

P5WAN491

PROCEEDINGS OF THE
PROLIFIC SHEEP WORKSHOP

Sponsored by the Small Ruminant CRSP
for the Near East Area in
Egypt and Morocco

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Participants	Representing	
Dr. Aboul Naga	Ministry of Agriculture	Egypt
Dr. Lahlou Kassi	IAV Hassan II University	Morocco
Dr. D.W. Robinson	Small Ruminant CRSP	USA
Dr. G.E. Bradford	University of California	USA
Dr. R. Land	Animal Breeding Research Org.	Britain
Dr. S. Quirke	Agricultural Inst. of Ireland	Ireland
Dr. W.M. Boylan	University of Minnesota	USA
Dr. B. Bindon	CSIRO, Armidale	Australia
Dr. M. Marie	IAV Hassan II University	France*
Dr. P. Glatzel	IAV Hassan II University	Germany*
Dr. F. Guessous	IAV Hassan II University	Morocco*
Dr. H. Narjisse	IAV Hassan II University	Morocco
Dr. Aboul Ela	Mansoura University	Egypt**
Dr. Mosilhy	Alexandria University	Egypt**
Dr. El Shrobosoky	Zagariz University	Egypt**

*Morocco only.
**Egypt only.

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* See Appendix

I - ITINERARY

AGENDA IN EGYPT
October 25-29, 1981

Sunday Oct. 25 Arrival in Egypt

Monday, Oct. 26

9:30 AM Ministry of Agriculture
Meeting with Dr. Walley and Dr. Hindy

10:00 AM Animal Production Research Institute

10:15 AM Introduction (Dr. Robinson)
Schedule for Egypt and Morocco
Objectives of meeting

10:45 AM Coffee Break

11:00 AM Report on current research (Dr. Aboul Naga)

1:30 PM Nadi El-Said

2:30 PM Prolific Sheep Proposals for Egypt (Drs. Aboul Naga,
Aboul-Ela, Mosilhy)

4:00-6:00 PM Individual presentations of research: Drs. Bradford,
Lahlou Kassi, Land, Boylan, Bindon, Quirke, Shelton

Tuesday Oct. 27 Ministry of Agriculture Farms

7:30-1:00 PM Sakha and Mahalet Mousa Farms

2:00-3:00 PM Lunch at Sakha Rest House

3:00-5:00 PM Laparoscopy demonstration (Quirke)
Discussion of goals of coordinated prolific sheep
research program

6:00-7:00 PM Back to Cairo

9:00-10:00 PM Robinson meeting with Minister of Agriculture, His
Excellency Dr. Dawood

Wednesday, Oct. 28

9:00 - 1:00 PM Discussion of prolific sheep research procedures

2:00-5:00 PM Discussion of prolific sheep research procedures

Thursday, Oct. 29 Departure for Morocco

AGENDA IN MOROCCO
October 29-November 4, 1981

Thursday, Oct. 29 Arrival at Casablanca Airport; to Hotel Tour Hassan
Rabat

Friday, Oct. 30
Visit facilities at Hassan II University
Communication: research on D'man breed in Morocco

Saturday, Oct. 31
8:30 AM Reports of Management, Breeding & Physiology
subcommittees

12:00 PM Lunch at Institute

2:00 PM Depart for Moghrane (80 km north from Rabat)

3:00-6:00 PM Visit of Institute's field station

Sunday, Nov. 1 Travel to Ouarzazate via Marakech

Monday, Nov. 2

8:00-10:00 AM Meeting with Director of Ouarzazate
"Office Regionale de Mise en Valeur Agricole"

10:00 AM Departure to Draa Valley

PM Visit of three local farms; hosted lunch in village;
visit of ORMVA selection station for D'Man breed in
Tinzouline

6:00 PM Return to Ouarzazate

Tuesday, Nov. 3

AM Discussion on prolific sheep research at ORMVA Office,
Ouarzazate
Lunch courtesy of Director, ORMVA, Ouarzazate

PM Return to Marakech
PSP meetings

Wednesday, Nov. 4

Return to Rabat via Hassan II farm at Tadla
Discussions and synthesis

Thursday, Nov. 5

Departure from Morocco

II - INTRODUCTORY REMARKS

D.W. Robinson

The Small Ruminant Collaborative Research Support Program (SR-CRSP) is a program between US and overseas institutions which are mutually interested in promoting the development of sheep and goats for smallholders. It is funded approximately 50% from USAID resources, 30% from US institutional resources and 20% from local government support. The total cost is approximately US \$30 million over a five year period (1978-1983).

Morocco is a participating country in the CRSP because sheep and goats are of considerable importance in North Africa and the Near East. Egypt, which is a participant in two other large projects with the University of California at Davis totalling some \$30 million, also places a high priority upon sheep and goat development.

There has been interest in focusing attention upon the specific aspect of prolificacy in sheep for some years. However, interest has been stimulated recently both by the impact prolific breeds have made in crosses with more established breeds around the world, and the realization that there may be other highly prolific breeds of sheep, as yet unresearched, in the world.

Following discussions with researchers in countries around the world and organizations such as FAO, the SR-CRSP has undertaken to bring together an international group of scientists to discuss the possibility of an international collaborative effort. Simultaneously, a first approach was made to the USAID Near East Bureau by submission of a Project Identification Document (PID) as a first attempt to secure funding for such an effort. At the time of the workshop, not all scientists invited were able to attend, nor had much progress been made for long term funding, but several possibilities were being explored including USAID Near East Bureau funds, USAID Morocco and Egypt Mission funds, existing funds in the SR-CRSP, the UC/ADS project in Egypt, the University of Minnesota project in Morocco, FAO, UNDP and bilateral resources from other donors.

The present workshop represents a first step to document some common objectives that such a program might serve. The agenda, and the papers that follow, will show that after brief reviews by each participant of his own individual work, recommendations for international collaboration in the study of prolific sheep were made.

The sequence of presentation that follows is the broad recommendations and the specific objectives defined by the team, followed by papers on individual interests, the PID as submitted earlier to AID, and some relevant appendices. The aim has been to collect the material as submitted in, hopefully, a not too disjointed fashion, so that it may serve as reference material for the further development of a project planning document or grant submissions elsewhere.

III - GENERAL RECOMMENDATIONS

1. Establishment of an international collaborative research program on prolific sheep is justified and worthwhile.
2. Steps should be taken to establish the framework and funding under which such collaboration can occur.
3. The broad goals of the Prolific Sheep Program (PSP) should be:
 - Exchange of knowledge and skills in the development and management of prolific sheep.
 - Facilitate joint research planning in order to improve the consistency and design of research work.
 - Share funding responsibilities among several participants of the program.
4. The specific research goals of the PSP should be to:
 - Compare, characterize and improve the performance of prolific sheep in all the environments and management systems represented.
 - Identify the breeds and crosses most suitable for specific environments and production systems, by a series of linked breed comparisons.
 - Study the genetic and physiological basis of prolificacy in the different breeds.
 - Study the utilization, exploitation and management systems for prolific sheep.
5. The creation of a single large center for the study of prolific sheep is not recommended. This would absorb enormous sums of money that could more usefully be channeled to support on-going research in several centers.
6. Incorporation of Near East Centers of excellence (at the present time defined as IAV Hassan II University, Morocco and Ministry of Agriculture, Egypt) will require special inputs from external resources to equip them for full participation. In Egypt, the most urgent current need is for additional equipment and training in the area of physiology, and in Morocco the addition of a more comprehensive genetic research component.
7. Inclusion of other countries where intensification of sheep production is needed, is recommended for exploration - possibly the Arab Research Center for Arid Lands. Resources from OPEC nations should be encouraged because of the potential benefits to them from increased availability of sheep for importation.
8. It was recommended that a small committee* take responsibility for organizing a Technical Workshop on Prolific Sheep to be held in Edinburgh in 1983 to bring together and update all the information on prolific sheep.
9. The members of the present workshop will serve as a review panel for the development of any future project papers.

*Consisting of Land (Chairman), Bindon, Robinson, Aboul Naga and Lahlou Kassi.

IV - SPECIFIC RECOMMENDATIONS

SUB-COMMITTEE I BREEDING RECOMMENDATIONS

1. Linkages

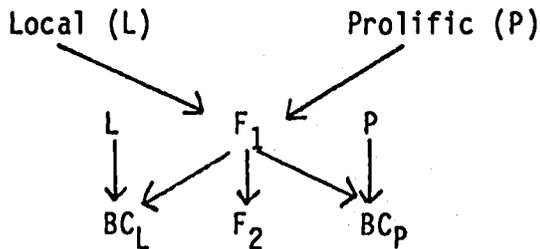
Each participating country, in addition to studying breeds of local interest, should maintain a linkage through the use of common breeds. For example, Egypt and Morocco: common breeds would be Finn and D'Man, each of these being used with at least one and possibly more (optional) local breeds. Since the Finn is also used in the UK, Ireland, France and the USA, the most likely common breed to be used is the Finn sheep.

2. Experimental design

Mating Plan

The basic design will be mating of exotic (prolific) sire breeds to local breed ewes to produce a series of crossbred combinations for genetic evaluation. The following mating design is proposed.

Local breed (L) x prolific breed (P), the F₁ and by further crossing the F₂, backcross to local (BCL) and backcross to prolific (BCP).



Number of Females

<u>Genotype</u>	<u>Number of ewes</u>
Purebred local	40
F ₁	40
F ₂	40
Backcross to prolific	40
Backcross to local	40
	<u>200</u>

Purebred flocks of prolific (where possible) and local breed ewes will be produced to provide contemporary comparisons. It is recommended that a minimum of 40 ewes of each genotype above be produced. It is further recommended that these be produced over a time span of two or more years to avoid confounding with year effects.

The above numbers of ewes produced are required for each prolific breed tested. The total number required for evaluating two prolific breeds would be 400. If two management systems are used, as recommended, the numbers will be doubled.

Sampling of males

10 of each breed, repeat sampling and where possible increase to 20. It was pointed out that in previous studies, mistakes had been made in selecting a prolific breed based upon litter size. The Booroola ovulation rate studies showed that some of the higher ovulators had lower litter size because of wastage down to one lamb. In this situation, simple selection on high litter size will not suffice. Therefore, a MUST in the selection criteria for rams is ovulation rate of the dams.

3. Breeds and Locations

a) Morocco

Breeds:

2 Prolific breeds

D'Man

Finnsheep

(future possibility of Booroola)

1 Local breed

Timahdite or Sardi

Locations:

Mohgrane potential 300-500 ewes

Meknes potential 300-500 ewes

Other Tadla, with development

b) Egypt

Breeds:

2 prolific breeds

Finnsheep

Chios

(Future possibility of D'Man)

1 local breed

Ossimi

Purebred local

F₁

F₂

Backcross to prolific

Backcross to local

Purebred prolific (if possible)

Location:

Delta Experiment Station - Sakha

4. Time Schedule

A time schedule needs to be developed for producing the required genetic material. It is anticipated that this may consist of several phases, including acquisition of prolific breeding stock, production of F₁'s and production of subsequent genotypes.

SUBCOMMITTEE II MANAGEMENT RECOMMENDATIONS

In the present discussion, management is treated in the context of how the animals will be managed while involved in genetic or physiological studies relating to characterizing more prolific sheep. It is not intended that the project attempt to deal with alternative management practices or sheep production systems. No doubt some information on these subjects will be forthcoming from observations and records derived from the project. Also researchers and administrators are encouraged to hold some of their resources outside the present project so that alternative research activities can be undertaken.

A. Levels of Nutrition

A major consideration of management alternatives is the level of nutrition or prevalent conditions at which the project is targeted. There appears to be a general belief that exploitation of highly prolific strains of sheep would be directed at conditions which permit intensified production systems. Prolific sheep have not been considered as suitable for extensive systems under desert or semi-desert conditions. However, testing them under these conditions might be an optional activity for those having the resources and desire to do so. In any case, the management conditions, including the nature and level of feeding practiced, should be recorded so that this information might be available in evaluating the results.

1. In case only one replicate can be conducted, the level of nutrition, and to a certain extent other management considerations, should be that which is prevalent or which can be recommended (prevalent plus) to target producers. The term prevalent plus is introduced to suggest that there are a few producers on the lowest rung of the ladder who cannot or will not be reached by research and extension and it may not be desirable to direct efforts at these. A more realistic approach is to direct programs at that level of sophistication or inputs which can be recommended based on a knowledge of environment, social and economic constraints. A primary concern here is that researchers resist the temptation to treat experimental animals in a superior manner to that which is feasible among target producers.
2. Where possible, it seems desirable that a second level of nutrition be included which does not limit the ability of the different genotypes to perform. The justification for this would be that the results from this level could more accurately be compared across regions or locations, and that it would also permit appraising what could be expected from a genotype given optimum conditions. One problem to be overcome in implementing this option would be to determine what level of nutrition should be taken as a standard. It is suggested that this be a level of body weight (at breeding) which does not limit the ability of that genetic group to reproduce. Body weight at breeding is a convenient point of control, but this would result from or be influenced by level of nutrition at other stages of the production cycle. The information

necessary to set this level of nutrition may not be available for all groups, but should be an early output from the proposed research.

This level of nutrition or management system could well be done at a different site to reduce the logistical problems of replications at the same site. It might also involve only some of the potential genotypes being tested.

3. Both the above two approaches would be directed at intensive management systems. Realizing that more of the sheep of the region are involved in extensive systems, researchers at each site should have the option of extending the work, particularly with crossbred groups, to more extensive production systems such as desert or semi-desert ranges.
4. It would be desirable to have all animals at all sites fed the same ration at the same or equivalent levels. However, this would be a near impossibility, and should probably not be attempted. Records should be kept so that this information can be made available in interpreting the results.

B. Supervision at Lambing

Prolific sheep are generally perceived as suitable to intense production systems, and thus labor and supervision at lambing should not be allowed to be a limiting factor at parturition and the early post-partum period. However, artificial rearing on milk or milk replacers should not be a routine practice in the experimental plan. The rationale for this is that under conditions of developing countries, these products would not be available or should be utilized directly by the human population. One exception to this general rule is that unique and valuable genetic resources might be maintained by artificial rearing. Also, if it is economically feasible, lambs might be removed and reared independent of the project. However, the researcher should be careful that the latter practice is not allowed to introduce a bias in the data. In any case, careful records concerning methods of rearing should be kept so that data can be expressed on the basis of lambs reared by the ewes.

C. Mating

Single ewe matings should be practiced or an alternative system which provides for collection of pedigree information used. Complete reliance on a single male should not be practiced as this might lead to a failure of a lamb crop in case the ram involved is not fertile. If accelerated lambing is to be practiced, a mating season of 35 days is recommended. A longer period may be useful if annual lambing is to be practical. Standardization of mating dates across experimental sites would be desirable, but this appears unattainable. Thus it is recommended that breeding dates be left to the discretion of individual researchers.

The major decision relating to mating has to do with accelerated vs. single annual lambing. Under field conditions, the males tend to be run continuously with the ewes. It may be assumed that with prolific sheep

maintained under intense conditions, some type of accelerated lambing should be practiced such as mating three times in two years. If resources are adequate, a single annual lambing may be practiced as an additional option, at least with some genetic types which are not expected to respond well to accelerated programs.

Age of mating constitutes a problem decision which must be dealt with. One trait of most highly prolific sheep is early sexual maturity. Therefore, this trait should be evaluated by mating or exposing all ewes to lamb at one year of age. This should be across both genetic types and locations. In case this is not an acceptable practice, the ability to breed early should be evaluated in an appropriate subsample.

D. Culling

It is preferable that all ewes assigned to the project subgroups be left until the experiment is completed or until they have completed their productive life. This may prove too expensive or unacceptable at some locations. If this is the case, it is suggested that they be carried until they become unsound or until they have passed two successive breeding seasons without lambing. They should not be removed for genetic reasons until the experiment has been completed.

E. Health Considerations

Health considerations should be left to veterinary officials at the various sites. However, this should be kept in the context that experimental conditions are not outside that of target farmers. For instance, if certain diseases are endemic in an area and cannot be handled by vaccination or the level of sanitation, genotypes intended for commercialization should not be subjected to these conditions.

SUB COMMITTEE III - REPRODUCTIVE TRAITS RECOMMENDATIONS

The sub-committee began with the assumption that the program, implemented for example in Egypt and Morocco, would create highly prolific genotypes based on one or other of the major prolific breeds. The objective would then be to recommend which measurement of reproductive characteristics should be made in order to allow comparative evaluation of the genotypes.

The committee took the view that reproductive efficiency is dependent on a sequence of reproductive processes which begin at puberty and is completed when the ewe recommences reproductive activity post partum. It is necessary therefore to consider each step in the reproductive process and recommend which measurements should be recorded, by what techniques and on which animals in the flock.

A second consideration of the committee was the need to carry out more basic studies in some situations. Such studies are not recommended as essential for comparative evaluation but rather that they may be necessary to fully understand a particular reproductive problem (eg. we may recommend the study of progesterone in early pregnancy in order to resolve a problem of embryonic wastage in a particular genotype). The committee includes therefore a category of "optional" recommendations that should be explored where the facilities, expertise and animals are available.

The committee then considered each component of reproduction in turn and developed a comprehensive set of recommendations as follows.

Comparative Evaluation of Reproductive Characteristics
of Prolific Sheep Breeds and their Crosses

Component of Reproductive Process	Animals on which measurements are made	Observations & techniques essential for evaluation	Optional Studies where facilities permit
Puberty	Breeding Flock	--Age & liveweight (lw) at 1st oestrus --Ovulation rate (o/r) after first oestrus (endoscopy)	_____
	Subsample of Breeding Flock	_____	--Test fertility of ewe lambs by joining for 6 weeks at 7 mos. age with crossbred rams --Study E ₂ feedback by implant technique in ovariectomized lambs
Fertility and Prolificacy	Breeding Flock	--Pedigree mating --Day of mating --Endoscopy between day 4-12 --Returns to service --LW on day 1	
	Subsample	_____	--Duration of oestrus (4 hourly) --2 hourly LH measurements --Time LH discharge --Time of ovulation
Wastage of potential embryos	Breeding Flock	--Relation between ovulation rate & lambs born (ie from endoscopy on day 4-12 & lambing records)	--Relation between o/r and progesterone (P) secretion
	Subsample		--Effect of replacement studies with P to improve survival

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Component of Reproductive Process	Animals on which measurements are made	Observations & techniques essential for evaluation	Optional studies where facilities permit
	Subsample		--Assess viability of individual ova from high ovulation rates (eg by ovum transfer) --Study the relation between o/r and fertilization rate
	Subsample		--Assess stage of reproductive wastage by fetal palpation and subsequent lambing records
Parturition & Neonatal Survival	Breeding Flock	i) Date, hence gestation length ii) litter size iii) Birth weight iv) Difficulty (eg, dystocia) v) mortality at: --birth --2 days --7 days --weaning as at age of local management	
Interval between Parturition & Resumption of Ovarian Activity	Breeding Flock	--Oestrus activity from day of parturition --Ovulation and o/r on day 40 & if needed day 20 --Relation between LW change after parturition & during lactation & post partum ovarian activity	--Prolactin measurement --Milk production --Uterine involution
Seasonality of Oestrus & Ovulation	Subsample of Breeding Flock	--Daily oestrus --Endoscopy - 14 days	
	Subsample		Use oestrogen implants & weekly LH sampling to define the breeding season

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Component of Reproductive Process	Animals on which measurements are made	Observations & techniques essential for evaluation	Optional studies where facilities permit
Ram Reproduction	Breeding Flock --selected sires	<ul style="list-style-type: none"> --Sperm production --Testis growth --Sexual drive --eg, minimum measurement necessary to ensure that male reproduction is not a factor limiting prolificacy of ewes 	<p>Basic ram studies, where necessary, which aid in genetic programme</p> <ul style="list-style-type: none"> --eg investigations aimed at identifying rams carrying a single gene for prolificacy (Booroola)

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V - OUTPUT FROM AN INTERNATIONAL COLLABORATIVE PROLIFIC SHEEP PROGRAM

Several benefits are expected from international collaboration in the area of prolific sheep research work. They may be summarized as follows:

- Exchange of knowledge and skills in the development and management of prolific sheep.
- Joint planning of research leading to improved design and more consistent comparative data.
- Systematic training of farm managers, technicians and scientists in the use of prolific sheep.
- Shared funding responsibility among several international participants.
- Improved characterization and comparison of the known breeds of prolific sheep.
- Improved crosses to provide sheep suitably adapted to a wide range of environments.
- Improve the basic understanding of the genetic and physiological control of prolificacy.
- Experiment with crosses not made in any of the existing national programs.
- Systematic exchange of germ plasm through new approaches such as embryo transfer.
- Encourage closer scrutiny of potentially prolific breeds not yet well researched.
- Encourage more rigorous examinations of the nature and importance of genotype x environmental interaction.
- Improve the extension skills for disseminating new breeds, new knowledge and new management practices.
- Encourage greater self sufficiency in research in less developed countries.

VI - THE BREEDS OF SHEEP IN USE OR NEEDED BY THE PARTICIPANTS OF THE WORKSHOP

Egypt Morocco Britain Ireland Australia Texas Calif. Minn.

Chios	*							
D'Man	*	XX						
Finn	X	*	XX	XX		XX	XX	XX
Rahmani	XX							
Ossimi	XX							
Barki	XX							
Booroola Merino		*	XX		XX			
Sardi	XX	XX						
Beni Hasn		XX						
Beni Guil		XX						
Timahdite		XX						
Blackface			XX					
Welsh Mts.			XX					
Tasmanian Merino			XX					
Galway				XX				
Lleyn				XX				
Merino					XX			
Border Leicester					XX			
Rombouillet						(X	XX	XX
Barbados Blackbelly						(X	XX	
Dorset							XX	XX
Targhee							XX	XX
Bangladesh ¹								
Priangan ²					X		X	
Romanov ³								X
Suffolk								XX

Codes: XX local breeds already in use
 X Introduced prolific breeds
 * New breeds required by certain locations

¹May be the original parent of the Booroola gene studies on location.
²via work in Indonesia by both USA & Australia.
³at Clay Center

VII - PEOPLE TO CONTACT FOR REFERENCES ON THE PROLIFIC BREEDS & SHEEP

1. I. Mason FAO Report Via delle Terme di
Caracalla, 00100
Rome, Italy
2. B. Bindon Booroola Merino CSIRO
Private Bag, PO,
Armidale, NSW 2350
3. G.E. Dickerson Finn Sheep in USA Animal Science Dept
Univ. of Nebraska
Lincoln, NE
4. A. Louca Chios Sheep Agricultural Research
Institute, Nicosia,
Cyprus
5. Lahlou Kass D'Man Sheep IAV Hassan II,
Rabat, Morocco
6. K. Maijala Finnish Sheep Institute of Animal
Breeding, Agr. Research
Center, Tikkurila,
Finland
7. P. Glatzel Alps Tyrol Sheep Gynakologische u Amb
Clinics, University of
Munich, 8 Munich 22,
Koniginstrasse 12,
West Germany
8. P. Brumby (ILCA) Prolific Sheep of Ethiopia ILCA
P.O. Box 5689
Addis Ababa
9. J.C. Flamant Romanov in France INRA
Station D'Amelioration
Genetique des Animaux
31 Auzeville
B.P. 12-31320 Castanet-
Tolosan, France

VIII - PROPOSED PROLIFIC SHEEP RESEARCH PROJECT

Egypt

Institution: Animal Production Research Institute, Ministry of Agriculture, Dokki, Cairo, Egypt

Personnel: A. Aboul Naga, Project Leader

Starting Date: January 1, 1983

Duration: Phase I, 5 years, Phase II, 5 years

Farms and Locations: Ministry research farms at Sakha and M. Mousa, and possibly Gemeiza. 20 breeders in two locations and other institutional farms will be included in the field testing.

Objectives:

- Phase I
1. Compare purebred Finnish Landrace and purebred Chios sheep under subtropical conditions.
 2. Compare F_1 crosses of Finn and Chios with Ossimi.
 3. Compare 1/4 Finn, 3/4 local with local sheep under field conditions.
 4. Produce and evaluate contemporary Chios x Ossimi and Finn x Ossimi F_1 's and F_2 's; include 1/4 Finns in this study.
 5. Compare management systems using groups of ewes varying in prolificacy.
- Phase II
- Compare reproduction and total productivity of the Finn and Chios F_1 's and F_2 's and backcrosses and D'Man x Ossimi F_1 's.

Breeding Plan (Numbers of Ewes to be Mated)

O-Ossimi
F-Finnish Landrace
C-Chios
D-D'Man

Estimates of numbers of ewes in later stages are based on the assumption of 40 ewes reaching mating age per 100 Ossimi ewes mated per year, with F_1 ewes (F x O and C x O) producing 50 replacement ewes per 100 dams per year.

Phase I

1. First two years. Compare purebreds; produce Finn and Chios F_1 's.

Rams	Ewes		
	<u>O</u>	<u>F</u>	<u>C</u>
O	120		
F	120	40	
C	<u>50</u>		<u>40</u>
	290	40	40
			370

since Finn rams from both Finland and the US are now available in Egypt, progeny of the two groups will be compared.

2. Years three to five. Compare purebreds and F, C F₁'s; produce F, C F₂'s, 1/4 Finn, D'Man F₁'s.

Rams	Ewes				
	<u>O</u>	<u>F</u>	<u>C</u>	<u>F x O</u>	<u>C x O</u>
O	40+	20	20	40	
F	20*	40		?	
C	20*		40		
D	40*				
F ₁ : FxO	40			40	
CxO					<u>40</u>
	160	60	60	80	40
					400

Phase II

Evaluate contemporary purebreds, F,C,D, F₁'s; F,C F₂'s, 1/4 Finns.

<u>Ewe breed or cross</u>	<u>Ewes mated to terminal sire</u>	<u>Ewes mated in purebred or backcross matings</u>
O	48	40
F		40
C	?	40
F ₁ : F x O	48	?
C x O	48	?
D x O	48	?
F ₂ : F x O	48	
C x O	48	
1/4 F: (F x O) x O	48	
O x (F x O)	48	
	<u>384</u>	

*If backcross matings are to be included in Phase II, larger numbers of matings will be needed in these classes.

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Field Tests

30 each Finn x Ossimi and Finn x Rahmani rams will be distributed to 20-25 breeders at two locations, one in the North Delta (FxR) and one in the Mid Delta (FxO). An additional 5 rams of each cross will be tested at a University or Institute Farm. Ossimi and Rahmani rams will be compared with the respective F₁ rams in each location.

Management

Ewes at the experimental stations will be maintained under one level of feeding, with an attempt to make it representative of conditions prevailing on farms in the Delta. Level of feeding will be adjusted according to production status of the ewe or lambs.

The flocks will be mated on a schedule to produce three lamb crops in two years. In addition, a group of purebred prolific sheep will be bred once a year (September), and a group of Ossimi sheep will be run with rams year round as is the practice on farms. Data from these two groups will be compared with those managed for three crops in two years.

Lambs will be weaned at 8 weeks, or at 90-120 days in the case of lambs from the one crop a year system.

Ewes will be hand mated or single ram pen mated, to permit pedigreeing of all lambs.

Physiological Parameters to be Measured

1. Puberty
 - a. Age and weight at first oestrus
 - b. Consistency of oestrus up to one year of age
 - c. Ovulation rate (sample of each group)
 - d. Test of early mating performance in some of the breeding groups

2. Fertility and Prolificacy:
 - a. Day of mating and return to oestrus
 - b. Weight at mating
 - c. Lambing performance
 - d. Endoscopy on day 4-12 post mating on sample of at least 20 ewes per group
 - e. Embryo survival (lambs born in relation to ovulation rate)
 - f. Lambing interval

Data to be recorded on samples of ewes when feasible will include:

- g. Time of LH discharge
- h. Palpation of fetuses at 2 and 3 months plus ultrasonic pregnancy diagnosis
- i. Progesterone on days 10-12

Animals needed

30 Finnish ewes and 5 rams
40 Chios ewes and 10 rams

Equipment needed

- 2 motor vehicles and 1 truck
- 1 laparoscope for ovarian examinations
- 1 intravaginal electrical resistance meter for heat detection
- 1 ultrasonic apparatus for pregnancy diagnosis
- 1 dissecting stereo microscope for ovum recovery;
facilities for radioimmunoassay
- 2 movable scales and small sheep handling units
- 1 photocopier
- 1 electric typewriter

VIII - Proposed Prolific Sheep Research Project

Morocco

Institution: Institut Agronomique et Veterinaire, Universite Hassan II, Rabat, Maroc (IAV, Hassan II University, Rabat, Morocco)

Personnel: A. Lahlou Kassi, Department of Reproduction, F. Guessuos, Department of Animal Science

Location: Moghrane and Tadla Farms, Hassan II

Starting date: January 1, 1983

Duration: 8 years

Objectives:

1. Studies of pure prolific breeds
 - a. Characterization of the D'Man breed and development of plans for its improvement
 - b. Comparison of the D'Man, Finn and Booroola Merino breeds.
 - c. Study of the relation of reproduction parameters to hormonal patterns, within and between breeds.
2. Measurement of reproduction parameters including age at puberty, sexual season and prolificacy, and other production parameters such as survival and growth rate, in crosses of prolific and non-prolific local breeds, with the objective of developing more productive breeds for intensive production systems in Morocco.

Work Plan

1. a. D'Man breed
 - Analysis of existing station records
 - Survey of performance of subpopulations
 - Matings within the D'Man breed
 - Progeny testings of D'Man rams on ewes of non-prolific breeds, to test for the presence of a major gene(s).
- b. Import Finnish Landrace and Booroola rams and ewes, to establish purebred research flocks in Morocco. (If Booroola ewes are not available, Booroola rams should be imported.)
- c. Investigate hormonal feedback mechanisms between estrogens, inhibin, and gonadotropin hormones in relation to ovulation rate, seasonal activity and puberty.
 - (i) Study folliculogenesis in regard to ovulation rate in the pure prolific sheep.
 - (ii) Evaluate semen production and quality in rams of the pure prolific breeds in relation to age and season.

Mating Plan

Objective 1. For studies of pure prolific breeds, a minimum of 50 breeding age ewes per breed will be kept in one location and under the same management. One of the non-prolific local breeds (Sardi or Timahdite) will be included. Additional D'Man and local ewes will be needed for objective 1a.

Total no. ewes: 200-400. 50-150 local; 100-150 D'Man; 50 Finn; 50 Booroola, if available.

Objective 2. Crossbreeding evaluation.

Years 1 and 2. Produce contemporary local, D'Man and various F₁'s.

Rams	Ewes	
	Local	D'Man
L	70	35
D	35	70
F	70	70*
	175	105 (175)
		280(350)

Years 3-5. Produce contemporary local, D'Man, F₁'s, F₂'s, and 1/4 prolific ewes.

Rams	Ewes				
	L	D	D x L	F x L	F x D
L	50				
D	50	50			
F	50				
D x L	50		50		
F x L	50			50	
F x D	50*				50*
	300**	50	50	50	50
					400 (500)

Years 5+. Mate 50 of each of the following groups of ewes to terminal sires. Total 400-500 ewes.

- Local
- D'Man
- F₁'s: D x L
- F x L
- F₂'s: D x L
- F x L

*Optional groups.

**To have this number, need to mate much larger number of local ewes in years 1, 2 or purchase local ewes at weaning and raise in same flock.

F x D*
1/4 D, 3/4 L
1/4 F, 3/4 L
1/4 D, 1/4 F, 1/2 L**

Parameters to be measured:

As outlined by Physiology Committee, Prolific Sheep Workshop. Weights will be recorded at: birth, monthly to 6 months, 9 months, 12 months and at each mating.

Management:

The sheep kept for Objective 1 and Objective 2 may be in different flocks and different locations. Within each flock, all groups will be treated alike.

The purebred flocks for Objective 1 will be managed to produce 3 lamb crops in two years.

The flocks for Objective 2 will normally be managed for once-a-year lambing. At some time a sample of all groups, or of certain groups of particular interest, may be managed for three lamb crops in 2 years, for a period of at least 2 years and longer if possible.

IX - INDIVIDUAL COMMENTS ON PROLIFIC SHEEP RESEARCH (APPENDIX)

These are in preparation