter with a butterfat differential of 1.5 millimes per 1/10 point for milk testing over 4.0% or less than 3.4%. Thus, herd milk testing 4.2% would be priced at 93 millimes per liter while a test of 3.2% would bring 87 millimes per liter. A deduction for transportation and service of 8 millimes per liter and tax of 2.7 millimes per liter was noted in the collection station area of Beja. This brought the net price received down to 79.3 millimes per liter.

For several years prior to January 1976, the price for milk paid by STIL was 65 millimes per liter. This low price had a depressing effect on dairy expansion. In 12 months following the

price increase to 90 millimes, an additional 100 farmers were selling their milk to the Tunis STTL plant.

A significant percent of the milk produced in Tunisia does not move into commercial market channels; a high portion is consumed by the calves and by the families of the farm workers.

The traditional practice of feeding milk to calves until three or more months of age drastically reduces the amount of milk available for human consumption. As an example, feeding an average of 5 liters of milk per day for 90 days requires 450 liters. Mr. Dhia of the INRAT livestock research section estimates 500 liters of milk needed per calf. The O.E.P. farm near Jendouba feeds 700 liters of milk equivalent before weaning at 16 weeks of age.

If we use a conservative estimate of 300 liters per calf and an 80 percent calf crop, 98,544 tons of milk are consumed annually by calves. This is 48 percent as much bovine milk as is domestically produced for human consumption (204,880 tons). This is considerably higher than the two percent allocation for calves in the U.S. where milk production per cow is higher and calves are weaned at four to six weeks of age.

A significant, but unknown, quantity of milk is consumed by the farm workers. As an example noted by the author, 15 percent of the milk from one UCP farm was sold to the cooperators working on the farm. This is not mentioned as a criticism but to indicate a significant portion of the domestic production does not flow through commercial market channels.

c. Imported Milk Products

Approximately 40 percent of the dairy products consumed in Tunisia are imported from Europe. In 1975, the last complete year with data available, the cost of these imports was 8,620,000 Tunisian Dinars (approximately 20 million U.S. dollars).

Table 4 shows the amounts and trends of imported dairy products since 1970.

TABLE 4 - Imported Milk Products (Metric Tons)

Year	1970	1971	1972	1973	1974	1975	1976*
Milk Powder.	5,684	5,388	5,173	5,804	7,090	7,196	9,049
Concentrated Milk	3,005	4,745	5,279	5,339	6,031	4,075	4,960
Dutter	1,829	1,859	1,894	1,730	1,865	3,753	2,900
Cheese	1,697	1,958	1,058	1,253	2,750	1,966	2,714

^{*} Data for 1976 covers 11 month period.

Reference: Bureau of Plans, Economic Analyses, and Project Evaluation (D/PAEEP).

The 9,049 tons of milk powder for 11 months of 1976, shown in Table 4, are equivalent to approximately 78,000 tons whole milk; while 4,960 tons of concentrated milk are equal to 10,500 tons of whole milk. This combined whole milk equivalent of 88,500 tons plus the 204,880 tons of domestic milk provide 52 kg or 114 lb. of bovine fluid milk equivalent per capits for 1976. Chesse and butter consumption would be additional.

All milk powder imported for human consumption, with the exception of that used for ice cream, is reconstituted and processed by the two government operated STIL milk plants at Tunis and Sfax. It is reconstituted and blended with approximately 10 percent domestic fresh milk and then processed into the following dairy products:

- 1. Liquid homogenized milk containing 2.5% fat
 - (a) Sterilized and packaged in liter plastic bottles
 - (b) Pasteurized 80 C and packaged in 1/2 liter blue triangle papernearton
 - (c) Pasteurized 135 C and packaged in 1/2 liter red triangle paper carton
- 2. Butter milk packaged in green triangle paper carton
- 3. Yoghourt-natural and an assortment of flavors
- 4. "Camembert" and "Gervais" soft cheeses.

According to information obtained from a representative of STIL, the current price paid per ton for powdered milk delivered in Tunis varies between 700 and 800 dollars (302 and 345 dinars). If such powder is reconstituted to 11.5% total solids (9% FLM and 2.5% fat), each kg powder would make 6.7 kg of final product. Thus, if we use a price of 324 millimes per kg of milk powder, the ingredient cost for reconstituted milk would be 37 millimes (or 8 1/2 U.S. cents) per liter. In terms of common language in the United States, this would be equal to a price of 3.86 dollars per cwt. No dairymen in the world can produce milk this cheap today; not even the European farmers

where the milk powder originated. The reason for such a low price is attributed to the European common market's farm policy of subsidizing purchases from farmers to enhance their income plus another subsidy added to the export of surplus products.

Several interesting questions may be posed regarding Tunisia's policy of increasing domestic milk production in view of the low cost of imported dairy products. One might also reflect on the difference in cost to STIL for the milk it purchases from Tunisian farmers (90 millimes/liter) versus the ingredient cost of imported reconstituted milk (37 millimes/ liter). STIL is a separate government agency not under direct obligation to the Ministry of Agriculture, Another question refers to the wide margin between the average purchase cost to STIL of 43 millimes/liter of blended milk and the consumer cost of 100 millimes/liter for milk in the blue carton and 138 millimes/liter for milk in the red carton. On the other hand, if the consumer cost/liter was lowered to reflect STIL's true cost of manufacturing and retailing, what would happen to the price of milk marketed through other channels and, consequently, to the milk price paid to Tunisian farmers?

The author feels the government's agricultural policy
which favors increasing the domestic production of milk and
STIL's policy of supporting current milk prices to farmers
will be to the long-term benefit and security of Tunisian
consumers. This feeling is based on the uncertainty of continued

low-cost milk powder and butter being available. Recent publicity on Western European farm and export subsidies of milk products has begun to reach the taxpayers in those countries. Butter exports were labeled at 40 cents per pound while taxpaying consumers were paying as much as \$ 1.70 per pound in their local supermarkets. Consequently, subsidized butter sales to Eastern European countries is already being banned and reviews of farm subsidies have commenced.

d. Characteritics of Herds Producing Market Milk

1. Location and size of herds

The largest concentration of milk cows in Tunisia is near the larger cities in the northern gouvernorats where rainfall will normally support adequate growth of forages. Table 5 shows the number of cows identified and recorded in the national herdbook on December 31, 1975 for various gouvernorats in the northern half of Tunisia. Sixty-five percent of the recorded cows were European purebreds and the remaining 35 percent were crossbreeds. Local cows are not included as they do not produce beyond the needs of their calf.

TARLE 5 - Geographical Distribution of Cows Registered in The National Herd-Book 31-12-75

Gouvernorat	: Cows Recorded in Herd-Book
Bizerte	4,879
Beja	3,573
Tunis	3,455
Jendouba	2,587
Le Kef	1,020
Nabeul	884
Sousse	437
Others	: 462
Total	17,297

Reference: 1975 Annual Report of Control Performance

These identified and recorded cows do not represent all milk producing cows in each northern gouvernorat but may give a fair indication of their relative distribution. Larsen estimated 98 percent of all purebred and crossbred cows and bred heifers were located in the five* northern gouvernorats in 1974. The author believes this figure may be closer to 90 percent today. Future livestock surveys may be designed to include data on farms selling milk. Such information would be helpful in planning future service programs.

^{*} The area designated as five northern governorats in 1974 has since been changed to seven governorats.

There is no typical herd size which reflects all farms selling milk. There are a large number of 3 to 10 cow herds operating within the northern and coastal city suburbs, while 20 to 60 cow herds are more common in the countryside of the northern gouvernorats. Only three of the 62 selected dairy farms visited by the author were milking more than 100 cows.

The average herd size on 137 farms participating in the control performance record program in 1975 was 31 cows. Smaller herds appear to be common in the southern coastal area of Sfax (13 cows) and Gabes (14 cows).

It is difficult to relate herd size to quantity of milk sold because of the variable amount consumed on the farm. Even so, it is interesting to note the average daily amount of milk sold to the Tunis STIL milk plant in January, 1976 was 47 liters per farm. This average was based on 260 farms. In January, 1977, a similar average of 43 liters per day was based on 349 farms.

2. Breeds of Cows and their Production Level

There are three European breeds of cows used for milk production in Tunisia; the Pie Noir, Swiss, and Tarentaise. Their estimated number is 27,600 head. Also, there is a small number of large red and white cows that belong to the Montbeliarde breed of French origin.

Bulls of the three major breeds are used in cross breeding programs with local cows. There are between 80 and 90 thousand resulting cross breds of which many are of the F2 and F3 generations.

Cows of the local breed are a composite of many generations of nomadic native animals that appear in poor condition even when

the roadside grass is up to their knees. Many do not produce enough milk to properly nourish their own caives and will not respond to hand or machine milking unless first stimulated by the caaf. There are approximately 300,000 local cows in Tunisia. The following table, based on control performance records, gives a relative comparison of milk yield from the three European breeds.

TAULE 6 - Breed Comparison of Milk Yield in Tunisia

: Breed :		: Milk : (kg):	Days Milked	: Kg Milk : per day		
Pie Noir	1297	3,018:	278	: 10.8	8.3	:
Swiss	630	2,565:	273	9.4	7.0	:
:Tarentaise:	188	2,109:	260	8.1	5.8	:

Reference: Summary of Control Performance Records - 1977

Crossbreeding research work at the OEP "Fretisse" farm

gives a vithiu herd comparison of milk yield. The results are shown on the next page.

TABLE 7 - Breed Comparison of Milk Yield in 2nd Lactation at OEP Fretissa Farm

: Breed:	:	No. Cows	:	Milk Yield (Kg)	:	No. days in lactation	:
Local	:	165	:	138	:	33	:
:Pie Noir	:	25	2	3,531	:	297	:
: :Swiss	:	8	:	1,547	:	232	:
: Tarentaise	:	17	:	1,212	:	165	:
: :F ₁ PN X L	:	8	:	2,122	:	308	:
: :F ₁ S X L	:	17	:	1,320	:	188	:
: :F ₁ T X L	:	12	:	666	:	118	:
:	:		:		:		:

These results point out the tremendous gains that may be possible through upgrading the 300,000 local cattle by crossbreeding; especially, when they are crossed with the Pie Noir breed. Even if they were not commercially milked, the autrition of their calves would be grossly improved and beef production could be enhanced markedly.

3. Current Practices of Herd Management

The following situation description is based on personal observations and assessments made during visits to 62 widely distributed farms as described in section I. No single farm fits completely into all categories. It was only when repeated situations or practices were observed that patterns formed and the following picture emerged.

(a) Feeding - Ost-vetch hay and plain ost hay are the basic forages fed to milk cows on almost all farms throughout Tunisia. During the winter months, the hay is supplemented with limited amounts of green-cut barley, oats, or bersim clover in the north and green-out alfalfa in the SFEx - Gabes irrigated areas. Grazing on native grasses is a common practice for small herds that can be easily tended. A small percent of the larger farms feed a limited amount of cereal-grass silage to the milk cows, but a more liberal amount to their fattening bulls.

All hay observed by the author was of exceptionally poor quality because it had been harvested at full maturity. Also, much of it had been rained on while curing in the field. The traditional harvesting practice is to wait until late April or May when the spring rains have normally subsided. Also, the shortage of harvesting equipment causes further delays on some farms. Consequently, the vetch and oats have gone to full seed at time of harvest. It is common to see full stands of volunteer oat-vetch pasture in these fields following the fall rains.

Most of the supplemental green chop forages is cut by hand labor. Because of the physical effort involved, and the fact that fresh-cut forages are only 25 percent dry matter, there is a tendency for the laborers to underestimate the quantity actually needed to supplement the poor quality hay. The author never observed the practice of feeding forage at a level of maximum voluntary intake on any farms where the cows were confined to stables. Thus, the cows' potential for maximum utilization of forages for low-cost milk production is not being attained.

Almost all of the 62 farms visited were feeding some concentrates to their milking cows. The average daily level was approximately 4 kg per cow with most farms varying the amount to each cow in accordance to her milk yield. The observed predominance of herds feeding concentrates is in contrast with Larsen's report of 1974 which indicated only 10 percent of all operators and only half of the larger farms and 2 percent of the small operators fed concentrates to their cattle. There has been a marked increase in the availability of concentrates in recent years. According to the Office of Cereals, 13,934 tons of No. 7 dairy concentrate was sold in 1975 and 19,209 tons in 1976. Many of the larger farms extend the No. 7 dairy mix by adding additional wheat bran. A few others, which have grinding and mixing equipment, formulate their own concentrate from barley, broad beans and bran. Many of the farms some the concentrates prior to feeding.

The highest levels of concentrate feeding were observed on farms at Gabes where the average daily level was approximately 10 kg per cow. In spite of the hot temperature in that area, the average daily milk yield on six farms visited was 16 liters per cow.

In conclusion, the ration consumed by most milking cows in Tunisia is inadequate to support high milk yaelds and is a major limiting factor to the efficient utilization of the total dairy resources.

(b). Breeding Practices - At least 93 percent of the cattle in Tunisia are bred by natural service; based on 29,244 first services recorded for artificial insemination in 1976. The Five Year Plan for A.I. calls for the number of first services to be increased to 70,000 by 1981.

Artificial Insemination services are offered free to cattlemen by the government OEP project. For small herds, breeding dates for each cow are recorded and maintained by the local inseminator. Return visits are scheduled according to when the cows, it not conceived, would be expected to recycle. On larger herds, more than 20 cows, the inseminator visits on a more regular basis. Even so, most of the farms using A.I., that were visited by the author, were displeased with the irregularity of the inseminator or with their conception rate. Most of the larger herds using A.I. maintain one or more "clean-up" bulls. One UCP farm with 19 cows had used its "clean-up" bull on first service of 14 cows because "the inseminator is seldom here when the cows are in heat". Another UCP farm with 26 cows claimed 88 percent of their calves were sired by the "clean-up" bull. Two other larger herd managers, visited by the author, were well pleased with their A.I. results.

The government O.E.P. sponsors another project of leasing purebred bulls to farmers whose location is not easily serviced by A.I. The primary objective of this project is to help those farmers with purebred cattle maintain their purity without inbreeding.

In general, most farmers are having difficulty getting their heifers and cows pregnent on a desired schedule. The following

Table 8 was extracted from control performance record summaries:

TABLE 8 - Age at Calving

Breed	:	lst Lactation (months)	:	3rd Lactation (months)	:	Average Calving Interval (months)	
Pie No\r	:	29.3		60.9	:	15.8	
Swiss	:	32.8		59.7		13.5	
Tarentaise	:	35.5	:	-	:		
Optimum Age*	:	26	:	50	:	12	

^{*} Opinion of author based on other dairy research.

The delayed age at first calving and the excessive calving interval may be caused by many different factors. Those believed by the author to be of a primary nature are: difficulty of workers being able to detect heat because cattle are restrained in barn most of the time; nutritional deficiency, especially vitamin A, which suppresses normal cycling; premature abortions caused by reproductive diseases such as Brucellosis; and delays of the inseminator in getting to the farm.

(c) <u>Calf Raising</u> - Almost all herd owners keep and raise their heifer calves to meet their cow replacement needs (the only noted exception was in the Gabes area). Inasmuch as there is a government policy prohibiting the slaughter of females under eight years old, cow replacement needs are less than normal. Therefore, the herd either gets larger or the surplus heifer are sold to other farms.

Many farmers also keep their bull onlyes for later fattening as an

additional source of income.

As a general observation, those farms with higher producing, better managed cows also have the larger, thriftier heifers.

Thus, expertise in management is important to successful heifer raising. Several problems on heifer raising were noted which deserve attention in future educational programs. These problems may be described as follows.

- 1. The navel cord of newborn calves is not being disinfected as a general practice. Thus disease organisms easily invade the calf's circulatory system before it has had a chance to develop any immunity. This problem is easily recognized by a lack of thrift, illness or death during the first week of age or by prolonged stiffness and swollen leg joints.
- 2. The calves are often housed in group pens located in the dark interior of the cow barn. This kind of housing is undoubtedly selected because the farmer believes the calves must be kept warm during the winter. However, there is a noted lack of fresh.dir; no sunlight; cleaning is difficult, especially, when the pens are overcrowded; and the calves suck each other after each feeding of milk. Sucking can facilitate the spread of disease and interfers with the normal development of the mammary glands.
- 3. Very few farmers feed adequate amounts of concentrates to their calves. From birth to three or four months of age, when the digestive capacity of the rumen is limited, many calves receive only milk and high fiber hay. Very little or no concentrates are

provided. These calves have a stunted, pot-bellied appearance.

After they reach 8 to 10 months of age and their rumen capacity is more developed, their appearance and growth improves. Therefore, it is the three to eight month old calves that have the greatest nutritional deficiency on most farms.

4. External parasites were noted on many heifers, especially those continously kept tied in barns. Evidence of these parasites was easily noted by the licked appearance of the hair coats. When close inspection verified such infestations, the farmer often appeared surprised and unaware of the problem. Blcod-sucking parasites are an irritation and deprive the heifers of much needed nutrients for growth.

Three other items should be mentioned, as they relate to calf raising but will be dealt with in greater detail in the section on recommendations.

- 5. The protein level of the commercial concentrate currently recommended for calves contains only 10.5 percent protein. The level should be around 18 percent.
- 6. Inasmuch as the farmers' selling price of whole milk is about 90 millimes per liter and the cost of reconstituted milk powder is 40 millimes per liter, this price differential favors the feeding of reconstituted milk to more calves and selling the whole milk for human consumption.
- 7. Probably 99 percent of all Tunisian cows have horns. To the author's knowledge, horns on domesticated cattle serve no useful purpose. The principle benefit for dehorning, of course, is to eliminate the risk of injury to other animals in the herd

or to people working with the cattle. The optimum time for dehorning is when the calves are one to three weeks of age. The application of caustic potash around the horn button at this age is effective, inexpensive and easy to do.

(d) Housing for Cows - The conventional barn in northern Tunisia has tie stalls, concrete floor with shallow gutters, and elevated feed mangers. The cows are secured in the stall by a chain fastened to their neckstrap.

The walls and ceiling are usually constructed of thick concrete blocks or tile and there is a noted lack of windows for ventilation and light. These barns are relatively warm in the winter and cool during the summer.

There are slight modifications of this typical design but no exceptions to the tie-stalls and thick wall construction were noted. The author is not cognizant of any herds in Tunisia with free-stall housing and automated milking parlors.

Most of the farms have an adjoining open lot in which the cows are put during barn cleaning (or to get a drink of water). Otherwise, the cows are confined continuously in their stalls.

This type of confined housing has some serious disadvantages compared to a more open, free movement type of housing in which cows are tied up only during milking time.

These disadvantages may be described as follows:

- 1. The detection of cows in heat (estrus) is especially difficult when they are kept tied in stalls. Heat expression is much greater and more easily noticed by the herdsmen if the cows are allowed free movement and the opportunity to mount each other. If they are permitted out of the barn only two hours or less per day, heat cycles will pass by undetected and long costly calving intervals are the end result.
- 2. Reing continuously confined on corcrete floors with a lack of exercise results in stiffness, and swollen leg joints. The author observed many such cows with puffy hocks, swollen pasterns, and sore feet.

clean

- 3. It is extremely difficult to keep cows/in tie-stalls unless they are heavily bedded and the workers continuously pick up the manure droppings. Consequently, dirty cows are a common sight in most tie-stall barns.
- 4. Conventional tie-stall barns are designed for a fixed number of cows and yet their heavy construction is meant to last for an endless number of years. They are not flexible enough to accommodate an expansion of herd size. Many Tunisian farms are now confronted with this problem.
- (e) Herd-Health The general health of most milking cows observed by the author appeared to be reasonably good. Of the the 62 farms visited, only five were confronted with obvious problems. Two of the herds were in extremely thin condition due to an apparent low feed intake. Two had a high incidence of tuberculosis and one herd of approximately 60 cows had 27 abortions due to brucellosis. The true prevalence of tuber-

culosis and brucellosis is impossible to ascertain from farm visits.

Monthly reports printed by the government's veterinary service give a summary of animals diagnosed ill and those vaccinated. They do not give a complete picture of the national situation, however, because of the limited use of veterinarians by many farmers. Table 9 summarizes the veterinarians' activities for the two months of January and February, 1977. The relative occurance of each disease may be valid for those farms which use veterinarian services. If so, tuberculosis and brucellosis are the most frequent and important diseases faced by dairymen.

TABLE 9 - Summary of Veterinarian Activities during January and February, 1977

: Disease	: No. Animals : diagnosed ill	: No. Animals vaccinated	:
• DIBERBY	• diagnosed iii	• vaccinated	:
Foot and mouth	<u> </u>	-	:
: Tuberculosis	1.09	1484	:
: Brucellosis	: 75	: 1113	:
: Anthrex	18	: 859	:
: Blackleg	9	: 2821	:
: Baccilary	:		:
: Hemoglobinuria	: 62	: 57 :	:
: Gangreen Mastitis	5	-	:

Reference: Situation sanitaire du Bétail, Direction des Services Vétérinaires. Another program affecting the well-being of many cows, not classed as a disease, is the lameness in feet and legs caused by stall confinement on poorly bedded concrete floors. This problem has already been described under the topic of Housing. Health problems noted in calves, especially systemic infections originating at the navel cord, and external parasites were covered in the section on Calf Raising.

The author does not consider the landless, local breed cows that are herded along the roadways as an important segment of the milk cow population. They do not produce enough milk to even satisfy the nutritional needs of their calf. However, they may be an important contributor to the spread or diseases and internal parasites from farm to farm. A majority of these animals appear emaciated and in general poor health.

(f) Labor and Mechanization - Most farms with milking cows employ an abundance of unskilled labor to manually care for the needs of the herd. Very little mechanization is used.

One of the major goals of the Tunisian government is to achieve a high level of employment. Thus, special incentives are given to those businesses that employ a large number of workers. The 1974 Enumerative Survey indicated cattle producers used 87 percent of the full-time farm labor force. The average number of full-time workers ranged from 2.3 for those farms with 1 - 9 cattle to 15.1 workers for farms with 50+ cattle. One herd of 300 cows is known to use 40 men to hand milk the cows at each milking. One problem of excess labor is that it increases the

requirement for personnel supervision and detracts from the manager's time spent on planning and decision-making.

The average daily wage for unskilled farm labor is approximately 1200 millimes; equivalent to 2.75 U.S. dollars. Therefore, it is economically difficult to justify a high investment in mechanized or automated equipment for the purpose of replacing labor. Also, maintenance or repair service and availability of replacement parts are seriously lacking. As more herds get larger, the level of mechanization may increase; especially for milking. If so, better equipment service will naturally follow.

(g) Herd Management Records - Records of physical and financial inputs which can be related to production and financial outputs, are very helpful for effective management of a dairy herd. Cause and effect relationships help to identify the source of problems. When corrective action is taken, the results of such action can be evaluated. This contributes to the overall learning process and the improvement of management expertise.

The need for recording input-output data is especially important in larger herds, where management decisions are made by those not directly in contact with the animals. This need also applies to those herds with absentee ownership.

The author noted a general lack of record keeping on most farms visited. A few farms, especially those government-operated, kept records on birthdates, calving, breeding, health and production of individual cows, but summerization of the total herd on such things as average yearly or monthly production per cow,

average age at first calving, average calving interval, feed inputs and cost per unit of milk sold, were entirely lacking. Cow records show the performance of individual cows, while herd summaries reflect the performance of the manager. It is at this level that guidelines are most needed for decision-making.

e. Physical Inputs and Services Provided to Farmers by GOT Agencies

The Government Of Tunisia has developed several programs to assist farmers in improving their production. The following programs have a significant influence on the production of milk.

of formulated

1. Commercial Concentrates - The manufacture/concentrates is under the direction of the Office of Cereals in Tunis. This office imports barley, corn and soybean meal as well as purchases the needed quantities of domestic cereals and beans. It is in charge of milling operations and the sale of final products to farmers.

Some of the government-operated farms and a few of the larger private farms have their own hammermill and mixing equipment. They divert a portion of their own cereal and bean crop into cattle feed and purchase only wheat bran and minerals to complete the mix.

The Office of Cereals has significantly increased its production of concentrates for milking cows as the demand increases and their milling capacity is expanded. Their tonnage increased 38 percent from 1975 to 1976. The following table shows the quantity of major feedstuffs imported for livestock and poultry feeds.

TABLE 10 - Major Feedstuffs imported for Poultry and Livestock Feeds

Item Imported		1974 (tons)	:	1975 (tons)	:	1976 * (tons)	-
Corn	:	36,950	:	40,920	:	50,625	-
Barley	:	20,000		29,200	:	not im-	
Soybean meal		10,300	:	11,800		ported **	

^{*} For 11 month period

Reference: Bureau of Plans, Economic Analyses, and Project Evaluation (D/PAEEP).

The current cost to farmers for a ton of concentrate for their milking cows is 40 Dinars. This is equivalent to 40 millimes per kg (or 4.2 U.S. cents per pound). With the price of milk at 90 millimes per kg (or 9.5 U.S. cents per pound), the ratio of concentrate cost to milk price is 1:2.25. This ratio economically favors a high level of concentrate feeding to cows of good genetics in early lactation. The current ratio in the U.S. is 1:1.55.

During the author's farm visits, several farmers expressed difficulty in acquiring concentrates in the quantities desired. Part of this problem appeared to originate from inadequate communication with their feed dealer prior to purchase.

The composition of concentrates currently available is not adequate formulated to meet the protein requirements of milking cows. The formula gives only 11.8 percent digestible protein.

^{**} Figure not yet available

TABLE 10 - Major Feedstuffs imported for Poultry and Livestock Feeds

Item Imported	:	1974 (tons)	:	1975 (tons)	:	1976 * : (tons)
Corn		36,950	:	40,920	:	50,625
Barley		20,000		29,200	:	not im-
Soybean meal	:	10,300	:	11,800	:	**

^{*} For 11 month period

Reference: Bureau of Plans, Economic Analyses, and Project Evaluation (D/PAEEP).

The current cost to farmers for a ton of concentrate for their milking cows is 40 Dinars. This is equivalent to 40 millimes per kg (or 4.2 U.S. cents per pound). With the price of milk at 90 millimes per kg (or 9.5 U.S. cents per pound), the ratio of concentrate cost to milk price is 1:2.25. This ratio economically favors a high level of concentrate feeding to cows of good genetics in early lactation. The current ratio in the U.S. is 1:1.55.

During the author's farm visits, several farmers expressed difficulty in acquiring concentrates in the quantities desired. Part of this problem appeared to originate from inadequate communication with their feed dealer prior to purchase.

The composition of concentrates currently available is not adequate formulated to meet the protein requirements of milking cows. The formula gives only 11.8 percent digestible protein.

^{**} Figure not yet available

When fed in combination with the traditional oat-vetch hay, the overall ration contains approximately 6 percent protein.

Inasmuch as the overall ration should contain around 12 percent to be in balance, inadequate protein consumption is one of the most serious limitations to higher milk yields. Increased levels of protein are needed in both concentrates and forages.

2. Artificial Insemination - Free artificial breeding service has been available to Tunisian cattle farmers since 1964. The primary objective for establishing this service was to maintain the purity of breeds that have been imported from Europe. In more recent years, there has been some emphasis toward cross breeding the native cattle to upgrade their productivity.

The growth of the artificial breeding program in Tunisia since 1970, as well as projected increases, are shown in the table below.

TABLE 11 - The Growth of Artificial Insemination in Tunisia

Year	1970	: 1	1971	:	1972	:	1973	:	1974	:	1975	:	1976	
No. First Services	13,368	: 13	3,707	:	13,450	:	15,508	:	1.8,340	:	24,077	:	29,244	
					Pro	oie	eted 5	-Ye	ear Gro	wtl	h			
Year	1977	:]	1978	:	Pro 1979	-			ear Gro		<u>h</u>			

Reference: Presented by Dr. Kefala at Extension Agents Seminar, February, 1977. The significant increase in A.I. services since 1973 was undoubtedly used as a basis for projecting growth in the next five years. Inasmuch as the GOT's five year plan calls for 63,400 purebred cows by 1981, the projected A.I. growth is conservative in relation to the needs of upgrading the total cow population.

The artificial breeding program utilizes bulls of three European breeds: the Pie Noir, Swiss and Tarentaise. The relative usage among the three breeds in 1975 is shown below.

TABLE 12 - Relative Use of Artificial Insemination in 1975
According to Breed

: Breed	: No. Bulls	: No. Cows Bred :
Pie Noir	8	10,900
Swiss	6	7,844
Tarentaise	6	6,224

Reference: Personal Communication with manager of A.I. Center, Sidi Thabet.

Approximately 65 percent of the services in 1976 were made on purebreds and the remaining 35 percent on crossbred and native cows. Most of the farmers with native cows prefer to breed to the Swiss or Tarentaise bulls. If the cow is small and likely to have calving difficulty, the inseminator will breed her to a Tarentaise bull.

Most of the A.I. bulls are individually selected from European herds after they have reached sexual maturity. The origin of bulls are shown on the next page for each breed.

TABLE 13 - The Origin of Bulls Currently being used in Tunisian A.I. Service

Breed :	Origin
Pie Noir	7 - Holland + 1 - France
Swiss	4 - Austria + 2 - Switzerland
Tarentaise	4 - France + 2 - Tunisia (OEP Fretissa Farm)

Reference: Dr. Kefala, Extension Agent's Seminar, February, 1977.

The genetic transmitting performance of these bulls is unknown because no progeny testing program has been developed in Tunisia. The author was unable to secure information on the genetic index of the bulls' sires, but the following table gives the calculated average production on their dams.

TaBLE 14 - Average Milk Yield of the Dams of Bulls Used in Tunisian A.I. Service

: : :		:	No. Records on Dams	:	Average Kg. Milk per Record	:
:	Pie Noir	:	34	:	6,829	:
:	Swiss	:	15	:	5,382	:
:	Tarentaise	:	11	:	3,328	:
:		:		:		:

Reference: Control Performance Office.

The 20 Tunisian A.I. bulls are housed at the Central A.I.

Center at Sidi Thabet, approximately 25 km north of Tunis. The semen is collected, diluted, antibiotics added, and then frozen in mini-straws. The frozen semen, along with the liquid nitrogen coolant, is distributed to 14 sub-centers every two weeks. The sub-centers cover all of the northern gouvernorats and as far south as Sfax along the coast. There are approximately 45 inseminators currently employed. The number of A.I. services annually per inseminator ranges from a low of 300 to a high of 1500.

From the author's viewpoint, the primary restraints on maximum success of the Tunisian A.I. program are listed as follows:

- 1. Inadequate heat detection of cows by herdsmen.
- 2. Irregularity of inseminator service, especially in small herds.
- 3. Not enough people from other government service agencies actively involved in promoting A.I. to farmers. This includes the livestock extension agents and control performance personnel.
- 4. The genetic level of the A.I. bulls is too low.

On the positive side, the technology of semen collection, processing and distribution is already well developed and the personnel are experienced. In addition, the organizational framework for delivering the service to farmers is established. Further improvements can be easily incorporated into the existing system.

3. Milk Production Records - The milk and butterfat yield of individual cows is recorded by the Control des Performances Project of the OEP. This record program has been operating in Tunisia since 1961. It is a member of the European control performance record system and is the only country in North Africa which offers such a program to its farmers.

In addition to milk and butterfat records, the control performance project includes measurements on body conformation and the national registry herd-book. There are approximately 46,000 cattle with recorded indentification in the herd-book.

There were 137 farms with 6,435 cows actively enrolled in the production record program at the end of 1975. This is an average of 47 cows per herd. The actual number in lactation was 4,227 or an average of 31 milking and 16 non-milking cows per herd. Eighty-five percent of the enrolled farms were located in the five gouvernorats of Tunis, Bizerte, Beja, Jendouba and Nabeul. The service extended as far as Kasserine in the southwest and to Sousse on the south coast. Sfax, with 23 herds, was added to the program in 1976. The current enrollment (January 1977) in production testing is approximately 9,000 cows.

There were 77 employees working with the bovine record project at the end of 1975. Their assignments were as follows: 55 were responsible for the fieldwork of obtaining milk weights and conducting butterfat tests; 18 were involved with the herdbook operations; two were central office key punchers; and two were responsible for program development and leadership.

The data records used in milk-cow here as follows:

- 1. Declaration of birth and identification
- 2. Growth record for heifers
- 3. Record of body conformation measurements on each cow
- 4. Single lactation production on each cow
- 5. Lifetime production record on each cow
- 6. A manila folder with format for recording identification, breeding, health, body traits, progeny and lifetime production of individual cows.
- 7. Declaration of cow's death or sale.

The only records that remain with the farmer are numbers 4 and 6 as described above. The other record sheets remain on file at the control performance office. Cows with lactation yields exceeding a certain level are issued an official lactation certificate.

The record project has just recently gained access to a computer. The first priority has been to conduct studies of the data on file. An extensive study of the production data for the years 1966 through 1975 has just been completed. Plans for utilizing the computer to facilitate current operations and to summarize herd management data for the farmers have not yet been developed.

After reviewing the current records provided to farmers enrolled in the "Direct control" program and observing their limited
use by a few of these farmers, it is the author's opinion that
much more emphasis in the future should be placed on summarizing
herd data for the farmers. Herd summaries would provide a valuable
guide for making herd management decisions and would be more effective for improving total herd production.

4. Cow replacements - Two government-operated programs provide a source of purebred cows to Tunisian farmers; one is directed by the Office des Terres Domaniales (OTD) and the other by the Office de l'Elevage et des Pâturages (OEP).

The OTD project started in 1961 with 35 Friesian heifers imported from Holland. Currently, they are importing heifer calves from Holland and Canada plus purchasing calves from local farmers. The size of this operation has increased significantly in recent years as shown by the following table.

TAPLE 15 - Number of Heifers being Raised by OTD for Sale to Tunisian Farms

: Year	:	1972	:	1973	:	1974	:	1975	:	1976	:	1977	:
Number	:	1331	:	1689	:	3573	:	5,000	:	6,000	:	6,500	
: Heifer	s :		:		:				:		:		:
:	:		:		:		:		:		:		

All of these animals are black and white Holsteins and Pie Noir. They are generally purchased as calves and sold as 7-month pregnant heifers. The sale price is 330 Tunisian Dinars. Around 80 percent are sold to small private farmers.

The OEP heifer project (No. 502) is sponsored by Austria. Over a four-year period from 1974 through 1977, 1200 Swiss heifers (7-months pregnant) are imported and placed with private farmers. The recipient farmers are selected on the basis of need and their estimated ability to give proper care to the animals. A contract with the farmer requires him to give back a springing heifer within 3 1/2 years or pay 330 Tunisian Dinars for each heifer received. This project will be self-perpetuating after the sponsorship of Austria is terminated.

f. Extension Educational Program for Livestock Farmers - The key to getting adoption of imported livestock practices is to have an effective educational program for farmers; one that teaches principles as well as demonstrates how to apply the practice. The Intergrated Livestock Project of OEP has been in the process of adopting such a program since 1971. The organizational structure, establishment of field offices, and personnel staffing is near completion. Currently, there are extension field offices in 16 of the 18 gouvernorats and the project staff consists of approximately 55 personnel.

The educational activities, thus far, have been devoted primarily to farm demonstrations on growing improved varieties of pasture, proper seeding and application of fertilizers; direct grazing of forages; creep feeding of calves; and to a lesser extent, lead feeding of milk cows. Certain husbandry practices such as dehorning and castration have also been demonstrated.

Inasmuch as this farmer educational program is still in its early functional stage, most of the field staff personnel are young and relatively inexperienced in the application of modern technology. However, they do appear to have the interest and intelligence necessary to develop an effective relationship with the livestock farmers if they receive the necessary direction and support from a central office staff that is well trained in modern technology.

Up to this time, there has been no emphasis or expertise devoted to dairy herd management by the central office staff.

No one is yet trained in this subject. Consequently, an effective educational program to improve milk production hinges on filling this position with a person well trained in modern dairy technology and management.

The author has noted that other OEP projects, not under the direction of the Integrated Livestock Project, conduct activities which relate directly to improved livestock practices. These projects include Artificial Insemination, Control Performance and the Fretissa crossbreeding study. These projects are separately managed and do not appear to be closely coordinated with each other or with the Integrated Livestock Project. Consequently, the promotion of A.I. to farmers and the information derived from record analysis and crossbreeding has not been channeled to the livestock agents as a normal course of action. It should also be mentioned that other projects outside the OEP, such as the forage testing and research section of INRAT, have developed information on forage quality that should be flowing to the agents. Greater initiative should be taken by leaders in the Integrated Livestock Project to assemble relevant information from all sources and channel it to the field agents as reference material for their work with farmers. This would improve the competence of agents and subsequently speed up the adoption of improved production practices by farmers.

PECOMMENDATIONS FOR IMPROVING DOMESTIC MILK PRODUCTION

The following recommendations are based on observations made by the author and his understanding of the current situation related to milk production in Tunisia. It is readily admitted that there are possibilities of certain false observations, misunderstandings, or incomplete understandings that may detract from the validity of such recommendations. It is, therefore, suggested that the reader refer to the previous sections of this report to understand the basis of these recommendations and then use his own judgement on their validity and feasibility under Tunisian conditions.

a. Nutrition Improvement

1. Forages - One of the most severe limitations to high milk production is caused by inadequate nutrient intake due to poor quality forages. Milk is synthesized from the nutrients contained in the feed; not from the feed itself. Also, the nutrient composition of milk is relatively constant. Therefore, when the feed nutrient intake is low, it becomes a limiting factor and high milk production is impossible. Greater attention to forage quality as a means of increasing nutrient intake is essential to higher milk production. Samples analyzed by the INRAT laboratory show an average of 2.1 percent digestible protein (M.A.D.) for ost-vetch hay. A cow weighing 550 kg needs 322 gm of digestible protein for body maintenance. If she consumes 14 kg of average out-vetch hay, her intake of digestible protein is only 294 gm. Consequently, there is no digestible protein available from this feed for milk production. On the other hand, if the same cow

SUMME EN





MICROFICHE NE

01135

République Tunisienne

MINISTERE DE L'AGRICULTURE

CENTRE NATIONAL DE

DOCUMENTATION AGRICOLE

TUNIS

الجيه عُور سية النونس ية وزارة العنالاحة

المركزالقومحي للتوثيق الفلاحي تونسن





consumed 14 kg of early-cut hay rich in vetch (8.4% M.A.D.), there would be enough protein to meet her maintenance needs plus 18 kg of milk. This example demonstrates the importance of forage quality for low-cost milk production.

The key to improving quality is earlier harvest; at a time when the protein content is still high and the plant is easily digested. The primary obstacle to early harvest of hay is rain damage during field curing. Therefore, it is recommended that greater emphasis be placed on making silage, whereby the freshcut forage can be taken directly from the field and stored in trench or bunker-type siles. This practice has been demonstrated with success for many years in areas where rain damage is too risky for making hay. The average digestible protein in oatvetch silage samples tested by the INRAT laboratory is 7.5 percent on a dry matter basis. This illustrates the gain in quality that can be achieved through silage-making.

Small farms which do not have the land and equipment for making either silage or hay are advised to plan the most appropriate combination of forage species to utilize as pasture or green chop. If supplemental hay must be purchased, they would be well advised to be selective for quality, even if the price is somewhat higher.

2. Concentrates - With the present cost of concentrates in relation to milk price, it would be economically feasible to feed a higher level of concentrates to cows in the early stage of lactation. The current break-even point is one-half liter of

milk in return for each additional kg of concentrate fed. If the cow's maintenance requirement has been met by forages, it is often possible to obtain 1 1/2 to 2 liters of milk for each additional kg of concentrate. Thus, a 40 millimes investment offers an opportunity for increasing the income 180 millimes.

It is also recommended that the protein level be increased in commercial concentrates fed to milking cows (ration #7). The present level of 11.8 percent is too low when fed in combination with the poor quality forages on most farms. It is suggested that the protein level be increased to at least 14 percent. This could be done at a cost which is loss than the present ration by following the least-cost formulation approach. Sample least-cost formulae for different protein levels are shown in Appendix A. The current price of ingredients was used. Future price changes will make these sample formulae obsolute.

Inasmuch as concentrate formulation for dairy cows should take into consideration the quality of forages fed, the nutrient requirements for milk production, as well as the price and availability of ingredients, the author strongly recommends that the OEP select a highly qualified nutritionist to work with the Office of Cereals in developing more appropriate concentrate formulae for dairy cows. The same problem of a low protein level (10.5 percent) is confronted in the ration (No. 9) being fed to calves. This ration should contain at least 16 percent protein for efficient growth of calves.

b. Improve the Genetic Level for Higher Milk Production

Second in importance to improving the level of nutrition, is the need to increase the genetic level of the cow population.

Genetic improvement increases the cows' ability to convert feed nutrients more efficiently into higher levels of milk production.

Significant gains in genetic improvement can be made by a few government decisions, while improving the nutritional level requires the slow process of farmer adoption.

Genetic progress is dependent on identifying the genetically superior animals and allowing them to have the most offspring. Within the present cow population there is practically no opportunity to make genetic progress through the female side because culling is not practiced on the basis of milk yield. The low producer is allowed the same opportunity to perpetuate offspring as the high producer. The Government policy prohibiting the slaughter of cows under 8 years of age inhibits the rate of genetic progress.

The only gaens being made through the female side is the importation of additional purebred heifers. The author favors continuation of the import heifer program, but feels this method is expensive and has a limited impact in relation to changing the genetic level of the total milk cow production. Purebred cows cannot effectively be used to upgrade the crossbred or native cows. This is a simple stated genetic fact which leads to the main point as follows: The greatest opportunity for making maximum genetic progress at lowest cost is through the use of highly selec-

ted sires widely extended to the cow population by means of artificial insemination.

In contrast to the aforementioned situation with females, there is a great opportunity to make genetic progness through the use of superior males. First of all, their genetic level can be determined more accurately; secondly, they can be perpetuated through more offspring; and thirdly; they can be used to upgrade all levels of the cow population including the purebreds. The selection standards for males can be high because only a small percent need to be kept for breeding purposes. The selection standards for A.I. bulls must be especially high because they may have thousands of progeny during their service span.

Research has shown that 80 percent of the milk yield variation among cows is due to their level of feeding and management while only 20 percent of the variation is due to genetic differences. Thus, selection based on yield alone, without considering the environment, is subject to 80 percent error.

The ,most accurate method of identifying the genetic transmitting level of AI. sires is by contempory herdmate comparisons in which the performance of equal age daughters of several sires are compared on a within herd basis. When these comparisons are extended over large herds containing many daughters of many sires, the accuracy is highly reliable. Computer technology combined with genetic research, artificial insemination and large herds are needed to make this system feasible. Such a system has been employed in the U.S. for nearly 15 years and in Canada on a more

limited basis for approximately 10 years. For those readers who may be interested in the "procedures commonly followed in selecting, developing and using A.T. sires in the U.S.", they are illustrated in Appendix B.

The author believes there is a vital need to raise the genetic standards of A.I. bulls being used in Tunisia. This is based primarily on the desire to genetically improve the purebred cow population as well as the crossbreds and local breeds. It is not enough just to keep the purebreds pure when their milk production can be substantially improved.

The foregoing statements were intended as a partial background for the following recommendations.

- 1. Import enough frozen semen from selected A.I. bulls in the United States to breed all uncommitted heifers (approximately 3,000 heifers per year) at the OTD heifer raising farm north of Tunis. This farm already has semen storage tanks and four trained inseminators. The same recommendation is suggested for the 900 cow dairy at Tebourba, the OEP swiss herds at Jendouba and Fretissa and any others where such methods of semen use could be implemented and the resulting offspring could be identified and male calves retrieved by the government for placement in natural service. The price of semen from highly selected A.I. bulls in the U.S. is 3 to 5 Dinars (7 to 12\$) plus shipping charges.
- 2. Scan the official lactation certificates in the control performance files and select the 20 highest producing cows

of the Pie Noir and Swiss breeds to special mate to highly selected U,S. A.I. bulls. The best three males from these unions to be placed in the Sidi Thabet A.I. center annually for a maximum service of three years before replacement by a new generation of similarly selected bulls.

- 3. Fill calves produced by the system described in Recommendation 1 should be selectively chosen for natural service and placed in purebred herds which are difficult to be serviced by A.I. The surplus males could be placed in other herds for upgrading crossbreds and local breed cows.
- 4. It is suggested that a committee of Tunisians be sent on a tour to study the genetic programs of two or three A.I. centers in the U.S.
- 5. Based on research results at Fretissa and personal observations, it is recommended that service to Tarentaise bulls be discontinued in all dairy herds. Their milk producing potential is too low to warrant further use. Their so-called "heat and disease resistance" does not enhance their milk yield to a level comparable to the Pie Noir or Swiss. Major emphasis should continue with the higher producing Pie Noir hreed.
- 6. The Government's policy prohibiting the slaughter of cows under 8 years of age should be abolished. Farmers should be encouraged to cull inferior and non-productive cows. This would not only improve the opportunity for genetic progress on the female side, but would make more efficient use of available feed supplies. The net result would be higher milk production.

of the Pie Noir and Swiss breeds to special mate to highly selected U,S. A.I. bulls. The best three males from these unions to be placed in the Sidi Thabet A.I. center annually for a maximum service of three years before replacement by a new generation of similarly selected bulls.

- 3. Ball calves produced by the system described in Recommendation 1 should be selectively chosen for natural service and placed in purebred herds which are difficult to be serviced by A.I. The surplus males could be placed in other herds for upgrading crossbreds and local breed cows.
- 4. It is suggested that a committee of Tunisians be sent on a tour to study the genetic programs of two or three A.T. centers in the U.S.
- 5. Based on research results at Fretissa and personal observations, it is recommended that service to Tarentaise bulls be discontinued in all dairy herds. Their milk producing potential is too low to warrant further use. Their so-called "heat and disease resistance" does not enhance their milk yield to a level comparable to the Pie Noir or Swiss. Major emphasis should continue with the higher producing Pie Noir breed.
- 6. The Government's policy prohibiting the slaughter of cows under 8 years of age should be abolished. Farmers should be encouraged to cull inferior and non-productive cows. This would not only improve the opportunity for genetic progress on the female side, but would make more efficient use of available feed supplies. The net result would be higher milk production.

c. Improved Housing for Dairy Cows

The most common system for housing cows in Tunisia is enclosed confinement in tie-stalls. This system leads to problems in heat detection, lameness, sanitation and herd expansion as described more fully in section IV d₃d.

The author believes the concept of "free-stall" housing can be easily adapted to Tunisian conditions and would offer the best solution to the above listed problems. It is especially suitable for farms that have a tractor which can be used for mechanical removal of manure.

The OEP architect has been versed on this concept by the author and his assistant has drafted a sample plan of a dairy layout utilizing free stalls. Visual alides illustrating the use of free stalls as well as mimeographed dimensions were presented at the February training conference for extension agents. A copy of these dimensions and sample plan is included in Appendix C for the reader's reference.

Thus, it is the author's recommendation hat the '"free stall" concept be actively promoted when assistance is given to farmers in planning future dairy barns or when modifying existing structures for herd expansion.

d. Disease Control

Tuberculosis and Brucellosis appear to be the two most serious diseases among Tunisian cattle but the actual percent of the population infected is unknown by the author. Brucellosis in man is commonly called unaulant fever. Both of these diseases are

easily spread to humans by drinking unpasteurized milk or eating unpasteurized cheese. Since only five percent of the domestic milk production is processed and pasteurized commercially, there is a tremendous responsibility put on the public to boil its own milk.

The test and slaughter method of eradication is the most effective. However, this method would be too costly for Tunisia at this time in terms of indemnity payments to farmers and in loss of cattle numbers. The only practical method is to continue calfhood vaccination in the purebred and crossbred animals. When have their numbers increased to a sufficient level, the slaughter of infected animals may be gradually imposed starting with local breed cows. Until then, the importance of boiling milk must be continually publicized to the consumer.

The GOT might consider the feasibility of imposing health regulations on the free movement of landless cattle along the road-sides and on fallow land to reduce the spread of diseases and internal parasites from farm to farm. Many of these nomadic animals appear to be in poor health.

e. Improved Practices for Raising Heifer Calves

The primary objective in raising heifers should be to give them the kind of care that will permit their early entry into the milking herd at an adequate size and at a minimum cost.

The "opportunity costs" from slow growth and delayed first calving are much greater than any savings made through conservative or negligent care. As an example, the basic portion of

a feed ration goes toward meeting the requirements of maintaining body weight. An additional allowance will permit growth. When the ration is not adequate to permit maximum growth, a higher percent of the feed supply is utilized for body maintenance, growth is delayed and the productive life of the animal is shortened.

There are many factors in addition to low feed intake which or add can inhibit the growth rate of heifers/to their cost of raising.

Some of these factors or practices are prevalent on Tunisian farms and are described in section IV d3c under Calf Raising.

The following recommendations are directed toward these specific problems or practices.

- Many calves were noted as unthrifty, with stiff and swollen leg joints, due to an infection in their circulatory system. The farm owners do not appear to be aware of the cause of this problem nor aware of the practice of disinfecting the umbilical cord to prevent such problem. This is a simple practice which can be easily adopted. Therefore, it is recommended that Extension Agents be encouraged to promote this practice in their work with cattle farmers.
- 2. Earlier weaning of calves The common practice of feeding milk to dairy calves until they are 3 or 4 months of age is an unnecessary extra cost and reduces the amount of milk available for human consumption. If calves are encouraged to start esting concentrates by the second week of age, they will be consuming enough (3/4 kg daily) when six to eight weeks old to permit weaning. High quality, soft textured hay should

also be available within the first week or two.

The important point is that calves must be consuming enough dry feed at wearing to meet their nutrient requirements. Because of their limited digestive capacity, the major part of their ration must consist of concentrates (16 to 18% digestible protein). Prolonged feeding of large quantities of milk delays rumen development and the calf's desire to eat sufficient quantities of dry feed. The daily allowance should not exceed 6 liters. Dairy calves are successfully weaned from milk or milk replacer at 4 weeks of age in the U.S.

The author recommends that an earlier milk program be developed for trial against controls on a few government operated farms. If successful, the results can then be demonstrated to private farmers.

- 3. Wider use of powdered milk for feeding calves Some farms have already adopted the practice of feeding their
 calves reconstituted milk powder. However, a majority of farms
 continue to use whole milk. With the current cost of reconstituted
 milk at 40 millimes per liter and the sale price of whole milk
 at 90 millimes, it is economically more feasible for the farmer
 to feed the reconstituted milk. It appears to the author that
 this substitution should be encouraged to all farmers who have
 a market outlet for extra milk.
- 4. Feeding concentrates till 8 to 10 months of age . The feeding of concentrates to heifers should be continued until the rumen has developed enough capacity to meet the heifers' nutrient requirements from forages alone. This practice is especially

needed when only poor quality forages are available. Feeding up to 2 kg of concentrates daily per animal until 8 to 10 months of age could significantly improve the growth rate of most Tunisian heifers.

5. Improved Calf Housing - The typical Tunisian calf pens are located inside the ccw barn. This practice was probably adopted for convenience of milk Seeding, or letting the calves nurse the cows, and to keep them warm during the winter months. This latter reason is evidenced by the lack of fresh air and light. If there is a window located in this section of the barn, it is common to see it stuffed with a bale of straw during the winter. The farmers do not realize the ideal temperature for calves is 10 to 15° C. (50 - 60° F).

Calves need dry bedding, fresh air without wind drafts, and light to stay healthy and grow properly. It is also preferable to provide them individual pens during the milk drinking stage to prevent sucking. Inasmuch as the ideal conditions for growing calves cannot usually be found inside the cow barn, it is suggested that separate calf housing facilities be recommended on all farms that are seriously interested in raising healthy calves. The facilities can be simple and inexpensive as their main purpose is to provide fresh air and light.

6. Treatment for Lice - The frequency at which lice can be observed on young heifers indicates a need to give this problem more attention in future educational programs. Farmers need to know how to recognize the problem and what insecticides to apply in treatment. Blood-sucking lice can cause anemia and

they rob the heifer of nutrients needed for growth.

7. Dehorning Young Calves - Horns on domesticated cattle serve no useful purpose. On milking cows, they present a continuous hazard not only to the workers but to other cows in the herd. Preventing such injuries can be easily accomplished by dehorning calves as a normal practice when they are one to three weeks of age. The application of caustic potash around the horn button at this age is effective, easy to do on all farms and is inexpensive. One of the best places to incorporate the practice of dehorning is at the large OTD heifer farm north of Tunis. As these heifers are widely distributed throughout Tunisia, the results would be widely disseminated to many farmers.

Serious consideration of the above seven recommendations is needed to help Tunisian farmers overcome their most prevalent problems of calf raising. The adoption of these recommendations would go a long way toward achieving the goal of producing the kind of heifers that could enter the milking herd at an earlier age with minimum cost.

f. Develop a Dairy Management Record Program

Dairy farm operations represent a large investment in cows, land, labor, buildings and equipment. To make the greatest returns to the owner, the management of this investment requires sound decision-making based on a knowledge of facts. Such facts are not available unless measurements are taken at regular intervals and recorded in a manner that can be easily summarized. This points to the need for developing a record program that is designed to help dairy farmers make management decisions.

Such records should include financial as well as physical data.

They should be simple in the beginning stages and progressively expanded as the management expertise of farmers improve.

It is the author's opinion that two separate types of records are needed on dsiry farms; one set designed for cow and herd management and the other set to manage the total resources of the farm. The cow and herd management records should be developed within the OEP Control Performance Project. Currently, this project only handles individual cow records but could be easily expanded to the herd level. The total farm enterprise records should come under the responsibility of the Economic Evaluations Section of the OEP Forage Production and Utilization project. This section is currently in the development stage, but hopefully could devote the effort needed in designing a set of farm enterprise records that would serve this purpose. Both record projects would need to be closely coordinated and extended to farmers through the OEP Extension Agents to be effective.

It is recommended that an advisory committee, which includes some innovative farmers and farm managers, be appointed to assist in the development of these record projects. This would help assure that such records are designed for the farmers' understanding, ase, and benefit. It is also suggested that a representative of the Control Performance project be given an opportunity to study the computerized dairy herd record system in the U.S. for possible ideas that could be applied to herd records in Tunisia. This may be especially appropriate, now that the Control Performance project has gained access to a computer.

g. Improve Opportunity for Increased Milk Sales by Small Farmers

Most of the milk sales by small farmers are through private distributors who deliver the milk from house to house. The quantity of milk which can be sold by each farmer is dependent on the consumer's needs within that distributor's delivery route. There is also a considerable seasonal variation in the consumers' need. The net result of this situation is that there is no market for surplus milk and consequently no incentive for increased production.

On the other hand, only 10 percent of STIL's milk sales are derived from domestic milk. Inasmuch as STIL is a commercially operated government enterprise outside of the Ministry of Agriculture and its cheapest source of milk comes from imports, it cannot be relied upon to develop a more extensive collection system for small quantities of milk from individual farmers.

The market dilemma must be resolved before farmers can be expected to adopt improved practices and increase their milk production. Market incentives must be provided. Therefore, the author recommends that OEP initiate a project to expand the milk collection system to more farms and to deliver the milk to the STIL plants for processing. The transportation costs for handling small volumes of milk may be greater in the beginning than the value of the milk. However, if a total package could be developed in which higher production was encouraged, extra cows and credit made available and improved management practices explained and promoted, the volume of milk could increase to a level where the farmers could eventually assume their

own costs of transporting the milk to STIL. The GOT is in an awkward position when it asks the farmers to increase their milk production if it is unwilling to give them assistance in selling the product. Among the GOT agencies, it seems most logical to put the project of milk collection in the hands of the OEP because it has the most expertise in helping the farmers increase their production level. The success of this project will be related to how much increase in production can be generated.

It is further suggested that an in-depth study be made to work out the details of how such a milk collection system can be operated most effectively and efficiently.

VI. INCREASING THE EFFECTIVENESS OF EXTENSION EDUCATIONAL PROGRAMS FOR DAIRY FARMERS

There are a few direct actions that can be taken by the Tunisian Government to increase milk production but those actions which will have the greatest influence must be taken by the farmers themselves. The adoption of improved practices at the farm level is essential to increased production. This requires an extension type educational system that can transfer an idea of improved technology to its final adoption on the farm.

The transfer of technology to the farm must be a long-term continuous process in which information from many sources must be gleaned, evaluated and selected at one level and then passed through appropriate channels to those working at the farm audience level. At this level, the idea must be disseminated in a manner that will create interest and the desire to try it out. To enhance the probability of the idea being successfully adopted, there is need for a close working relationship between the field agent and the farmer.

Those of the information assembly level must also be kept informed of the situation and problems at the farm level so the information to be transferred is practical and geared to priority problems. Therefore, a feed-back system is an essential part of all educational programs.

This whole process must be designed for a smooth coordinated flow of information. The farmer audience is large, diversified, widely distributed and not in direct contact with those who initiate the flow of information. This is why the organizational

structure should be one of the first considerations in developing an effective farmer educational program. The organization must serve as the vehicle for transfer of information. The development of an effective organizational structure must consider two ends; how it can be linked to the higher administrative structure and how it can be extended to its organizational members in the field. The administrative end will be looked to for needed support and guidance; while extension of the organization to the field agents must consider now the ultimate sudience, the farmers, can be served most effectively to accomplish the goals of the organization. The success of an extension educational program is mostly dependent on the expertise of the field agents and how well they are supported by the organization.

In most situations, there is more than one way to accomplish the same end. The same is true with organizational structures. At any rate, the author has taken the liberty to suggest an organizational structure that reflects his opinion of how an extension educational program can be extended effectively to Tunisian dairy farmers. It is illustrated in Appendix D. The lack of availability of qualified personnel would prevent immediate implementation of such a plan, but it may provide a guide for future adoption as qualified personnel become available. The primary points in this proposed plan are: (1) to tie the dairy program together under one leader who has been broadly trained in dairy production technology and (2) to have a program coordinator for agents who can be responsible for coordinating in-service training programs

and for promoting effective teaching methods.

The dairy production leader with the assistance of the three specialists must be responsible for supplying dairy technical information to the field agents. The leader and specialists must keep themselves well informed on the latest developments in their speciality, relate how such developments or practices may apply to Tunisian farms and relay that which is feasible to the agents. Follow-up assistance will be needed in some situations. The development of a dairy reference handbook would be a helpful basic tool for agents.

Consideration should be given to assigning dairy educational resposibilities to specific agents. The number of dairy agents would depend on the importance of dairying in each gouvernorat and the number of agents available. This designated responsibility would help assure action and improve the efficiency of in-service training efforts. The assigned agents could develop more interest and expertise in their work and finally the farmers would have greater respect for the agents, which would lead to a more effective relationship.

Getting farmers to adopt new practices or ideas, which will lead to improving their production and incomes, requires a well-developed educational organization that is staffed with highly competent and devoted personnel. The author has been favorable impressed with the interest shown by DEP and the progress it has already made toward developing this kind of an organization.

VII. GOVERNMENT OWNED AND OPERATED FARMS

There are 700,000 to 800,000 hectares of land that were foreign-owned prior to Tunisia's independence and are now under the administration of the Office des Terres Domaniales (OTD). The farms are managed by production cooperatives (Union des Coopératives de Production) or state farms (Agro-Combinats). There are also four or five government-owned farms under the supervision of OEP.

Many of these farms have dairy herds which are often classed as a secondary enterprise to cereal crop production. The author had the opportunity to visit 23 of those farms which maintained herds of milking cows ranging from 18 to 180 head. The average herd size was 54 cows.

The land on most all the farms visited appeared well-suited for growing abundant quantities of excellent forage.

Thus, the major resource needed for good milk production was present. Yet, the average daily production per cow was only 7.1 liters. Management and employee incentive were the missing factors. There appeared to be too much of a void between the devision-makers and those who worked with the cows. With a few exceptions, the same problems found on poorly managed private farms were also prevalent on the OTD farms. These problems include poor quality forages, low levels of concentrates fed, reproductive problems, low genetic level, confined housing and inadequate care of heifers.

The author feels especially critical toward the OTD operations because they have such a high potential that is not being realized. They could not only make a significant contribution to

the domestic milk supply but could be used to demonstrate good production practices to the private farmers.

It is the author's understanding that vitally needed changes are being made at this time in assignment of more highly trained managers, decentralization of authority and profit sharing incentives. Perhaps the past situation has been a natural transition process that will eventually lead to a system of government farms that will serve a valuable purpose in Tunisian agriculture.

To enhance the training program for those who will be responsible for managing dairy herds, it is recommended that a selected group of future herd managers be sent to the western region of the U.S. to study the operations involved in managing high production herds. This experience would not only give them a better understanding of modern dairy technology but would provide them an incentive to strive for higher production upon their return.

APPENDIX A

Relative Cost and Valve of Concentrate Ingredients
(February, 1977)

:Ingredient	:	Cost/Kg	:	UF	:	Cost/Kg.UF	:	MAD	:	Cost/Kg.MAD	
A property of the second of th	:		:		:		:		:		
: Barley	:	30	:	1.00	:	30		8.5	:	353	4
•	:		:		:		:		:		-
: Beans	:	90	:	1.00	:	90	:	20.2	:	445	
:	:		:		:		:		:		
: Bran	:	22	:	.70	:	31	•	11.5	:	191	:
:	:		:		:		:		•		:
: Corn	:	40	:	1.04	:	38	:	7.0	:	571	:
:	:		•		:		:		:		
:Soybean Meal	:	80	:	1.00	:	80	:	37.0	;	216	

Sample Rations for Milking Cows

	R B							
: Ingredien	t :Kg/To	n: UF :	MAD:	Cost	Kg/Ton	: UF :	MAD :	Cost
<u>:</u>	•	: :		(TD)		: :	:	(TD)
: Barley	: 403	.400:	34.0	12.000	360	.360:	30.6:	10.800
: Bran	: 400	.280:	46.0	8.800	400	.280	46-0:	8.800
:Soybean Mer	: al: 140	: 140:	51.8	11.200	180	.180:	66.6	14.400
: ; Salt	: : 1J			.210	10	: : : -:	- :	.210
: CMV	: 30	: -:		3.900	30	: : : -:	· ·	3.900:
CaCO ₃	: 20	: -:	_ :	.520	20	: -:	_ :	.52J
Total	•	: :	127 9.	3.1.1.1.2.1.1			: :	
: TOORT	:1000	; ;	131.0:	30.030	1000	.020	143.2:	38.630

APPENDIX A (con't)

Sample Rations for Milking Cows

					C		H H			D		
:	Ingredient	:1	Kg/Ton:	:	UF:	MAD:	Cost	KG/Ton:	UF:	MAD:	Cost	**
:		:		:		:	(TD)				(TD)	
•	Barley	:	330		330:	28.1:	9.900	290	.290	24.7:	8.700	:
:	Bran	:	400	:	280:	46.0:	8.800	400	.280	46.0	8.800	:
:	SBOM	:	210	: ,	210:	77.7:	16 800	250	.250	92.5	20.000	:
:	Salt	:	10	•	- :		.210	10	-	- :	.210	
•	CMV	:	30	:	- :	-	3.900	30	-	- :	3.900	:
	caco3	:	20	:	-:	-	.520	20	-	- :	.520	
	Total		1000	•	820	151.8	40.130	1000	.820	163.2	42.130	

			E					F	
- :	Ingredient	:Kg/To	n: UF :	MAD :	Cost	Kg/Ton	· UF :	MAD:	Cost :
:			• •		(TD)		: :		(TD)
:	Barley	260	.260	22.1	7.800	230	.230	19.6	6.900
:	Bran	1:00	.280	46.0	8.800	400	.280	46.0	8.800
:	SBOM	280	.280	103.6	22.400	310	.310	114.7	24.800
:	Salt	10	-		.210	10	-	-	.210
. 62	CIMV .	30	-		3.900	30	-	-	3.900
:	CaCO3	20			.520	20	-	-	.520
:	Total	1000	.820	171.7	43.630	1000	.820	180.3	45.130

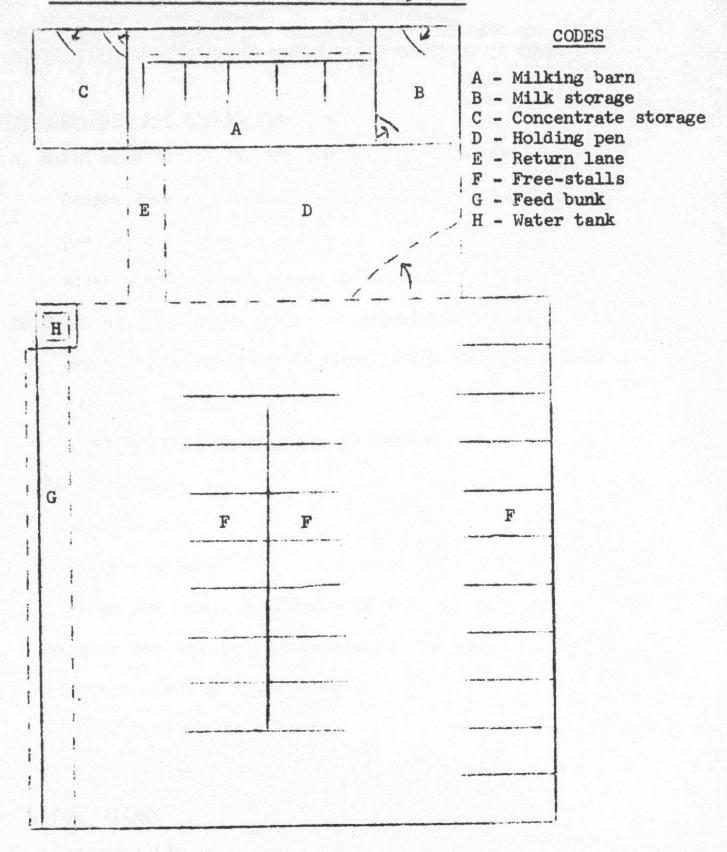
APPENDIX B

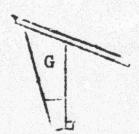
Procedures Commonly Followed in Selecting, Developing, and Using Artificial Insemination (A.I.) Sires In The United States:

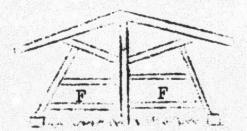
- 1. A computerized genetic analysis is made on approximately 3 million cows by USDA every four months. A list of the upper 2 percent of the registered cows is then sent to all 22 A.I. commercial breeding centers.
- 2. The cows on this list are further screened and evaluated by the A.I. personnel. The chosen cows are then mated to the highest genetic A.I. sires and the resulting male offspring are brought to the A.I. centers for progeny testing.
- 3. After breeding approximately 500 cows, each bull is put aside for approximately 40 months until the performance of their daughters is genetically evaluated by USDA.
- 4. The best 20 percent of the progeny tested bulls are retained at the breeding center for further active service.
- 5. The list of active service bulls, along with their genetic index, is distributed by Extension Agents to all interested dairy farmers every four months.
- 6. The dairy farmers individually select which A.I. balls are to be used in their herd. Consequently, a strong competitive pressure is put on each A.I. center to have the highest genetic level represented in their bulls.
- 7. There are approximately 2,000 progeny tested A.I. bulls in the U.S.
 - 8. Some bulls will have as many as 100,000 offspring during

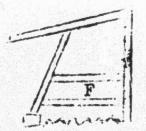
APPENDIX C

MILKING BARN WITH FREE-STALLS FOR 25 COWS









SIDE VIEW OF FREE-STALLS

DIMENSIONS TO CONSIDER FOR PLANNING DAIRY MILKING AND HOUSING FACILITIES FOR TUNISIAN HERDS OF 20 TO 70 COWS.

1. Stanchion Barn for Milking the Cows

a. Stall size for herds with cows weighing 550 kg.

Length from stanchion to gutter = 152 cm slope: 1 cm per 12 cm length.

Width = 122 cm from center to center.

b. Stall size for herds with cows weighing 650 kg.

Length from stanchion to gutter = 165 cm slope: 1 cm per 12 cm length.

Width = 135 cm from center to center.

c. Manure gutter

Depth = 20 cm

Width = 40 cm

Slope for liquid drainage = 1% or 1 cm per 1 meter.

d. Mangers for feeding concentrate to cows while milking:

Bottom width of trough = 60 cm

Front curb height = 25 cm

Back curb height = 18 cm.

e. Feed alley:

Width = 150 cm.

f. Service alley between gutter and wall:

Width = 165 cm.

g. Window space in milking barn for light and ventilation per cow = 3,720 sq.cm or 1.5 sq. meters/2 cows or 1 sq. meter per 20 sq. meters of floor space. Windows uniformally distributed on both side walls.

2. Holding Pen

Floor area per cow = 1.6 m²
Rail height = 1.5 m.

3. Free-stalls for Housing Cows

- a. One stall should be provided for each cow.
- b. Stall size:

For cows weighing 550 kg:

Length from head wall to outer edge of curb = 1.95 m
Width from center to center = 1.1 m.

For cows weighing 650 kg:

Length from head wall to outer edge of rear curb = 2.1 m
Width from center to center = 1.17 m.

- c. Stall partitions:
 - a) Height = 1.2 m
 - b) Lowest partition pips or board should be 45 cm above floor level
 - c) Slant rear post forward 60° to allow cows easy movement into stalls
 - d) Stall floor:

Coarse gravel in bottom with dirt and sand in upper 15 cm. Straw may be added on top for insulation.

- e) Rear curb:
 - 25 cm above paved lot to prevent manure from flowing into stall during cleaning of lot.
- f) Brisket pipe or shoulder cable approx. 1.4 m from rear curb.
- g) Allow at least 1.85 m height for cows head clearance.

4. Loafing and Forage Feeding Paved Floor Area

- a. 9 sq. m per cow
- b. 3% slope away from milking barn.

5. Forage Feeding Bunk (hay, silage or green chop)

- a. 70 cm feeding space per cow
- b. Height of curb at cow's throat = 60 cm
- c. Height of back curb at least 75 cm and sloped outward
- d. Inside bottom width of forage bunk at least 50 cm.

6. Maternity Pens

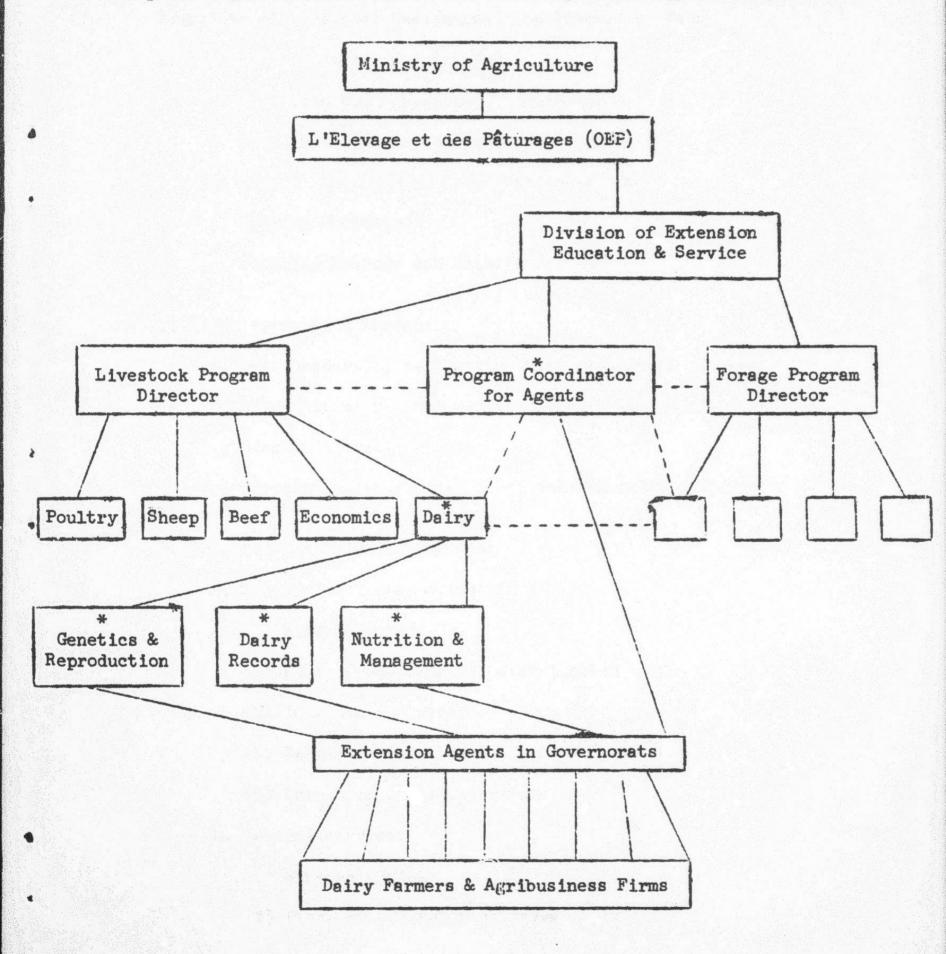
a. Number pens determined by herd size:

No. Pens	No. Cows
1	< 20
2	20 - 50
3	51100

- b. Dimensions: 10.7 sq.m/pen; min. single dimension = 2.7 m
- c. Height of partitions separating multiple pens: 1.3 m
- d. Width of gates: 1.3 m.

APPENDIX D

Proposed Organizational. Plan for Transferring Technology to Dairy Farmers



^{*} see next page for functions

Functions of Personnel Designated * on Preceeding Page

- 1. Program Coordinator for Agents:
 - a. Selection and Placement of Extension Agents
 - b. Coordinate in-service Training Programs
 - c. Assist in Program Planning and Development
 - d. Program Evaluation
 - e. Teaching Methods and Materials
- 2. Dairy Production Leader:
 - a. Give leadership to overall Dairy Production Program
 - b. Cooperate with other Section Leaders i.e. beef, economics and forage sections
 - c. Coordinate activities of specialized dairy assistants
- 3. Genetics and Reproduction Specialist
 - a. Artificial Insemination:
 - (1) Sire selection
 - (2) Semen processing and distribution
 - (3) Insemination service
 - (4) Progeny testing of A.I. sires
 - (5) Promotion of A.I. service
 - b. Natural service:
 - (1) Sire selection
 - (2) Placement of bulls on farms

- c. Bred Heifers:
 - (1) Selection of heifer calves
 - (2) Raising heifers
 - (3) Placement of heifers on farms
- 4. Dairy Records Specialist:
 - a. Gathering herd input data
 - b. Computer processing
 - c. Summarization and Analysis of records
 - d. Helping Farmers understand records
 - e. Promotion of records to more dairymen
- 5. Nutrition and Management Specialist:
 - a. Feeding
 - b. Buildings and equipment planning
 - c. Calf raising
 - d. Health and sanitation.

