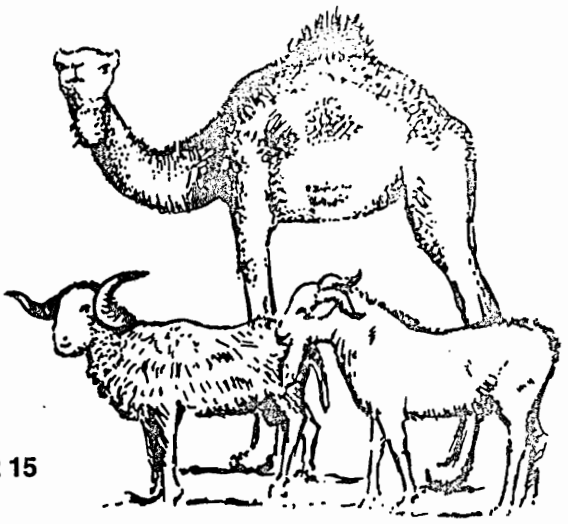
THE SMALL RUMINANT AND CAMEL GROUP



International Livestock Centre for Africa,
P.O. Box 5689, Addis Ababa, Ethiopia. Telephone: 18 32 15

No. 1 Date October 1984

This is the first issue of what will become a regular Newsletter and means of communication between scientists interested in research and development on small ruminants and camels. The establishment of a Small Ruminant Network has been talked about and discussed at ILCA for some time. In view of the importance of camels to many countries it was considered convenient to add these animals to the same network.

At its annual meeting in March 1984 the ILCA Board of Trustees gave formal approval for the Group within the Central Research Units structure at ILCA Headquarters in Addis Ababa. Currently the Group at Headquarters comprises one Principal Animal Scientist! However, a Research Assistant will be added in July and a further scientist will join the group in October. This last position is being made available through a secondment arrangement with the IEMVT at Maisons-Alfort on the outskirts of Paris. Additional finance is being actively sought through requests for special funding to various donor bodies.

The Group's objectives can be summarised as:

i. the encouragement of research on all respects of productivity of Goats, Sheep and Camels;
ii. providing help in the organisation of regional or national training needed to meet research objectives;
iii. the collection and collation of analysed data with a view to suggesting solutions to production constraints in the light of available results;
iv. to help national or regional organisations in the analysis of unpublished data on reproduction, growth and disease in the various ecological zones of sub-Saharan Africa and to relate these to prevailing nutritional and management conditions;

v. the development of a manual of survey techniques (including sampling procedures, sample sizes and diagnostic methods) for use in research, particularly in relation to traditional systems;

vi. helping to organise and to participate in national and regional research meetings and seminars with a view to improving the means of communication between researchers;

vii. publishing a Newsletter to disseminate information, research results and development experience and to maintain contact between researchers and officials;

The identification of existing national, regional and international research programmes on Small Ruminants and Camels will be one of the Group's first tasks. Once this is well under way it will be possible to identify, at least tentatively, gaps in existing research and to attempt to promote new research to fill these gaps or to extend current research to the same end.

To help fulfill these objectives help is needed from all recipients of this first Newsletter and from many other people besides. The success of the Group depends on your response and your collaboration. You should consider it as your Group, the main function of which is to help you keep in contact with fellow researchers and up-to-date with current developments. In this respect the Group will act as a clearing house. Pass the information contained in this Newsletter to as many people as you know who are interested in either Small Ruminant or Camel research and productivity.

Let us have a big response to this request for cooperation and information so that the Group can achieve its objectives. Its success depends on you.

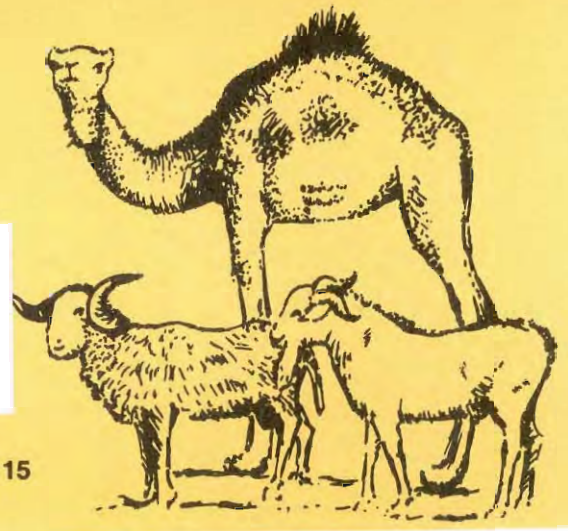
Yours sincerely,

R.T.W.

R T Wilson
Coordinator/Principal Animal Scientist
Small Ruminant and Camel Group

THE SMALL RUMINANT AND CAMEL GROUP

NEWSLETTER



International Livestock Centre for Africa,
P.O. Box 5689, Addis Ababa, Ethiopia. Telephone: 18 32 15

No. 2 Date February 1985

FIRST ISSUE OF NEWSLETTER SENT TO 57 COUNTRIES

The first modest attempt at a Newsletter for the group was sent to 229 specific addresses in 57 countries. Of these, 141 addresses were in 29 African countries, 24 in 15 other "developing" countries and 64 in 13 "developed" countries.

NEW ANIMAL SCIENTIST JOINS GROUP

Mr. Daniel Bourzat has been seconded from the French Institute of Tropical Veterinary Medicine (IEMVT) to the Small Ruminant and Camel Group for a period of two years. Mr. Bourzat brings with him six years' field experience from Burkina Faso and considerable competence in computerized data processing. His addition to the Group will also make contact with francophone members much simpler.

In addition to helping generally with the work of the group, Mr. Bourzat is currently compiling a monograph on the West African Dwarf Goat. Information, of even a preliminary nature, on the Dwarf Goat would be very useful for this project and the help of all members in providing this is solicited.

ZIMBABWE ANIMAL SCIENTIST SPENDS STUDY LEAVE WITH GROUP

Mr. Bright Mombeshora of the Farming Systems Research Group, Research and Specialist Services Department, Ministry of Agriculture, spent two weeks at ILCA Headquarters during January 1985. During his stay, Bright completed a preliminary report on livestock ownership and management in two Communal Areas of Zimbabwe which will shortly be published as a Group Document.

INTERNATIONAL CONFERENCE ON GOAT DISEASES

A conference on the diseases of goats was held at Niort in France from 9-11 October 1984. Pathology is considered to be one of the main factors limiting the production of goats but is one of the least researched subjects. This conference was therefore organised by the French National Agricultural Research Institute to bring together workers in the field of goat diseases in an attempt to summarise current knowledge and to indicate where gaps still remain to be filled. The conference had 15 themes of which the one on diseases in the dry and tropical zones was the most interesting to us. Nevertheless, there were useful papers in all the sessions and, as some of these had to be carried out concurrently, it was not always possible to hear and to be able to discuss all that one wanted to.

Dr. Adama Traore of the ILCA Arid and Semi-arid Zones Programme in Mali represented the Small Ruminant and Camel Group and presented the keynote paper in the session on dry and tropical zones. The paper, a joint effort by four ILCA staff, provided data on levels and causes of mortality from various zones and countries in which ILCA has been collecting data over a long period of time. Copies of the paper are available from us on request.

Other papers of direct African interest presented at the conference included: brucellosis in Egypt; mycoplasmas in Nigeria; general pathology in Ethiopia; peste des petits ruminants in Nigeria; and respiratory infections in Senegal. The Proceedings of the Conference run to 750 pages and contain the texts of the 89 papers which were presented. The Proceedings (Les Colloques de l'INRA No.28) are available, price 270 FF from Service des Publications, CNRA, route de Saint-Cyr, 78000 Versailles, France.

CREATING A NEW BREED OF SHEEP AT WAGENINGEN

The Swifter - named after the experimental station from where it has been developed - is a synthetic breed obtained by crossing Texel and Flemish sheep. The male Texel is used for his size and meat producing characteristics and the female Flemish, which is a sub-group of the north-west European milk sheep, for her prolificity.

The aims of the Swifter are to:

i) raise more lambs per ewe mated in once a year lambing;

ii) have easily managed ewes with few dystocia problems;

iii) produce fast growing lambs when back-crossed to Texel rams as terminal sires for meat production;

iv) give a carcass with similar qualities to that of the Texel.

A comparison of the reproductive characteristics of the two parent breeds and of the cross-breed shows:

Age (years)	Lambs born per ewe lambing		
	Texel	Swifter	Flemish
1	1.08	1.65	1.79
2	1.80	2.28	2.57
3	1.87	2.57	2.79

The Swifter is early maturing and at least 80 per cent of first year ewes are expected to lamb. Lambs are ready for slaughter at 46 kg at 160 days, 12 days earlier than Texel lambs. Lambs weaned per ewe lambing are 2.15 compared with 1.65 which gives a return to labour 58 per cent greater for the Swifter than for the Texel.

CAMEL RESEARCH UNIT AT THE FACULTY OF VETERINARY SCIENCE - UNIVERSITY OF KHARTOUM

Dr. Bakhari Musa writes to tell us of the activities of this group which will be happy to welcome regional and international scientists to the Group. Results of recent

research have been published in:

Vlaams Dier geneeskundig Tijddschrift 52(1983) : 255-268
Dtsch tieraztl. Wschr. 3(1984) : 94-96
J. Arid Environ 6(1983) : 265-268

Fifteen Sudanese researchers are currently working on aspects of health, reproduction and productivity; two students are being supervised for M.Sc. and two for Ph.D; and two assoiated German workers are investigating retention time and particle size in the rumen and in different parts of the digestive tract of camels.

BIOTECHNOLOGY AND RECOMBINANT DNA TECHNOLOGY IN THE ANIMAL PRODUCTION INDUSTRIES

The above was the title of a conference recently held in Australia. Specific sessions were devoted to: Biotechnology and Improvement of Animals; Applied Molecular Biology and Control of Diseases and Pests; Manipulation of the Ecosystem for Increased Productivity of Cattle and Sheep; Manipulation of Animals by Administration of "Hormones"; Improving the Plant and Soil Components of Livestock-Pasture-Cropping Systems.

The full proceedings are available as Reviews in Rural Science No. 6 published by CSIRO. Abstracts of some papers which appear of particular interest to Africa are given below.

THE BENEFITS FROM ELIMINATING PROTOZOA FROM THE RUMEN OF SHEEP AND CATTLE

S.H. Bird and R.A. Leng

Department of Biochemistry and Nutrition, University of New England, Armidale, 2350

The ruminants can survive and grow without a rumen ciliate population is now well established. However, whether or not rumen metabolism can be altered to the advantage of the ruminant through the removal of the ciliates remains an open question. Current research findings are discussed with

particular emphasis given to the effects of protozoa on (i) protein availability and (ii) fibre digestion in the rumen. Responses associated with defaunation are also discussed. From the known characteristics of the rumen ciliate protozoa and a consideration of the factors influencing microbial protein synthesis in the rumen, it is suggested that in the absence of the ciliates the amount of digestible protein flowing from the rumen is increased.

The role of ciliates in fibre digestion in the rumen is less clear. While many plant cell-wall degrading enzymes have been isolated in protozoal extracts, their importance in vivo has not been quantitated. Microbial interactions within the rumen, the influence of diet and changes in rumen environment associated with defaunation are discussed. On low quality diets removal of protozoa from the rumen allows the bacterial and fungal biomass to increase which has resulted in a five to ten-unit increase in digestibility of straw. Thus, defaunation should result in large increases in productivity of animals on low quality pastures. Defaunation has not resulted in consistent changes in ruminant production, however, dietary conditions under which positive responses to defaunation can be expected are identified and the practical application to grazing ruminants in Australia are discussed.

MOLECULAR BIOLOGY AND FOOTROT

John S. Mattick, Beau J. Anderson and John R. Egerton

CSIRO, Division of Molecular Biology and Sydney University, Department of Veterinary Clinical Studies

Footrot is a contagious disease of the feet of sheep and other ruminants. It is essentially caused by the gram-negative anaerobe. *Bacteroides nodosus*, of which there are at least eight major serogroups and a number of subtypes existing in the field. The major protective and serological antigens are associated with the fine surface filaments termed fimbriae (or "pili"). Current vaccines against footrot consist of mixtures of whole cells representative of the different serogroups of *B. nodosus*, and, although relatively effective, are sufficiently expensive as to discourage their widespread use of acceptance by the pastoral industry.

The objective of our collaboration programme is to develop a new, more economic (and perhaps more effective) vaccine against the disease using recombinant DNA technology, by the cloning and expression of the genes encoding the fimbrial antigens in a more suitable bacterial host. Such a program requires definition of the antigenic polypeptides, the identification of those variants most appropriate for inclusion in a (broad-spectrum) vaccine, and an understanding of the molecular genetics of fimbrial biosynthesis.

We have analysed fimbriae isolated from B. nodosus and found that there are in fact two distinct antigens associated with the structure: one is the structural subunit of the strand itself (mol. wt. about 17,000); the other (mol. wt. about 80,000) appears to be the basal protein which links the fimbriae to the surface of the cell. Both proteins exhibit electrophoretic and antigenic variation. This variation has been surveyed in the context of the serotypic classification system, by examining fimbriae prepared from the independent isolates classified within particular subtypes. Matrix western transfer analyses have shown that the primary serogroup-specific, and hence protective, antigen is the fimbrial subunit. The basal antigen varies independently of the serotypic system, and may contribute to the weaker cross-protective immunity sometimes observed between isolates from different groups.

The genes encoding the fimbrial subunit from the different B. nodosus serogroups have been cloned into Escherichia coli. Significant restriction site polymorphism and sequence divergence is evident in the fimbrial gene region. The subunit is expressed in the recombinant cells from an associated promoter within the cloned sequence, but is not assembled into fimbrial strands. The antigen is located in the cell wall/membrane fraction of the recombinant E. coli. For both immunological and practical reasons, it is necessary to obtain mature fimbriae on the cell surface, and our current research (in conjunction with the CSIRO Divisions of Animal Health and Protein Chemistry) is directed at achieving proper morphogenetic expression of the fimbriae in recombinant cells, by incorporating the other genes involved in fimbrial assembly, derived from B. nodosus itself or from a compatible system such as Pseudomonas aeruginosa.

THE PRACTICAL AIMS AND RECENT PROGRESS IN THE TRANSFER OF RECOMBINANT DNA TO RUMINANTS

K.A. Ward, J.D. Murray, C.D. Nancarrow, R. Sutton and M.P. Boland

CSIRO, Division of Animal Production, P.O.Box 239, Blacktown, 2148

Techniques for the isolation, characterisation and modification of individual genes are now well-established, which opens the way for the development of gene transfer as a way of modifying the genetic properties of animals. In the last few years, it has been shown that functional genes can be transferred to single-cell mouse embryos, and that when these embryos develop into adult mice, the transferred genes form an integral and functional part of the animal's genome. Such animals are trmed "transgenic'. In several instances, foreign genes have been able to alter the actual phenotype of the transgenic animal in which they are incorporated, and this suggests that it may be possible to alter the phenotypes of some of our important domestic breeds of animals by similar techniques of gene transfer.

The application of gene transfer by microinjection into embryos has proved to be more difficult in domestic animals than in mice, for several technical reasons. Firstly, the injection target is one of the pronuclei of the single cell embryo, and in larger animals, these are frequently obscured by layers of dense cytoplasmic inclusions which appear to be predominantly lipid in composition. Secondly, the embryos of domestic animals are more sensitive to the traumatisation of their zona pellucida than are mice, thus significantly lowering their survival after microinjection.

In this review, the current status of gene transfer in animals is summarised, and some experiments in the use of the technique for sheep are disucssed. These show some of the technical difficulties encountered with sheep, and evaluate several approaches taken in an attempt to circumvent them. In addition, the actual gene sequences which form the basis of the CSIRO sheep gene transfer programme are described. These include the sheep growth hormone gene, the genes of the cysteine biosynthetic pathway of E. coli, the wool keratin genes and sheep immunoglobulin genes. A discussion of the potential value of these sequences for improving the productivity of our domestic livestock is included.

MODIFICATION OF THE SEX RATIO

Ken C. Reed

Department of Biochemistry, Faculty of Science, Australian National University, Canberra, ACT 2601

Pre-determination of the sex of mammals has been a source of interest since the time of Hippocrates, but for the most part this interest has been more fanciful than discerning. Recent advances in our understanding of sexual differentiation have at last led to real possibilities for diverting its course.

The economic and scientific background to the most desirable means of manipulating the sex of livestock is well presented in the published proceedings of a recent symposium on "Prospects for Sexing Mammalian Sperm" (Amann and Seidel, 1982). Since that symposium, we have seen the development of the first experimental procedure that appears to effectively separate bovine sperm (Keeler et al., 1983), a procedure that is based on the ability of a Fluorescence Activated Cell Sorter to differentiate between the fluorescence signals generated by viable X- and Y-bearing sperm. Projected developments indicate that the technique may be available on a limited scale within the next few years.

More immediately, we are now in a position to rapidly and unequivocally determine the sex of foetuses in vivo or of embryos in vitro, prior to transfer, by screening small samples of cells with Y-specific DNA probes. With the growing adoption of embryo transfer as an acceptable means of producing quality stock, sexing fills an obvious gap and represents the first in what will undoubtedly develop into a battery of similar genetic tests used to characterise embryos in vitro.

In the distant future, embro culture and DNA-mediated gene transfer techniques will revolutionise livestock propagation. Such manipulations will undoubtedly focus initially on the alteration of genetic sex, but will lead ultimately to the manufacture of cloned animals with genomes sufficiently altered to give rise to entirely new strains.

This review will outline the diverse technical developments that are bringing each of these approaches nearer to fruition, highlighting areas of uncertainty and directions of future research.

References

Amann, R.P. and Seidel, Jr., G.E. (1982). Prospects for Sexing Mammalian Sperm (Colorado Assoc. Univ. Press, Boulder).

Keeler, K.D., Mackenzie, N.M. and Dresser, C.W. (1983). Flow microfluorometric analysis of living spermatozoa stained with Hoechst 33342. J. Reprod. Fertil. 68, 205-212.

ARTIFICIAL INSEMINATION OF GOATS

According to the Farming World Programme of the BBC, successful A.I. of goats is possible using frozen semen diluted with skim milk. Insemination apparently presents no problem. The inseminator places the goat's head between his legs, leans over her back and lifts her back legs up. He then crosses the legs over the belly of the goat (it is not clear whether the legs to be crossed are his own or the goat's) and then inserts the insemination gun into the cervix. The operation should take about 40 seconds.

Conception rates are said to be 54 per cent in does with induced out-of-season oestrus. Up to 60 per cent conception would be expected in natural oestrus does.

CAMEL PASTORALISM IN SOMALIA

Camel Forum Working Paper No.7 (Somali Academy of Sciences and Arts, P.O.Box 1228, Mogadisho, Somalia) presents the proceedings of a workshop on camel pastoralism held in Somalia in April 1984. The participants were mainly Somali researchers and herd owners. The workshop attempted to discuss current problems in camel husbandry in Somalia under three main headings, these being socio-economic, veterinary and nutritional aspects.

The workshop proceedings contain a very interesting article on "Oral Literature on Camels" (a contradiction in terms here - literature is by definition something that is written), the preliminary results of a slaughterhouse study

on reproduction and six other articles of differing quality and interest.

The workshop is one of a series of similar ones being sponsored by the Swedish Agency for Research Cooperation with Developing Countries which have either taken place already or are planned for the future.

RESTOCKING PASTORALISTS IN NORTHERN KENYA

In Isiolo, a semi-arid region in northern Kenya, several thousand ex-pastoralists belonging to the Boran tribe lost their herds of cattle and flocks of sheep and goats some years ago through drought and civil disturbance.

In the meantime, many of them sought work on the irrigation schemes that have been set up in the area by the government. Many of these schemes have not worked out as they had originally hoped, so the Boran are, once again, left without any income or support.

To encourage some of them back to their traditional way of life, OXFAM, with the help of the World Food Programme, have started a pilot re-stocking scheme, involving 70 families.

The package the Boran got was 35 female sheep of breeding age, 5 she-goats of breeding age, 7 male sheep and 3 male goats. This made a total package of 50 head of small-stock. They also get one year's supply of food to ensure that they do not sell any of the issued livestock to buy food. These livestock do not produce milk yet and the Boran will milk their sheep and goats.

This scheme is intended to try and restore the Boran to their pastoral economy. It is not a large package and really they need more than that. But they were given 7 male sheep, which are intended as store animals to be fattened for sale. So, in the second year, they will have large animals to sell to buy food.

The scheme has provided a dosing programme for the animals against worms and flukes and so on. They intend to get the Boran to agree to repay the cost of this; it won't be a free issue.

There are three assistants in the field, monitoring the exercise. They keep a record of what is happening. This is very important because OXFAM wants to keep track to see what the reproductive performance is on the flocks. Their survival is going to depend on that.

It is still very early to say how the scheme is working. There have been a few losses, which were expected. On the other hand, there have been quite a number of lambs and kids born. The veterinary cover given is going to be very important. It is hoped that other schemes can develop on these lines to help other pastoral people.

UREA SUPPLEMENTATION INCREASES SHEEP PRODUCTIVITY

The results of recent research work[a)] have shown that urea supplementation of lambing Merino ewes increased milk yield and lamb growth and survival rates in both pen and paddocks studies. These productivity gains occurred in a semi-arid environment characterized by poor reproductive efficiency in Merinos. In pens, urea supplements fed to latating ewes at the rate of about 12g day stimulated intake of poor quality pasture hay (0.9 per cent nitrogen) by about 30 per cent and increased total nitrogen intake by 100 per cent. Milk yield was improved by about 50 per cent and lamb growth rate by about 140 per cent. Sorghum grain supplements stimulated milk yield and lamb growth to a lesser extent than urea.

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a) Stephenson, R.G.A., Edwards, J.C. & Hopkins P.S. 1981 The Use of Urea to Improve Milk Yields and Lamb Survival of Merinos in a Dry Tropical Environment. Aust. J. Agric. Res. 32:497-509.

The correlations found in pen studies between nitrogen intake and milk yield of ewes (r 0.85; P 0.05), and between ewe milk yield and lamb growth (r 0.80; P 0.01), prompted further investigations under paddock conditions. Ewes grazing dry pastures and supplemented with urea (8-10g/day) via drinking water yielded more milk (11-32 per cent) than unsupplemented counterparts. Similarly, there were improvements in lamb growth (80-100 per cent) and survival (about 10 per cent) in the supplemented groups.

It has also been demonstrated[b)] that the uniform (6.4 - 8.3 grams/hd /day) and compulsory supplementation of urea in the drinking water is a practical consideration if water troughs are an important source of water. The ammonia concentration (10 mg per cent) of supplemented ewes suggested that urea provided sufficient nitrogen to ensure maximum rumen function.

As deficiency in rumen nitrogen is a major factor limiting intake and digestion of mature pasture grasses, the simple and accurate administration of urea under African conditions could form a useful subject for research and development not only to improve weight gains but also to decrease mortality.

CONTRIBUTIONS INVITED FOR THE NEWSLETTER

News and notes from Network members would be greatly appreciated for inclusion in the Newsletter.

R.T. Wilson
Group Coordinator

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b) Stephenson, R.G.A. 1983 The Operation and Reliability of Urea Dispensers to Supplement Sheep via Drinking Water. Aust. Rangel. J. 5:83-88.

THE SMALL RUMINANT AND CAMEL GROUP

NEWSLETTER

International Livestock Centre for Africa,
P.O. Box 5689, Addis Ababa, Ethiopia. Telephone: 18 32 15

No. 3 Date JUNE 1985

GOOD RESPONSE TO FIRST ISSUES OF NEWSLETTER

Letters are coming in from all over Africa and elsewhere expressing support for the Small Ruminant and Camel Group network and the Newsletter. The second issue went to 65 countries and over 300 addresses. Individual requests to be added to the network and kept informed of developments arrive by every postal delivery.

FOURTH SMALL RUMINANT CRSP KENYA WORKSHOP

The annual meeting of the SR-CRSP group in Kenya was held at Kakamega in Kenya's Western Province on 11 and 12 March, 1985.

The aims of the programme are: i) to develop and test a practical dual-purpose goat production system in order to improve the nutrition and income of small farm families, and ii) to train Kenyan, U.S. and other scientific and extension personnel. During 1980-1985, a total of 15 Kenyans were given university training to M.Sc. or Ph.D level and there are currently a further 7 undergoing such training.

The steps in the programme are:

I (1980-1983) - Characterisation of systems and start of component research

II (1983- ?) - Continue component research, initiate integrated multidisciplinary evaluation of it, and extend to farmer level.

III (1986- ?) - Extensive on-farm evaluation of dual-purpose goat production systems managed by farmers.

In the period 1980-1985, the programme has distributed about 80 goats to participating farmers and a further 80 goats will be available shortly. The dual purpose goat contains about 50-75 per cent Toggenburg blood at the moment but a composite breed with 25 per cent each of East African, Galla, Toggenburg and Anglo-Nubian is also being developed.

The annual CRSP meeting is principally a forum where programme staff present the results of the past year's work to each other, to "principal investigators" (senior American researchers, usually from U.S. Universities) and to a limited number of outsiders - which in 1985 included Kenya government extension personnel and ILCA and University of Nairobi scientists. Thirty-four papers with a total authorship of 136 persons were presented this year under the headings of: Dual-purpose goat production systems; Feed resources; Breeding; Animal health; Systems analysis; and Socio-economics.

Proceedings are published every year but these tend to take far too long to appear. Enquiries for this and previous years' proceedings can be addressed to SR-CRSP, Republic of Kenya, Ministry of Livestock Development, P.O.Box 252, Maseno, Kenya.

GOAT CROSS-BREEDING PROJECT IN ZIMBABWE

At Mzarabani, in the lowlands of northern Zimbabwe, a project to improve the small local but trypanotolerant goat has been in operation since 1982. The project aims to involve women in cooperatives - men were not very enthusiastic about the scheme - which will attempt to improve goat productivity by crossing the indigenous female goat with male Boer goats, by better management and by better nutrition. PhaseI is currently underway, this being a pilot scheme which is being managed by the Agricultural and Rural Development Authority. Phase II will involve a series of satellite villages, and a possible Phase III will hope to improve milk production.

The breeding season is limited to 6-8 weeks in April and May which ensures kidding just before the onset of the rains in October. The litter size has been improved from 1.2 kids per birth for indigenous

goats to 1.5 in the F_1 generation: the growth rate of these is 125-130 g per day compared to the 30-40 g of the foundation stock, both groups receiving some supplementary high protein concentrate. The pre-weaning mortality rate in the cross-breds is about 28 per cent compared with 5 per cent in the indigenous stock: it is hoped that better management will reduce the cross-bred mortality.

RWANDA DATA BEING ANALYSED IN COLLABORATION BETWEEN RWANDESE AGRICULTURAL RESEARCH INSTITUTE (ISAR) AND SMALL RUMINANT AND CAMEL GROUP

Mr. Theophile Murayi of ISAR was at ILCA Headquarters during April and May 1985 to participate in the analysis of research data and in the preparation of a preliminary report on the results.

Research into the productivity of local sheep and goats has been in progress at four research stations in Rwanda since 1971. Attempts have also been made to improve the local goat by crossing with Saanen, Alpine and AngloNubians. It was considered by the Rwandese authorities that a detailed analysis was now required in order to assess progress to date and to assist in deciding future lines of research. A total of 2099 sheep and 1815 goats are included in the analysis. Initial results show a large litter size of 1.4 lambs for the local sheep and exceptionally fast growth rates, under station conditions, for some of the cross-bred goats.

Further details of results will be provided in the next newsletter. The full analysis and recommendations will eventually be published as a Research Report in the main ILCA series.

GOATS AND SHEEP IN MOZAMBIQUE

Goats numbered 442 000 and sheep 118 000 in 1975 since when no census has been taken. Sheep numbers are considered to have declined recently due to the effects of drought. More than 80 per cent of sheep and 50 per cent of goats are in the southern part of the country. The management system is a sedentary agropastoral one, average flock size

being 10-15 head.

Major impediments to productivity are considered to be climatic variation, lack of dry season supplementary feed, the limited use of "improved" breeds or of superior genotypes of the local breed, and disease (including heartwater, parasites and the pneumopathies).

Initial research work compared the characteristics of the local sheep breed (Landim) with the Blackhead Persian. Since 1982, research has been the responsibility of the Institute of Reproduction and Animal Improvement of the Ministry of Agriculture. The objectives of this research are:

i) Selection of local breeds and distribution of improved types to the traditional sector.

ii) A study of the productivity of local breeds under intensive commercial management using locally produced feed resources.

iii) The possibilities of using artificial insemination.

iv) Improving meat and milk production of the local goat by crossbreeding with French Alpines.

The research is being carried out at Chobela Station with about 800 animals on 3000 ha. Some initial results will be presented at the "Small Ruminants in African Agriculture" Conference at ILCA Headquarters in October 1985.

CAMELS ON COMMERCIAL RANCHES IN KENYA

Four commercial ranches in the arid areas of Kenya are keeping camels as part of their policies of balanced use of range resources and increased output from the land. Camels were bought from Turkana, Somali and Gabbra herders in 1974 and have been added to since. Abortions were a problem in the early days but these are now much less frequent and familiarity of the owners with the camels appears to be leading to improved productivity.

First calving occurs at about 4½ years of age with subsequent parturition intervals being about 20 months. The first calving age is similar to reports from other areas. The parturition is shorter

than that recorded elsewhere and can probably be attributed to the relatively high plane of nutrition of these camels due to low stocking rates and also to the non-seasonal nature of the climate in upland equatorial Kenya.

MONOGRAPH ON THE WEST AFRICAN DWARF GOAT

Daniel Bourzat has just completed the first draft of a monograph on the West African Dwarf Goat.

Most of the literature used in this review was obtained from the ILCA library. Documents were also obtained from IEMVT at Maisons-Alfort and from the University of Wageningen. The review rather surprisingly shows that in spite of a goodly number of documents and publications relating to this type of goat knowledge of many aspects of its productivity remains scanty and incomplete. The monograph will first be published as a Group Document and we hope that network members, after reading it, will help us to fill some of the gaps with results of their own work.

CHARACTERISATION OF INDIGENOUS GOAT AND SHEEP BREEDS IN CAMEROON

The Institute of Animal Research (Institut de Recherches Zootechniques) of the Republic of Cameroon has launched an ambitious programme at its various research centres to characterise its indigenous breeds of livestock. The programme will cover breeds of all species including cattle, pigs, horses and donkeys, poultry and goats and sheep. Goat and sheep breeds are to be collected and studied at Mankon (North-west Province), Garoua (Northern Province) and Yagoua (Far North Province).

The only goat breed so far collected is the "Grassland Dwarf" at Mankon. Sheep breeds include the "Grassland Dwarf" and Fulani Bornu at Mankon, the Fulbe and "Sahel cross" at Garoua, and the Kirdi, Fulani Woila and Djallonke at Yagoua.

GROUP DOCUMENTS

A series of documents of a "working paper" type has recently been initiated by the SRCG. These documents will provide various kinds of information on results of work carried out by the Group or by the Group in collaboration with other organisations. Many will contain, in addition to the principal results, conclusions and recommendations, detailed information on methodologies (including the format of questionnaires and listing of analytical programmes) and tabulations of raw data.

The first document in the series, published in collaboration with ILCA's Arid and Semi-arid Zones Programme in West Africa, is entitled "Livestock Production in Central Mali: A preliminary study of backyard poultry production in the Niono area". A French version of this document will be available shortly.

Group documents can be obtained by application to the Head of the Group.

CAMEL PASTORALISM WORKSHOP IN KENYA

One of the proposed series of camel pastoral workshops (SRCG Neswletter N°2) was held in Marsabit, Kenya, from 2-6 April, 1984. A total of 19 people, including three camel owners, participated. Most of the participants have connections with the UNESCO/IPAL (Integrated Project for Arid Lands) programme. The fact that the meeting was held in the camel herding area rather than in the more accommodating atmosphere of Nairobi, was greatly commended by Northern Kenya politicians and administraters. The workshop proceedings were to have been published in August 1984 (no copy has yet been received by the SRCG) and should contain about a dozen papers, most of which refer to production and marketing aspects.

ASSISTANCE PROVIDED TO IRAZ

The Small Ruminant and Camel Group assisted the Agricultural and Livestock Research Institute (Institut de Recherches Agronomique

Zootechnique) of the Great Lakes Economic Community (Communaute Economique des Pays des Grands Lacs) to prepare research projects and protocols of research for presentation to the governing body of the Institute.

Mr. Augustin Bizimungu, Small Ruminant Specialist at IRAZ, spent a period of three weeks at ILCA during which detailed protocols were prepared for a regional research programme in the GLEC countries (Rwanda, Burundi, Zaire), and additional documents relating to IRAZ co-operation with the national research institutions of the countries concerned were also prepared.

These propositions were presented to the governing body of the Institute at Bukavu in Zaire during January 1985.

PRODUCTIVITY OF THE BURUNDI GOAT

A study is currently being made of the productivity of the Burundi goat (a local ecotype of the Small East African) at the University of Burundi under the direction of the Dean of the Faculty of Agriculture, Professor R. Branckaert.

Burundi is estimated to have 1.2 million goats capable of providing 1.7 kg meat per year per head of population. Results obtained so far at the University research farm indicate a litter size of 1.75 young with approximately 34, 57 and 9 per cent of all parturitions being singles, twins and triplets respectively. Primiparous females have a smaller litter size of about 1.3 young. The interval between successive kiddings is about 213 days leading to an annual reproduction rate (litter size x 365/parturition interval) of 3 kids per female per year. There is no marked seasonality in the number of births, kids being dropped throughout the year.

Birth and weaning weights according to sex and type of birth are given in the Table.

Mean growth rates to weaning are about 66g/day for singles and 59g/day for young from multiple births. Postweaning growth is 47 g for singles and about 35 g for multiple births. Weight at first conception at about 11 months is 17.3 kg and at first parturition is

Type of birth	Sex	Weight (kg)	
		Birth	Weaning
Single	Male	2.29	10.02
	Female	2.15	9.74
Twin	Male	1.96	8.45
	Female	1.92	8.10
Triplet	Male	1.57	6.80
	Female	1.26	8.07

23.5 kg. The dressed carcass weight at 10 months of age for single-born animals is about 49 per cent.

RANGE AND LIVESTOCK IMPROVEMENT PROJECT, YEMEN ARAB REPUBLIC

This project is at Dhamar in the central Montane Plains of the Y.A.R. It is currently carrying out programmes with the aim of improving the Dhamari fat-tailed sheep initially through selection within the project's own flock. The flock is constituted from locally purchased sheep and is constantly being expanded by new purchases. A limited amount of research is also being carried out on mineral nutrition in relation to phosphorus and magnesium and on the incidence of disease. Both of these last two sub-projects are being carried out in collaboration with the Veterinary Services.

Additional aspects being studied are the local husbandry systems especially in regard to housing and grazing management.

The project is looking for suitable opportunities for short periods of field training for its staff. This must be in an Arabic language country. Offers of training would be greatly appreciated and should be sent to: The Project Manager, Range and Livestock Improvement Project, P.O.Box 87180, Dhamar, Yemen Arab Republic. A copy of any such offers should also be sent to the SRCG at ILCA.

OFFICE INTERNATIONAL DES EPIZOOTIES

At the 6th Conference of the OIE Regional Commission for Africa (held in Harare from 22-25 January 1985), the increasing importance of goats and sheep was given recognition.

Daniel Bourzat of the SRCG presented* the position paper on small ruminants. Following the presentation, the Conference made the following Recommendation in relation to development of the Small Ruminant sector:

CONSIDERING

The recommendations of the 4th Conference of the OIE Regional Commission for Africa held in Rabat in 1980

The dramatic decline in natural pastures

The main changes occurring in traditional animal production systems

The production potential of African breds of small ruminants

THE OIE REGIONAL COMMISSION FOR AFRICA
RECOMMENDS THAT

1. When livestock projects concerning small ruminants are presented, special attention should be paid to the collection of statistics.

2. Projects involving intensification of production should only be formulated after consultation between research workers, development experts, livestock owners and veterinarians.

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* The paper was prepared by Dr. Landais currently attached to Agricultural Sciences Research Institute in Senegal who was unavoidably absent.

3. Research into pathology, nutritional and management aspects should be encouraged.

4. Genetic improvement should be considered as an advanced step towards the process of intensification.

SMALL RUMINANT RESEARCH AT UNIVERSITY OF ZIMBABWE

The Department of Animal Production at the University of Zimbabwe is paying more attention to Small Ruminants than previously. In addition to survey and monitoring work in the Communal Areas (the traditional small-scale system as opposed to the large-scale Commercial Areas), it has research programmes, or plans to have them, on several aspects of goat and sheep productivity. These include: monitoring of reproduction in the local fat-tailed sheep; the relationship between body weight and body composition in sheep with a view to selecting against fat deposition in favour of lean muscle; possible cross-breeding of sheep for lean meat production (although Dr. Duncan Hale, Chairman of the Department, considers that there is sufficient genetic potential in the local breed for long-term cross-breeding to be unnecessary); improvement of litter size from the present 1.5 lambs per birth; and the genetic resistance to internal parasites, particularly Haemonchus contortus. With goats, research will initially concentrate on aspects of growth and the potential for improving it; the effects of nutritional plane on post-partum oestrus; and the effects of season on the oestrus cycle independently of nutritional status.

Two research assistants registered for advanced degrees are currently working on: the effects of nutrition of female goats at various stages of pregnancy on pre- and post-natal growth of the young; and feeding behaviour of goats on the open range in relation to quantity and quality of food fed during night paddocking.

BLACK BEDOUIN GOATS IN KENYA

The FAO Kenya Goat and Sheep Development Project (started in 1972) imported Black Bedouin goats from Israel in 1981. This is one

of several breeds of goat (and sheep) which have been introduced during the course of the project with a view to improving the productivity of Kenya indigenous strains.

The goats are kept at the Naivasha research farm in a 600 mm rainfall area, are watered twice a day, have free access to Cynodon dactylon pastures and are given routine veterinary treatment including vaccination against Clostridium and hoof trimming.

Over a three-year period, there have been about 600 kiddings all giving rise to singles. Young does are mated at about 15.5 kg (estimated to be 75 per cent of mature weight) at 13 months of age. Kid birth weight from primiparous does is said to be 2.18 kg and average weaning weight 7.82 kg at 120 days. Total milk yield under free range conditions is 0.32 kg per day with a fat content of about 3 per cent. Milk yield has been greatly increased (attaining 1.2 kg per day at about the two-month stage of lactation) by feeding 0.3 kg of concentrated Dairy Meal.

Although the total milk yield is low, it is said to be 0.048 kg per kg metabolic body weight, this being superior to AngloNubian yields (0.028-0.037 calculated on the same basis) from a number of tropical countries.

TREATMENT OF STRAW WITH UREA

Trials on this subject were carried out by the "Centre d'Appui Zootechnique" (CAZ) in Ouahigouya, Burkina.

The quality and quantity of natural pasture is inadequate to feed the large numbers of ruminants kept in the intensive agro-pastoral systems of the sudano-sahelian zone.

Studies on the local ecology and nutritional analyses show that pasture is inadequate for at least 3 months each year. During this period, the animals suffer a severe feed stress aggravated by lack of adequate water supplies.

The density of the fodder tree population (Acacia albida in particular) is much too low to rely on browse as a possible remedy.

As agriculture is highly intensive, the potential of crop by-products, particularly straws from cereals such as sorghum, millet and rice have been considered as an additional food supply.

Traditionally, the local farmers and breeders collect and store haulms from leguminous crops and straws from cereals immediately after harvest. Unfortunately, the method of collecting and distributing the straw (which has a very low energy content and almost zero protein) leads to very poor consumption levels of only about 8 to 15 per cent.

Considerable work has been done on the ways of improving straws by treating them with ammonia, urea or soda. In view of the large quantities of these products readily available and the ability of the Sahel breeds (zebu, sheep and goats) to use urea, we have conceived and carried out several sets of feed trials both on sheep and cattle.

These various trials have enabled us to suggest:

- an original method for treating straws, adapted to the area;
- economic rations for the feeding of ruminants during the hot dry season.

DESIGN OF THE SILO

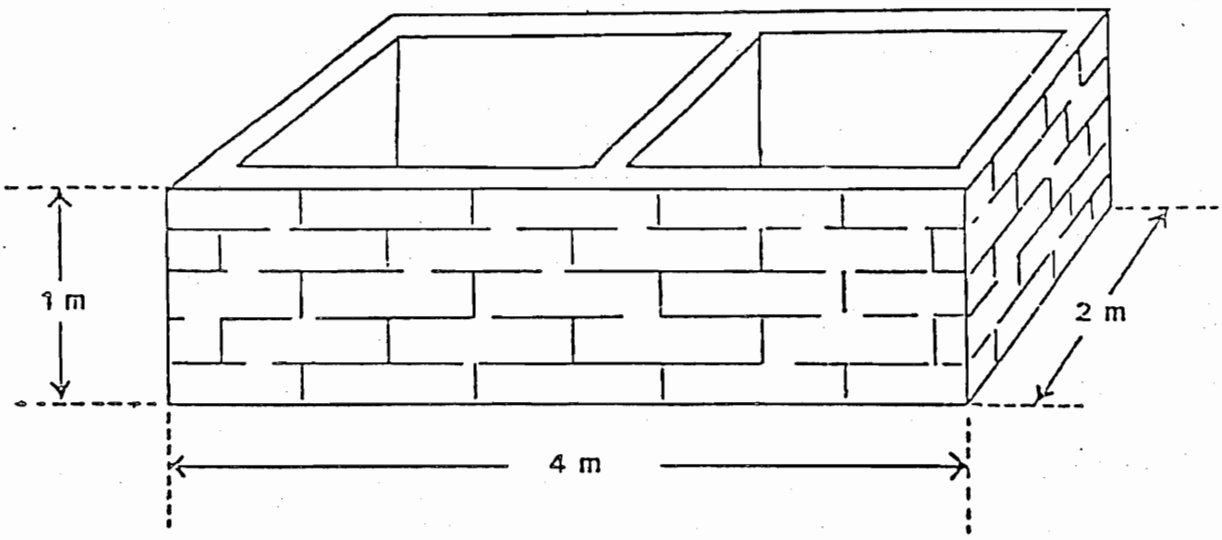
The silo had to be both cheap to build and large enough to treat and store sufficient quantities of straw to supplement two oxen and some fifteen sheep during 100 days (end of the hot dry season and the early rains period). These quantities amount to 600 kg of treated straw.

Our design was made up of two compartments of $4m^3$ each (to contain 300 kg straw) built with sunbaked bricks (banco) and covered inside with a mud plaster. A small amount of salt (NaCl) was added to the plaster to prevent damage by termites. We had to ensure that the silo was permeable to avoid any concentration of liquid urea at the bottom.

In terms of costs, manpower was the only input required to build this silo. The dimensions selected were 2m x 2m x 1m for each compartment (see diagram).

FILLING THE SILO AND TREATING THE STRAW

The straw was treated by sprinkling the liquid urea onto it,



a technique easily implemented in village conditions.

For each $4m^3$ compartment, the farmer prepares 300 kg straw, 300 l water and 42 kg agricultural urea, equivalent to 19.3 kg N (6.5% N/kg straw). The straw is arranged in regular layers approximately 10 cm thick. The urea is dissolved in water and sprayed with watering can. It is important to saturate the upper layers and to compress the straw at each stage of the operation. When this work is completed, the top of the silo is covered with a layer of dry straw and covered with ovelapping bricks. The contents of the silo can be used after 4 weeks. Every time straw is taken out, the silo must be sheltered from the sun by a canvas or straw cover to avoid excessive moisture losses. The second compartment is filled when use of the first one starts.

NUTRITIONAL VALUE OF THE TREATED STRAW AND EVALUATION OF LOSSES

The tables show the variations recorded for the various forage components during the 4 weeks of curing. As the number of samples

Changes in nutritional value of sorghum straw treated with liquid urea (IEMVT lab.)

Values	Samples					
	Untreated straw	Ensiled treated straw				
		D + 0	D + 11	D + 18	D + 25	D + 31
Dry matter (%)	92.92	93	70.45	71.37	57.14	87.6
Organic matter (% DM)	93.08	91.8	85.65	86.21	91.14	95.07
Crude protein (N x 6.25)	3.12	30.4	28.88	16.87	18.34	34.78
Crude fibre	32.05	32.25	24.37	33.88	35.59	27.64
Nitrogen free extract	55.92	27.4	30.84	33.76	35.53	30.13
Soluble N	0	81.3	76.56	70.39	72.39	84.10
Ca	0.53	0.5	0.67	0.27	0.33	0.38
P	0.13	0.05	0.15	9.09	0.06	0.05
K	1.68	1.32	0.84	1.72	2.49	0.92

Changes in nutritional value of rice straw treated with liquid urea

Values	Samples					
	Untreated straw	Ensiled treated straw				
		D + 0	D + 11	D + 18	D + 25	D + 31
Dry matter (%)	92.98	51.5	45.3	42.06	48.6	
Organic matter (% DM)	86.68	86.22	87.09	87.33	88.13	
Crude protein (N x 6.25)	6.75	20.72	22.39	31.23	18.87	
Crude fibre	37.43	36.46	37	36.04	39.71	
Nitrogen free extract	39.91	27.95	26.48	18.67	28.13	
Soluble N	0	79.70	79.0	86.99	75.75	
Ca	0.33	0.33	0.27	0.34	0.26	
P	0.06	0.05	0.06	0.07	0.04	
K	2.40	2.34	2.02	2.05	2.19	

was small (due to despatching difficulties to the laboratory) and the samples were not sufficiently representative (it was particularly difficult to sample sorghum straw), we were unable to draw conclusions on the changes in forage nutritional value over the month. It seems that the DM content dropped during the storage period (as the straw soaks in the moisture) and increased when the silo was opened (evaporation).

Treated straw contains considerably more crude protein (23-25 per cent) than untreated straw. Since untreated straw contains 3-6 per cent crude protein, the treatment contributes another 20 per cent CP/100 kg DM or 32 g N/kg DM. The total contribution of urea is estimated at 70.6 g N/kg DM. Seepage losses are about 46 per cent.

BIBLIOGRAPHY

Recent publications

- An article by L. Ngere, I. Adu, I. Okubanuo, published in the No.3/1984 issue of Animal Genetic Resources Information under the title "The Indigenous Goats of Nigeria".

  The authors describe three breeds of goats found in Nigeria: the Sahel breed, the Red Sokoto breed and the West African Dwarft breed. Some performance figures of the last two breeds are presented as tables.

- A monograph published in the Revue d'Elevage et de Medecine Veterinaire des Pays Tropicaux (1984, No.27) written by a group of INRA and IEMVT scientists: P. Chemineau, Y. Cognie, A. Xande, F. Peroux, G. Alexandre, F. Levy, E. Shitalou, J. M. Beche, D. Sergent, S. Camus, N. Barre, J. Thimonier; title: "Le 'Cabri Creole' de Guadeloupe et ses caracteristiques zootechniques: monographie". This article reviews the main characteristics of the "Creole goat": phenotypes, cartotype, gamete production and sexual activity of males and females, gestation period, post-partum anoestrus and puberty, prolificity, milk production, behaviour of dams, kid mortality and growth, carcass yield

and composition, induction of ovulation by the "male effect" of vasectomised breeds. The most common internal parasites are identified, as well as heartwater and bluetongue.

This article shows that the "Creole goat" could well be a distant relative of the West African dwarf goats.

NOTE

If your address is incorrect or if a colleague would appreciate receiving a copy of this Newsletter, please fill in the form below.

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THE SMALL RUMINANT AND CAMEL GROUP

NEWSLETTER

International Livestock Centre for Africa,
P.O. Box 5689, Addis Ababa, Ethiopia. Telephone: 18 32 15

No. 4 Date October 1985

NEWSLETTER LEADS TO EXPANSION OF GROUP INTERESTS

The favourable response to the first issues of the SRCG Newsletter has continued. Following the third Newsletter and an announcement in ILCA's main Newsletter of the formation of the Group letters from individuals, national and international organisations and universities continue to arrive daily. There are now more than 500 names on our list in some 70 countries.

CONTACTS OF THE SRCG WITH AFRICAN NATIONAL RESEARCH ORGANISATION

Cameroon: During a visit to Cameroon in late March 1985, R.T. Wilson had discussions with the Director-General and the Deputy Director-General of the Livestock Research Institute (Institut de Recherches Zootechniques, IRZ) and was also able to visit most of the Institute's research stations. The Institute has just started an ambitious research programme which aims to characterise the local races of all domestic species both on station and in the traditional systems of management.

Following discussions with the DG and with Heads of research stations, the SRCG is preparing a working document on "Research Protocols for Small Ruminants" covering research both on station and in villages. Samples of questionnaires relating to the system as well data sheets for animal performance have been designed and will be an integral part of the document. It is hoped that additional discussions with the Cameroon authorities and our colleagues there will lead to further collaboration.

Djibouti: In late May, D. Bourzat spent a week in Djibouti where he had discussions with senior technical staff of the Livestock and Fisheries Department and also with the FAO Desert Control Project. The low rainfall with wide variations in its distribution results in migratory movements of stock over longer or shorter distances which in turn mean that stocking rate varies tremendously. A knowledge of these movements and stock densities is a necessity for good resource planning and in fact a census of stock is considered to be an important task of the Livestock Department.

The SRCG has helped so far by outlining how a preliminary census might be carried out and has designed questionnaire forms suitable for use in Djibouti.

SMALL RUMINANTS IN THE NIGERIAN SUB-HUMID ZONE

The following information has been provided for the Newsletter by Wolfgang Bayer, formerly an animal scientist with the ILCA Sub-humid Zones Programme in Kaduna.

Holding size and demography

A single-round survey of smallholder goat and sheep production was carried out in three case study areas between March and October 1984. Tables 1 and 2 show the structures of holdings in two of the villages. Although no ducks were recorded in Ganawuri, many ducks were in fact seen: it is probable that the ducks did not belong to household heads, who were the people interviewed, and therefore were not recorded. (Editor's comment: note this point - it can be very important in designing and executing surveys).

Flock structures are presented in Tables 3 and 4. As is common in African village flocks (e.g. Wilson 1980, 1984), males accounted for 25-30 per cent of the total number of small ruminants. The percentage of males in sheep flocks was slightly higher than in goat flocks, and males above one year of age were more common in sheep than in goat flocks. This can be largely explained by the desire of the Muslim Fulani to retain male sheep for religious festivities. Among both sheep and goats, the percentage of breeding females, defined here as females over 12 months

of age, was around 50 per cent, which is fairly typical for African village flocks (Wilson 1980, 1984).

Table 1 Livestock holdings of crop farmers in Kameru Kaje (sample size 39 interviewees)

Species	Households with species		x[a)]	s
	n	%		
Goats	39	100.0	6.6	5.50
Pigs	29	74.4	3.0	2.25
Sheep	1	2.6	2.0	-
Chickens	33	84.6	25.1	15.90
Ducks	9	23.1	5.6	6.10
Guinea fowl	1	2.6	8.0	-
Dogs	31	79.5	1.5	0.60

Note: a) of households owning

Table 2 Livestock holdings of crops farmers in Ganawuri (sample size 41 interviewees)

Species	Households with species		x	s
	n	%		
Goats	38	92.7	5.2	2.71
Pigs	5	12.2	1.4	0.90
Sheep	5	12.2	7.6	4.90
Chickens	37	90.2	9.9	2.71
Dogs	30	73.2	1.5	0.60
Cats	8	19.5	1.0	0
Horses	9	22.0	1.2	0.44
Cattle	4	9.8	40.8	24.50

Note: a) of households owning

Table 3 Structure of goat flocks kept by crop farmers in Kumeru Kaje and Ganawuri

Village	Kameru Kaje			Ganawuri		Total		
Age class	Male (%)	Castr. (%)	Female (%)	Male (%)	Female (%)	Male (%)	Castr. (%)	Female (%)
0-3 months	12.5	-	15.0	11.5	7.8	12.1	-	11.6
3-6 "	1.7	-	3.3	6.9	9.7	4.2	-	6.3
6-12 "	1.7	-	6.7	6.9	7.8	4.2	-	7.2
12-24 "	3.3	3.3	4.2	2.8	12.2	3.1	1.8	8.7
24-36 "	1.2	1.2	19.6	0.5	18.4	0.9	0.7	19.0
36-48 "	-	-	17.5	-	8.3	-	-	13.1
48-60 "	-	-	5.8	-	3.2	-	-	4.9
60-72 "	-	-	-	-	0.9	-	-	0.4
over 72 mo.	-	-	-	-	2.8	-	-	-
Total (%)	20.4	4.5	75.0	28.6	71.4	24.3	2.4	73.3
Total no. of goats	240			217		457		
% breeding females (over 12 mo.)	50.0			46.1		48.1		
Ratio Males>12 mo. / females>12 mo.	1 : 10.9			1 : 14.3		1 : 12.2		

Table 4 Structure of sheep flocks kept by pastoralists in Ganawuri and Abet

Village	Ganawuri		Abet		Total	
Age class	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)
0-3 months	7.3	9.1	7.8	3.9	7.6	6.3
3-6 "	6.8	4.5	7.4	4.7	7.2	4.6
6-12 "	2.7	7.7	11.3	8.2	7.4	6.3
12-24	7.7	17.3	5.9	12.1	6.7	14.5
24-36 "	4.1	10.5	-	15.2	1.9	13.0
36-48 "	-	4.5	-	6.3	-	5.5
48-60 "	-	5.9	-	7.0	-	6.5
60-72 "	-	3.6	-	3.9	-	3.8
over 72 mo.	-	8.2	-	6.3	-	7.2
Total (%)	28.6	71.4	32.4	67.6	30.7	69.3
Total no. of sheep	220		256		476	
% breeding females (over 12 mo.)	50.0		50.8		50.4	
Ratio Males 12 mo. / Females 12 mo.	1 : 4.2		1 : 8.7		1 : 5.8	

Fertility

Fertility calculations depend on definitions. In the present survey, females over 12 months of age were regarded as 'breeding females', and 'dam years' were defined as age of dam minus one year. It was assumed that a dam estimated to be 4 years of age was actually 48 months old or, substracting 12 months, 3 dam years.

In the case of goats, the number of offspring per dam year was considerably lower than found in other studies of West African Dwarf goats. For example, in goats kept under village conditions in the humid zone of Nigeria, Mack (1982) found a reproductive performance of 2.2 kids per doe year and 1.5 kids per parity. The major difference in number of offspring per doe year between the findings in the humid zone and those of this study in the sub-humid zone is in the lower number of parities per doe year.

The Yankasa sheep in the sub-humid zone survey were less prolific (1.2 lambs per ewe year) than the West African Dwarf sheep (1.5 lambs per ewe year) studied in the humid zone (Mack, 1982) but were slightly more prolific than the Yankasa sheep studied under station conditions in northern Nigeria, in which Adu & Ngere (1979) recorded a lambing percentage of 110-112 per cent, or 1.1 lambs per ewe-year.

With a view to improving productivity by improving fertility, there appears to be more scope in goat than in sheep flocks. The present survey did not reveal reasons for the low number of births per doe year; however, it may be that tethering and the consequent separation of male and female animals during the wet season may restrict birth rates.

Mortality

In this analysis of mortality, only the fate of offspring as recalled by the interviewees was considered:

Species	Village	% Mortality
Goat	Kameru Kaje	17.0
Goat	Ganawuri	25.2
Sheep	Abet	28.1
Sheep	Ganawuri	28.1

These figures include all offspring of existing dams, irrespective as to whether the offspring died as kids or lambs (pre-weaning) or as adults. Therefore, the results cannot be directly compared with figures of pre-weaning mortality or viability from other studies.

These mortality figures indicate a serious problem in small ruminant production in the study areas. Since a reduction in mortality would greatly improve overall productivity, veterinary research into causes of mortality is required and a veterinary package should be designed and tested in smallholders' flocks in the sub-humid zone.

Sales, slaughters and transfers

An initial analysis of only the fate of offspring yielded the following pattern of offtake expressed in percentage of total offspring:

Species	Village	Sold	Slaughtered	Transferred out of flock	Total offtake
Goats	Kameru Kaje	42.3	0.5	5.2	48.0
Goats	Ganawuri	21.4	0.4	0.4	22.2
Sheep	Abet	15.9	3.3	0	19.2
Sheep	Ganawuri	18.2	1.0	0.4	19.6

There was little difference in sheep offtake between Abet and Ganawuri. The very high number of goats extracted from the Kameru Kaje flocks may reflect some hidden mortality (emergency sales) but may also be a reaction to the poor harvest in 1983 insofar as livestock had to be sold to purchase foodstuffs. It was, indeed, stated several times in Kameru Kaje that goats were sold for this reason. As was also found among the Abet households included in the production monitoring study, the Kameru Kaje farmers also sold some goats to buy fertilizer for their crops.

In the case of Ganawuri, a more detailed analysis was made of the origin of goats. Out of the 217 animals in the flocks covered by the survey, 28 had been purchased, 2 received as gifts, 9 received as brideprice payments and 6 transferred in to be kept for an owner not resident in the household. Thus, 20.7 per cent or one out of every five animals in the flocks were of external origin. If animals below six months of age

are excluded (since only animals above six months of age were of external origin), then 25.7 per cent or a quarter of the animals were not bred within the herd. This indicates a high turnover in goat-keeping in the Ganawuri area, with a high number of sales and purchases as well as transfers in and out of the flocks.

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A CAMEL DAIRY IN LIBYA

Mr. Stewart Macfarlane, for many years a Principal Livestock Officer and sometime Acting Chief Veterinary Officer in Tanzania, more recently of Libya, has sent us the following information on a camel dairy in Libya.

A farmer near Benghazi managed about 500 hectares on the "Australian Dry Land" cropping system. This involved the rotation of barley with lucerne or medicago alternating annually. The lucerne and medic once established, could survive a barley crop superimposed on them every second year, coming away nicely under sprinkler irrigation after the barley was harvested, lying dormant over winter, and coming away again with the warm March/April rain and not requiring irrigation until mid-dry season in July/August.

The farmer kept a milking herd of 150 Jerseys and followers to supply milk to Benghazi but, because he liked camels and had access to

a specialised market in Benghazi for camel milk, also kept and milked (once a day) a herd of around 30 mature female camels and followers. They were grazed on the lucerne and medic behind an electric fence from March until December, grazing being supplemented with about two kilos of barley grain fed at milking time (early morning). In winter, they were allowed to wander around common land on the outskirts of Benghazi to pick up what they could and to keep them off the sown barley (October/November) and the lucerne/medic, which tended to puddle in the wet winter. They were fed baled lucerne hay and barley straw, apparently ad lib, in a night enclosure. The fields were well supplied with piped, trough water and he fed the barley supplement mixed with a "handful" of a high salt, mineral mixture.

Camel calves ran with their dams until about 10 months of age. Milking was done by hand as the calf suckled. Milked once a day with calf at foot, I have personally recorded between 4 and 10 litres. The farmer reckoned he sold 100 litres of milk per day, every day, in Benghazi. Females first calved around 4-5 years and subsequently every 18-24 months. Young males (uncastrated) met a ready sale for meat, along with aged females. The farmer reckoned they weighed 350 kilos. I hesitate to express an opinion, as we arrived at this figure by comparing their weight with a Jersey cow. During my period of association with this camel herd, we experienced no health problems. No vaccines or anthelmintics were used. There was some untyped mastitis which cleared up with intramammary antibiotics. The teat appeared to have two or three openings, all communicating with the gland.

SHEEP IN FRANCE

France has 12 million sheep of which 7.5 million are in the breeding flock. There are 159 000 individual enterprises with an average holding of 47 ewes although more than half of producers have less than 20 ewes and own less than one-tenth of the national flock.

Production is of the order of 173 000 tonnes of meat, 20 000 tonnes of wool and 20 000 tonnes of cheese. Income from wool is only 2-3 per cent of total sheep returns. Meat production is insufficient to meet

internal demand (4.2 kg/person/year) and about 25 per cent of consumption has to be imported from the EEC's main producer, the United Kingdom. Management for out-of-season production, spongeing and hormonal aids to breeding are features of intensive sheep production as are A.I., group breeding schemes, preventive medicine and measures to increase productivity in difficult areas. Production of lamb per ewe per year is 19 kg (U.K. = 21 kg).

More than two-thirds of the national flock are in the southern part of the country. Approximately 40 breeds are recognised, 23 per cent of these being "unimproved" types, 7 per cent are Merinos, 12 per cent milk breeds, 10 per cent grazing breeds used for crossing to the 13 per cent early maturing breeds which are the terminal stock for meat production.

(Abstracted from U.K. Farmers Weekly, 10 May 1985).

RECENT LITERATURE

Bernadet, P. 1984 Association agriculture-élevage en Afrique. Les peuls semi-transhumants de Côte d'Ivoire. (Paris, Published by "Harmattan" in their series "Alternatives Paysannes"), 235 pp.

The author is a sociologist at the Centre National de Recherche Scientifique in France. In this book, he outlines the particular way of life of Fulani herdsmen who have recently settled among the indigenous people of northern Ivory Coast. The author considers that the spread of agriculture in savanna areas is directly related to the disappearance of client groups under the colonial administration and the preoccupation of herders with management rather than with more menial tasks. Recent Fulani movements are considered to result from the same process.

Paradoxically, agricultural intensification appears to be a result of herders becoming less mobile (from whatever cause) rather than to expansion by agriculturalists.

Lefèvre, P.C. 1983 La variole ovine (clavelée) et la variole caprine |sheep & goat pox| (Paris, Published by IEMVT), 171 pp.

This is essentially a review of 235 references. After a general introduction (history and distribution of the diseases and the animals affected), the author describes the viruses and remarks on the differences between different types in behaviour and pathogenicity. He emphasizes, however, that there is only one antigenic type of each virus. This uniqueness coupled with a long antibody - effective time is of considerable interest.

Following a description of clinical effects and the epidemiology of the virus, the author shows what treatments of affected animals are possible and develops prophylatic regimes for countries where the disease is absent - to prevent its introduction - and in countries already infected (in order to eradicate it). The different types of vaccines are described at the end of the book.

Pugliese, P.L. 1983 Les graines de légumineuses d'origine tropicale en alimentation animale (Paris, Published by IEMVT) 186 pp.

This well-referenced work is an attempt to synthesize what is known about tropical legume grains currently used or with future possible use in animal nutrition.

Sections cover: groundnuts, soya, *Dolichos lablab*, velvet bean, horse gram, winged bean, kidney or French bean, Lima bean, mung bean, cowpeas, the Congo groundnut, pigeon pea, common vetch, locust bean and the carob. Each section has information on the probable origin, present distribution, principal floristic, botanical and agronomic characters, chemical composition and toxic and/or anti-nutritional factors.

SMALL RUMINANT PRODUCTIVITY IN BURKINA FASO

Following an agreement between the ILCA Arid and Semi-arid Zones Programme in West Africa and GTZ in Burkina, a study of small ruminant productivity was undertaken in northern Burkina from May 1983 to May 1985. After an initial rapid survey to establish ownership patterns and demographic structure of the flocks, a detailed study was undertaken over a two-year period in order to establish the major production parameters relating to breeding, growth and mortality.

In total, at four different sites covering sedentary and transhumant systems of management, the animals of 47 households with sheep and 34 households with goats were systematically followed. About 3000 animals were recorded during the study. Data relating to these animals have now been prepared for computer analysis. Initial results will be reported in a later Newsletter.

NEW HOPE FOR RESEARCH ON THE CAMEL

The United Nations Sahelian Office (UNSO) is actively considering providing support for a research centre on *Camelus dromedarius*.

Senior staff of UNSO and of the Small Ruminant and Camel Group had a preliminary meeting in late June 1985 to discuss the need for such research and the benefits that might be expected to result from it. It is possible that the SRCG will be asked to assist in a pre-feasibility study for the establishment of research projects.

Additional external funding would be required, part of which is being sought through the aid organisation of a member country of the EEC.

PROLIFIC SHEEP

The difficulties associated with managing prolific breeds of sheep have recently been highlighted. The increased range of litter sizes, lower birth weights, higher lamb mortality and possible difficulties at parturition all need to be considered. Standards of management need to be of a high order if full benefit is to be gained and even in areas where this is available, it is considered that ewes cannot rear triplets off grass alone. In addition, the consequences of the stress on the ewe (upto 40 per cent of live weight might be lambs and placenta when near to term) need also to be considered and minimised.

ARE CAMELS GAINING RECOGNITION BY ECONOMISTS?

A highly respected and widely circulated weekly journal, "The Economist", analyses political and economic events for a generally highly

intelligent clientele. Earlier this year, it ventured into the field of animal science and more particularly into a branch of it close to the hearts of readers of this Newsletter. We reprint verbatim their original article and the correspondence this provoked.

The comeback of the camel (from Science and Technology Section, "The Economist", 20 April, 1985)

In August 1984, Samburu tribesmen in northern Kenya faced an awful dilemma. Their only way to obtain food was to trade their skeletal cattle for maize, but those cattle were their livelihood. It is a decision that has been all too commonly faced by Africans in the past year. What made the Samburu case worse was that, in the same area, there were other tribesmen herding camels, who were still getting up to five litres of milk a day from each of their beasts.

All over the world's arid regions, a vast source of water and protein is being neglected: camel's milk. Dr. Reuven Yagil of Israel's Ben Gurion University has put forward a big programme to encourage camel farming in dry areas, based on his own research at the camel research laboratory at Beersheba.

Take first the camel's obvious advantage over cattle. It can last for long periods without water and can feed on thorny and saline vegetation which cattle find indigestible. It can feed farther from watering holes and reach higher into trees, so that it makes fuller but less damaging use of ground vegetation.

Next consider the quality of the milk. Cow milk is higher in fats and lower in water and protein than camel milk. And, when deprived of drinking water, a camel responds by increasing the water content of the milk from 84% to 91% while the fat content drops from 4% to 1%. The camel does this by transferring water from its blood to the milk (incidentally, water is stored not in the hump but in the bloodstream) in order to help its young survive in arid conditions. This milk is particularly well suited for people with no other source of nourishment and is ideal for small children. A well fed camel can yield 40 litres of milk a day - as much as a Friesian cow in Europe. (In the Saudi Arabian Royal Palace

at Riyadh, there is a fully automated milking parlour for 40 camels.) Dr. Yagil estimates that the milk from one camel can keep up to 20 children alive.

So why, if the camel's milk is so beneficial, has the camel been neglected? A camel costs much more than a cow, which makes camel owning a risky and inaccessible business for a poor person. But there is another, biological reason. Cattle breed faster. They start calving at a younger age, have calves more often and more of the calves survive. Therefore, in good times, you can get rich quicker by breeding cattle.

In seeking a way around this problem, Dr. Yagil and his team began experimenting with hormone-based fertility drugs to try to increase the camel's breeding rate. The experiments seem to have worked - with coralled camels - and Dr. Yagil's camels can now start breeding at the age of three instead of five or six, have calves every year instead of every other year and with a calf mortality rate of virtually zero.

In order to pass the results of the experiments on to those who can benefit from them, Dr. Yagil now aims to set up this year a camel breeding station in an arid region, probably in southern Egypt or northern Sudan. He also plans to buy camels in areas where there are plenty and move them to drought-stricken areas - as a kind of bottomless well of food aid. But first the research team needs to find $2m, for which it has approached the Food and Agricultural Organisation and private bodies including the Rockefeller Foundation.

If this amount is to be raised, Dr. Yagil will first have to find answers to critics of the scheme who claim that coralling camels would remove their advantages. Camels and their dependents are nomadic in nature. Once an area starts to run short of foodstuff and firewood, they move on to allow the area to recover. This practice will stop if camel breeding communities are encouraged to settle.

<u>More about camels</u> (from Letters Section, "The Economist", 25 May 1985)

SIR - No, the camel does not (April 20) store water in its blood, anymore than it does in its hump. Were it to transfer it from the blood to the milk, the heart would be unable to pump the resulting viscous fluid.

The camel does, of course, lose some water from its blood when dehydrated, but to a lesser extent than other animals, it loses water preferentially from the gut and from cellular tissue and maintains blood liquidity by allowing the red cells to shrink.

While it is possible that the reproductive rate of camels can be improved from "a calf every other year" - on Kenyan ranches, the actual rate is about one every 18.5 months - it would not be possible to have them produce one every year. The gestation period is about 385 days, natural conception is inhibited by milk production and the shortest practical interval between calves would be about 15 months. I am a great admirer of Dr. Yagil's pioneering work on camel productivity, but please do not do him the injustice of making him out to be a miracle man.

R.T. Wilson

Addis Ababa

Small Ruminant & Camel Group

SIR - You fail to see the implications of replacing cattle by camels in arid areas. Indeed, camels survive better and produce more milk than cattle in arid areas, but the changeover from cattle to camels, like that from sheep to goats, usually indicates the beginning of desertification. This changeover shows that the natural vegetation cannot sustain cattle and the corollary is that the remaining vegetation will eventually be devastated by the more efficient camel. This trend is already exacerbated in northern Sudan by overstocking of camels. Dr. Yagil's idea of breeding camels faster seems totally inappropriate. What happened to ecology?

Khartoum Rodger Hodgson

Camels again (from Letters Section, "The Economist", 15 June 1985

SIR - Mr. Roger Hodgson (Letters, May 25th) appears to equate "efficient" grazing with "vacuum cleaner" grazing and in doing so implicates the camel. As a result of many years spent studying the grazing behaviour of nomadic camels in the Western Sahara, Dr. Hilde Gauthier-Pilters was of the opinion that camel grazing provided the most rational utilisation of desert vegetation. It is entirely different from that of sheep and

goats and slow moving cattle. Camels move constantly, whatever the quality or quantity of the vegetation, taking only small portions from any one plant. It is erroneous to associate free ranging camels with desertification. Man is the cause of desertification. The impact of technical civilisation into the semi-arid areas has restricted the mobility of the nomadic camels and by preventing their expressing innate grazing behavioural patterns, has endangered the vegetation.

Edinburgh J.S. Macfarlane

(Note also the information on camels in Libya from Stewart Macfarlane on page 7 in this issue of the Newsletter.)

FAO EXPERT CONSULTATION ON SMALL RUMINANTS: SOFIA, BULGARIA 8-12 JULY 1985

A meeting sponsored by FAO was held at the People's Palace of Culture in Sofia to discuss ways of improving small ruminant productivity, particularly in the developing countries. A field trip to Bulgarian research farms provided a welcome break from the formal discussions and participants were able to see something of Bulgarian agriculture in general as well as local breeds of livestock.

A final report is expected to be published shortly, which should include, as well as the recommendations made, the texts of all the papers presented.

In brief, the recommendations covered the following broad fields: the need to establish and coordinate networks; better definition of research and development strategies; the need to provide specialist support services and infrastructure; aspects of genetic improvement; technology of reproduction; pasture management and forage crops; health; the systems research concept; and the exploitation of inherent efficiencies both among animals and among owners/managers.

GROUP DOCUMENT N°4

A Group Document prepared by Daniel Bourzat entitled "La chèvre Naine d'Afrique Occidentale" (The West African Dwarf Goat - but note that

only the French version is ready) has just been published by the Group.

The document is an extensive literature review and contains a reference list of some 130 titles. In spite of this body of literature, it appears that there a lot of research is still required on this species.

Single copies can be obtained on application to the Group.

MALI TO SET UP CAMEL RESEARCH STATION

The National Livestock, Forestry and Hydrobiology Research Institute of Mali has plans to set up a research station on camels at Gao in the remote north-eastern part of the country. Feasibility studies are to be undertaken soon but it is proposed that a Malian scientist will first visit countries and organisations where camel research is currently being carried out.

Such organisations could help in this project by contacting the Malian scientist in charge of the project (Dr. Aly Kouriba, Chef Section Génétique et Elevage, INRZFH, B.P. 1704, Bamako, Mali) with a brief outline of their work. The SRCG would appreciate receiving copies of any such communications.

TREATMENT OF STRAW WITH UREA (Continued from Newsletter N°3)

CATTLE

Materials

Three females and two males were given 3 kg urea-treated straw and 1.5 kg pelleted bran to supplement poor quality grazing over a period of 23 days. This ration was established to produce an average daily weight gain (ADG) of 500 g on an animal of 155 kg average body weight.

Methods

The animals were weighed at the start and at the end of the experiment. The 23-day period corresponds to the consumption of the contents of one silo compartment (330 kg treated straw). At first, the animals were reluctant to eat the straw but the intake levels showed a

Table 1 Weight changes in cattle

Animals	Age	Weight at start of trial (kg)	Weight at end of trial (kg)	+ kg	A.D.G. (g)
Male	2-3 years	155	161	6	260
Male	3-4 years	174	183	8.5	369
Female	1-2 years	120	128	8	347
Female	1-2 years	85	91	6	608
Female	4-5 years	239	253	14	608
				42.5	369

constant increase for the whole group during the trial period. The refusals never exceeded 20 per cent of the straw. The animals adapted very quickly to the pellets of bran and there were no refusals.

Results

These results are only significant within the context of the trial. It appears possible to supplement the diet of cattle at the end of the dry season with a cheap formula (194 CFA F/kg gain, or 72 CFA F/head/day) using crop by-products still available at this time of the year.

SHEEP

Materials and methods

Two groups of 4 young male sheep (8 to 12 months old) with a standard body weight of 17 kg were fed sorghum straw treated with urea supplemented with agro-industrial by-products (bran pellets, cotton seed, molasses).

Daily intake levels were measured. The animals were kept in permanent open housing and weighed twice every two weeks.

Rations

Group A:

Ingredient	% of DM
Treated straw	59
Bran pellets	30
Cereals (red sorghum)	11

Group B:

Ingredient	% of DM
Treated straw	53
Cotton seed	15
Molasses	32

Results

Weight changes (Table 2, Figure 1). The ADG graph remains similar in the two groups. The upward trend shows a clear drop from D-30 to 60, for which no plausible explanations have been found.

Intake levels. Tables 3 and 4 indicate a higher intake level for the group which did not receive cotton seed. The consumption index is much higher for Group A, which was not given molasses, than for Group B (Table 5).

Figure 1 Weight changes in two groups of supplemented sheep

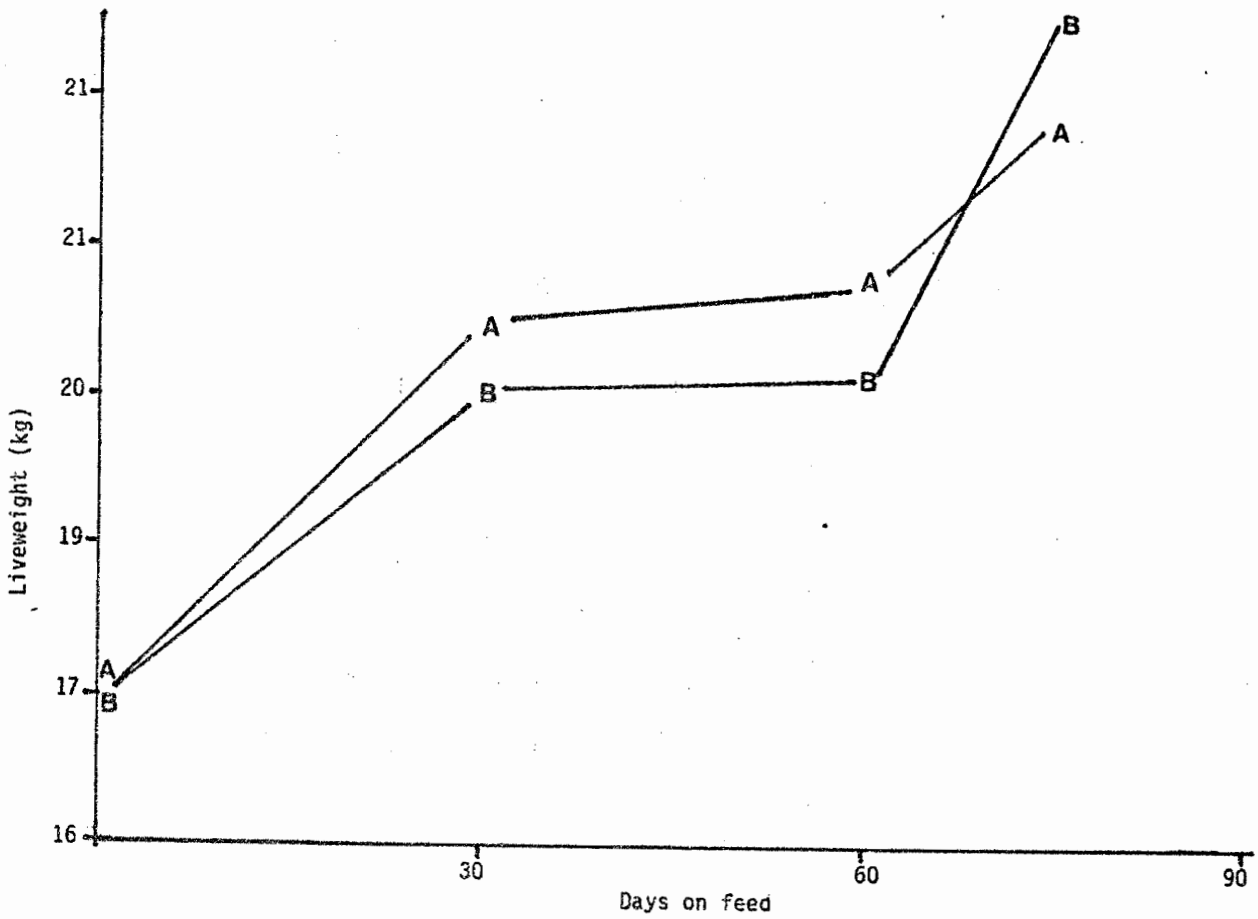

Table 2 Weight changes in sheep

Group	Dates of weighing and average daily gain							
	25.01.83	24.02.83	A.D.G.	26.03.83	A.D.G.	10.04.85	A.D.G.	A.D.G.
A	17.0 ± 2.05 kg (5)	19.5 ± 2.2 kg	83.3 g	19.75 ± 2.7 kg	8.3 g	20.95 ± 3.8 kg	80 g	52.6 g
B	17.0 ± 1,9 kg (5)	19.0 ± 1.6 kg	66.6 g	19.12 ± 1.2 kg	4 g	21.6 ± 3.2 kg	165 g	61.3 g

Group A: Young Mossi sheep: treated straw, pelleted bran, cereals
Group B: " " " " " cotton seeds, molasses

Table 3 Average intake per animal/day/trial

Group	Element	25.01 to 10.04.83					Value (Forage Units)	Consumption Index
		Straw + urea	Straw + urea + molasses	Cotton seeds	Pelleted bran	Cereals		
A	CP	484			383	141		
	DM	445			352	130	0,55	10,4
B	CP	561	169					
	DM	471	156				0,39	6,4

Table 4 Intake expressed in relation to DM and per kg of $W^{0.75}$

Group	25.01 to 24.02.83			25.02 to 26.03.85			26.03 to 10.04.83			24.01 to 10.04.85		
	Weight		g/kg $W^{0.75}$	Weight		g/kg $W^{0.75}$	Weight		g/kg $W^{0.75}$	Weight		g/kg $W^{0.75}$
	x	$W^{0.75}$		x	$W^{0.75}$		x	$W^{0.75}$		x	$W^{0.75}$	
A	18.25	8.8	100.9 g	19,6	9,3	102,5 g	20,35	9,6	98.4 g	19	9.1	101.8 g
B	18.0	8.7	68.9 g	19.06	9.1	68.9 g	20.36	9.6	71.8 g	19.3	9.2	68.1 g

Table 5 Consumption index kg DM/kg gain

Group	A	B
DM intake (g)		
Straw + urea	445	294
Molasses		177
Cotton seeds		156
Pelleted bran	352	
Cereals	130	
Total DM intake (g)	927	627
D.A.G.	52.6	61.3
C.I. kg DM/kg gain	17.6	10.2
kg DM treated straw/kg gain	8.46	4.79
kg DM molasses/kg gain	-	2.88
kg DM pelleted bran/kg gain	6.69	-
kg DM cotton seeds/kg gain		2.54
kg DM cereals/kg gain	2.47	

Conclusion. This trial proved that young sheep could be fed over a relatively long period of time wth a diet based on urea-treated straw.

DISCUSSION AND CONCLUSION

These two experiments show the value of this method of using treated straw to solve livestock (in particular weaners and draught oxen) feeding prblems during the hot dry season and the start of the rainy season in areas dominated by crop production but with a high livestock density.

The method suggested for the treatment of the straw proved easy to implement and the mixed farmers who treated it expressed a strong interest.

MORE ABOUT CAMELS ON COMMERCIAL RANCHES IN KENYA

Further to our note on p.4 of Newsletter N°3, we hear from Daniel Stiles of UNEP/KENYA that there is a possibility of importing camels from

Pakistan on to the ranch of J.O. Evans. A project is being developed in cooperation with Heifer Project International and Technoserve Inc. to look at the possibilities. We hope to hear more about this in the future.

NEW PUBLICATIONS BY GROUP AND ASSOCIATE STAFF

Three recent articles by staff of the Group and their associates are:

Kolff, H.E. & Wilson, R.T. 1985 Livestock production in central Mali: The "Mouton de Case" system of smallholder sheep fattening. Agric. Syst. 16:217-230

Wilson, R.T. 1985 Livestock production in central Mali: Reproductive aspects of sedentary cows. Anim. Reprod. Sci. 9:1-9

Wilson, R.T., Traoré, A., Peacock, C.P., Mack, S. & Agyemang, K. 1985 Early mortality of lambs in African traditional livestock production systems. Vet. Res. Commun. 9:295-301

NOTE

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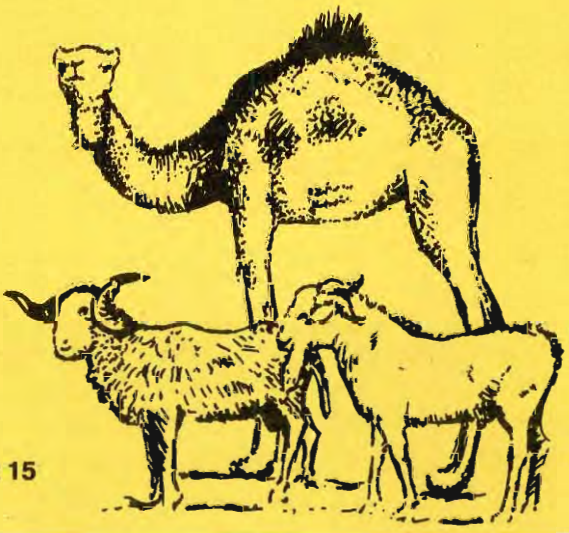
THE SMALL RUMINANT AND CAMEL GROUP

NEWSLETTER



International Livestock Centre for Africa,
P.O. Box 5689, Addis Ababa, Ethiopia. Telephone: 18 32 15

No 5 Date February 1986

SRCG CONFERENCE AT ILCA

The Small Ruminant and Camel Group hosted a conference with the theme "Small Ruminants in African Agriculture" at ILCA headquarters from 30 September to 4 October 1985. A total of 33 participants presented 24 papers in the general subject areas of reproduction and growth, nutrition, diseases and mortality, productivity and socio-economics.

The conference proceedings were prepared by the SRCG as camera ready copy and passed to ILCA Publications section for printing within one month of the end of the conference. The proceedings were published and available for distribution only ten weeks after participants returned home. Consisting of about 270 pages of text the proceedings are presented in their original language (English or French) and have a summary of each paper in both languages. There is a bibliography of about 200 references included. Copies can be obtained by writing to the SRCG.

CAMEL MILK ON SALE IN SAUDI ARABIA

Dr. K.H. Knoess who was previously an FAO expert, is now manager of Mujahim Company for Camel Production, Development and Research. This Saudi Arabian company has started to sell pasteurized, homogenized and carton packed camel milk in Saudi Arabia. The milk is produced on a farm near Riyadh by Saudi Arabian and Pakistani camels which are fed concentrates and forage. The camel milk, which first appeared on the market early in 1985, has become very popular. The milk is not standardized but sold as it comes from the animal. The milk sells for SR10 (SR3 = US$ 1) while

fresh milk on the farm is sold for SR5. The company also has various research projects concerning management, breeding and disease control.

AN IMPROVEMENT IN THE RATE OF OVULATION IN EWES

At the United Kingdom Hill Farming Research Organisation attempts are being made to increase numbers of twins and triplets.

The problem is that if the ewe is not in very good condition when she goes to the ram her hormones automatically reduce the number of eggs shed. Basically, a hormone in the form of an injection is introduced into the animal. This acts against her own hormones, creating a balance, and allows the animal to shed more eggs than she would normally do. Under normal circumstances there is a negative feedback in the hormone balance, which prevents the ewe from carrying more lambs than her body deems to be correct. The injection cuts off that negative feedback and allows perhaps 50 per cent more eggs to be shed. Clearly the number of lambs that these eggs provide at full term is very much dependent on the management strategy that follows, but perhaps a 25 per cent increase would not be out of the way in hill sheep.

In the first year two injections are given, one ten days before the other. In subsequent years a single injection would normally be adequate. This adjusts the levels of hormone in the circulatory system. The standard of management of ewes that are going through this process has to be very much higher as the possibilities for loss are obviously greater. To prevent these losses management is the key. Scanning provides one of the major possibilities of identifying what's going on. The individual ewe can be determined for foetal number at some stage between 45 and 100 days of pregnancy. The value of determining the number of foetuses carried by each individual is that the flock can then be divided on the basis of the findings from the scanning. This gives the opportunity of providing more food where it is necessary to those carrying more lambs.

(Adapted from the BBC "Farming World" July 1985)

NOTE ON THE DIFFERENT SYSTEMS FOR THE ESTIMATION OF FOOD ENERGY VALUES AND THE ENERGY NEEDS OF ANIMALS

INTRODUCTION

Two types of system for the estimation of food energy values have developed in the world:

- One based on the evaluation of the amount of food in metabolisable or digestible energy (TDN System)
- The other on the value in net energy for fattening (Starch Equivalent; Fodder Equivalent).

This second system allows animal needs and feed contents to be expressed in the same units. In all systems it is assumed that foods have the same relative value for maintenance, lactation and fattening, which causes a fairly significant error, particularly for fattening.

At present, the systems based on metabolisable and digestible energy are used mostly for monogastric animals such as pigs, poultry and rabbits, whereas the net energy systems are more frequently reserved for ruminants.

In the last three decades all over the world energy nutrition studies have developed with new methods for testing values (electronic respiratory chambers, automatic tests and calculations). This work in conjunction with that on the physiology of digestion in the ruminant has allowed us to determine the efficiency of ME use for the different products, the energy value of foods or rations and the animals' needs.

These recent findings show that some foods do not have the same relative value in comparison with others, for fattening and lactation; therefore it is not possible to give a food a single energy value.

SYSTEM BASED ON METABOLISABLE ENERGY

TDN system (Total digestible nutrients)

In this system we consider the energy value of foods to depend solely on their amount in digestible elements. The following formula is applied:

TDN = % digestible protein + % digestible fibre + % digestible nitrogen free extract + (2.25 x % digestible fat)

The coefficient 2.25 is used because fats have an energy value about 2.25 times above that of proteins and glucides.

We assume the metabolisable energy is used with constant output for maintenance (0.76), for lactation (0.69) and for growth and fattening (0.58), whatever the qualities of food may be.

From the results of experiments it appears that 1 kg TDN produces about 4.4 Mcal of digestible energy, and for ruminants 1 kg TDN makes 3.56 of Mcal energy.

This system has the advantage of being very simple but overestimates the value of roughages in relation to concentrate foods, especially for growth and fattening.

SYSTEMS BASED ON NET ENERGY

Old systems

In 1905 Kellner proposed a system of calculating the energy value of foods founded on the relation between the amount of digestible elements in the foods and the quantity of energy converted in the form of fat. He defined these as the net energy of fattening. The net energy of foods expressed in Kcal/kg is compared to that of starch according to the formula:

$$SE = NE/2.360 \text{ where } SE = \text{Starch Equivalent}$$

From Kellner's formula expressing net energy:

$$NE = [2.24\ DP + (4.50 + 5.70)\ DF + 2.36\ CDF + 2.36\ NFE] \times W$$

DP	Digestible Proteins	CDF	crude digestible fibre
DF	Digestible Fats	NFE	nitrogen free extract

one can deduce,

$$[SE = 10.94\ DP + (1.91 \text{ to } 2.41)\ DF + CDF + NFE] \times W$$

W is a coefficient of efficiency which takes into account the observed differences between the values calculated by this equation and the values determined experimentally (eg: W = 0.95 for cereals). For fodder crops, Kellner substracted 0.58 SE per g of crude fibre for hay and 0.29 to 0.58 for green fodder crops. This varies the yield of ME taking into account the amount of crude fibre.

Following the results of experiments numerous corrections have appeared.

Widely used throughout the world, starch equivalents were still in practice in many European countries up until ten years ago.

Scandinavian Systems of Fodder Equivalents

The Scandinavian FU (SFU or NFE). Fjord and Hanson estimated the energy value of a food in relation to that of barley, according to the milk production of a group of cows receiving either the food being analysed or barley, as a supplement to a basic ration.

Hanson used Kellner's method to determine the value of milk production of foods; however he used different coefficients for digestible proteins (1.43 instead of 0.94). The fodder unit value (FU) is obtained by multiplying the value of milk production by 1.333.

Fattening fodder units (FFu or FFe) In 1935 Mollgaard proposed expressing the energy value of foods, calculated with the help of Kellner's formula, in Kcal of net fattening energy (NKF). This fattening fodder unit (FFu) corresponded to the energy value of 1 kg of barley at 85 per cent dry matter (1650 NKF).

The French System of Fodder Equivalents

Professor Leroy brought into focus in 1954 a concept of net energy maintenance and production, corresponding to an average level of production and suitable for average rations.

The amount in metabolisable energy of a foodstuff is calculated starting from the amount in digestible elements.

$$ME = [DP + DF \times 2.25) + CDF + DNFE] \times 3.65$$

The net energy is obtained by deducting the extra heat (Q) from the metabolisable energy

$$NE = ME - Q.$$

The extra heat value was calculated from the results of numerous experiments on different species of animals and for different functions. It is on average equal to one Kcal per gram of ingested dry matter. This

net energy is compared to that of the barley used for reference (1883 Kcal/kg) - the equation is expressed in fodder units:

$$\text{Energy value FU} = \frac{[DP + 2.25\ (DF \times 2.25) + CDF + DNPE] \times 3.65 - DM\ (g)}{1883}$$

This system underestimates by 5 to 20 per cent the value of hay for lactation and overestimates by about 10 per cent that of cereals.

NEW SYSTEMS

These new systems are either an improvement on Kellner's starch equivalent system or an adaptation of the different metabolisable energy yields of the same food for maintenance, fattening or lactation.

Rostock's NEF system (GDR)

The official system in G.D.R. since 1976, it is used for all categories of animal. This system relies on the energy use of rations of very variable composition, distributed at only one level of feeding by animals being fattened.

The net energy of foods (NEF) is calculated from the amount of digestible elements.

NEF = 1.71 DP + 7.52 DF + 2.01 CDF + 2.01 DNPE + correction

The correction is introduced to take account of the amount in mono - or disaccharides of the ration or the digestibility of the ration.

The energy value is expressed in fodder units (FU)

1 FU = 2.5 Kcal NEF

FU = 0.68 DP + 3.01 DF + 0.80 CDF + 0.80 DNPE + Correction

The American systems

'Californian' System

In 1968 Lofgreen and Garett proposed a net energy system designed to replace the TDN system. This system distinguishes the net energy values of maintenance (NEm) and of production (NEg) of foods. Animal needs are expressed in net energy of maintenance and net energy of production. The same system exists for growing sheep.

Net energy of lactation system

Proposed by Flatt et al and Moe et al, the net energy value of foods (in Mcal/kg Dry Matter) is calculated according to the amount in digestible energy with the help of the following equation established from results obtained by indirect calorimetry.

NE = 0.68 DE - 0.36

The animal's needs are obtained by the addition of the maintenance needs (0.073 Mcal NE/kg 0.75) to the production needs (0.74 Mcal NE/kg milk to 0.040 Dry Matter). These American net energy systems were introduced into the feeding recommendations of the National Academy of Sciences (NRC 1970, 1974)

New European Systems

On the initiative of the EFZ (European Federation of Zootechny), a working group composed of Dutch, Swiss and French researchers brought into focus systems for the estimation of energy values of foods having the same scientific bases and as close to each other as possible while still taking into account particular needs in each country.

The system used rests on the amount of ME produced for different functions, treating separately net energy of lactation and net energy of maintenance and production of meat. It was officially introduced in May 1977.

In the Netherlands

Energy values of foods and animals needs are expressed in fodder units of lactation (VEM = 1,650 Kcal ENL) and in fodder units of meat production (VEVI = 1,650 Kcal ENF)

In Switzerland

The system adopted is practically identical but the energy values of foods and animal needs are expressed in Megajoules (MJ) of net energy of lactation and growth.

In France

The means of expression is Fodder Units (FU) and the analytical processes used in the old system (UF leroy) have been kept.

As in the new Dutch and Swiss systems, two types of Fodder units have finally been retained:

- Milk fodder unit (MFU) for females during lactation and animals being maintained at stable weight or at moderate growth.
- Meat fodder unit (MFU) for animals being fattened or at rapid growth (> 750 g/per day for cattle)

Net energy for lactation and its units

The NEL (net energy of lactation) is proportional to the ME of the ration and the amount (kl) of ME for lactation.

$$NEL = ME \times kl$$

From experiments, a value has been deduced for kl expressed by the formula

$$kl = 0.463 + 0.24\ q \quad \text{or} \quad q\ \frac{ME}{GE}$$

The milk FU corresponds to the net energy value for lactation of 1 kg of barley used for reference.

1 MFU = 1.730 Mcal NE

The energy value is expressed by:

$$MEV = \frac{ME \times (0.463 + 0.24\ q)}{1.730}$$

Net energy for maintenance and meat production and its units

Net energy of maintenance and production is proportional to ME and to the total yield of ME.

ME (maintenance + production) = ME x Kmf

(The total yield of ME) is largely dependent on the level of production. The researchers had therefore to choose a certain number for the level of production. They distinguished in the particular conditions of French production a level corresponding to animals showing growth of less than 750 g/per day (level of production from 1.0 to 1.35) and those having ADG > 750 g whose level of production is above 1.35. In experiments it appeared that the relative error is minimal when one keeps for the two types of animal the production levels 1.2 and 1.5

respectively.

The MFU (Meat Fodder Unit) corresponds to the net energy value of 1 kg of barley used for reference for maintenance and production of an animal being fattened at production level 1.5

1 MFU = 1.855 Mcal

From which

$$MEV = \frac{ME \times Kmf}{1.855}$$

Relations with other European systems follow the conversion table below.

	France		Netherlands		Switzerland
NEM	1 FU milk	=	1000 VEM	=	6.90 NEL
NE (maintenance + production)	1 FU meat	=	1060 VEVI	=	7.3 NEW

CONCLUSIONS

For several years, the use in the tropical zone of tables established in the temperate zone for fodder crops has shown very important variations, particularly in energy values. With the same amount in organic matter and raw fibre the coefficients of digestibility of this organic matter are not the same for a fodder crop of tropical origin and a fodder crop from the temperate zone.

It was appropriate to study the influence of climatic environment (temperature, hygrometry, rainfall etc...) on chemical composition, digestibility and quantities voluntarily ingested.

Finally, needs of tropical ruminants are not known or badly calculated taking account of the size of the local species, their production potentialties and the diversity of their production (work, milk, meat, etc.) in very variable ecoclimatic conditions.

Work carried out in Senegal since 1979 (ABT programme) on the study of the digestibility of organic matter and its components (in vivo and

in vitro), on the quantity of dry matter voluntarily ingested and of behaviour on natural grazing as well as studies more recently started by ILCA (digestibility of fodder crops, behaviour of moving animals, anti-nutritional factors) allow us to hope to soon have better tools in the form of norms for tropical fodder crops and needs of tropical species.

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MCDONALD (P.), EDWARDS (R.A.), GREENHALGH (J.F.D.) Animal Nutrition (Second Edition)
Edimburgh, Longmans, 1973, 479p

ZIMBABWE TO SELL GOATS TO THE ARAB STATES

The following notes have been contributed by Dr. I. Reh, Principal Research Officer, Department of Research and Specialist Services, Ministry of Agriculture, Zimbabwe.

It may be of interest to you to hear a bit more about the envisaged exports of goats to arabic countries; the contracts are apparently already signed. Export will focus on intact males with milk teeth, possibly 20 - 25 kg liveweight at an age of 8 - 10 months.

From our present knowledge it appears difficult to reach these conditions with the indigenous stock under extensive or even semi-intensive management conditions. The exporters intend, therefore, to import Boer sires and to distribute them to commercial farms/ranches but intend to buy, at a later stage, locally produced Boer males for use in Communal Areas. We had a discussion with one of the exporters and he consideres the proposed experiment interesting from the pilot point of view.

The Veterinary Department of the University is presently running studies on the nutritional status of communal cattle and it may be

interesting to extend this study to our goats in order to see whether or not nutrition is a constraint (what I personally do not believe - but I may be wrong).

With regard to the mentioned disease studies, they have not yet been defined. According to the present stage of discussion with the vets, they may concentrate on two aspects - prevalence of internal parasites and of reproduction diseases (Brucellosis, Vibriosis).

The exporter has offered study facilities at the slaughter house.

CAMEL TRACTION IN THE SUDAN

Some years ago ox ploughs were imported to the Jebel Marra area in the far west of the Sudan. The design was a simple one and soon local blacksmiths were making them from scrap iron and adapting them for use by camels.

A survey of about 150 farmers showed quite conclusively that they were getting higher yields as well as expanding their cultivated area and reducing the weed populations. In a pre-planting ploughing they turn the soil half way over, doing a very good job of weed control. People can then plant into a clean field. This was the first issue. It meant that the labour within a family which was available for weeding could be spread over a larger area. They could therefore do better weeding.

The second point was that the ploughing gave the land a rough surface and so much more rain went into the ground. In particular the early showers were caught. The survey asked the farmers to point out the effects of ploughing and these points came up time and time again in the interviews. Farmers were quite clear about what the ploughs were doing!

The scientists decided to confirm this in trials, so they did three years of site trials to compare different cultivation techniques. The ploughed plots gave more or less the same order of yield increase over the hoe cultivated plots as the farmers had told them. This was anything from 15 to 30 per cent, depending on the year.

The trials had to be done, because although the scientists believed

the farmers, they had to present proof. Their reports are going to be read by people at a central research station or by a donor, and these people want hard facts! In agricultural research there is still very much the feeling that you have to back your 'hunches' with experimental data. This is quite right, provided that it doesn't actually inhibit action

The trials didn't stop the team from getting on with the job. They went ahead with project in the first year anyway. If 120 farmers out of 125 tell you that ploughing increases yield, this does put an order of magnitude on it and one can believe them!

Another thing that emerged from the trials was that because the ploughs are individually made from scrap metal, no two ploughs plough the same! They are all a little bit different. Some have a 9 inch share, some have the bolt-holes all at one end and some work better than others. It could be seen very clearly on different fields, that some ploughs were working well while other farmers couldn't get the ploughs to work, because the alignment wouldn't be quite right.

The main problem was getting spare parts. If the plough had been made by a blacksmith in one of the larger towns, the farmer would have to take to plough on a 150 kilometre trip to that town to get the share fitted. Because the ploughs were individually made they could not find a share to fit the plough in the village.

The researchers went to talk to the leading blacksmith in Nyala, the town where most of the ploughs were made. This leading blacksmith agreed to co-ordinate most of the other blacksmiths in Nyala to produce ploughs to a certain pattern. The project made sure this actually happened by purchasing a number of ploughs from the blacksmith and checking the specifications. They then took the ploughs to their own area to be sold through the agricultural extension service.

The blacksmiths could also make all the spare parts. If a plough did not meet the specifications, the project simply did not buy it. One could still find ploughs of any shape and size on sale in the market. But any farmer buying his plough through the project knew that he was

buying a standardised type and that spare parts would be available to back it up.

The next thing the project did was to arrange a credit programme with the Agricultural Bank of Sudan. ABS had been on the verge of closing down their office in Zalingei, the administrative town in the far west. They were closing down because they had nothing to offer credit for. So they asked the project to prove that the innovation of the ploughs was worthwhile. This justified the trials! The data obtained from the trials backed up what the farmers said. Bankers are very cautious people and they wanted really hard data. The trials convinced them and the programme has gone from 60 ploughs in the first year (1982) to over 800 this year (1985). This still does not satisfy the ever increasing demand from farmers.

(adapted from the BBC "Farming World" October 1985)

MILK EWES IN GREAT BRITIAN

The following is extracted from a letter by Mrs. Olivia Mills, Secretary of the British Sheep Dairying Association.

The milking of sheep is indeed a very exciting new development in this country and is carried out on a very different level to sheep milking in other countries as here it is not the "peasant shepherds" who are milking, but the dairy farmers who have lost their quotas and other highly educated and experienced farmers. I stress this difference as I spend a lot of time in countries where "tradition" hinders progress, especially as far as hygiene is concerned, but more especially where breeding and selection ought to be practised.

Most of the breeds being milked in England are not suitable for hotter climes. The Friesland is the basic breed, but because of scarcity and expense, Friesland crosses of many types are in the majority. This includes the Colbred, bred by Professor Broadbent which is a fixed breed with one quarter Friesland, and the British Milksheep, not yet a fixed breed as far as ewes go, but based on the Friesland. Then the Dorset Horn and Polled Dorset are being pressed into service following Ken Geenty's work

in New Zealand. Cluns, Mules, Halfbreds, Lleyns, and many other commercial breeds, by selection, are being milked. Many of these are now being crossed, once only, with the Friesland as people get more experienced and their markets develop.

Yields vary tremendously between the best Frieslands at about 450 litres in a 7 month lactation to the Dorsets with about 200 litres in a 5 month lactation. In between this are the farmers who milk purely for the Third Profit, rearing their lambs to market requirement and then milking the ewes until they go dry. This does eliminate mastitis and as milking equipment costs so little, it is a nice extra profit and a safeguard for when the EEC subsidy finally comes off.

Management is very similar to a cow dairy but we try to milk entirely off grass. Marketing good quality sheep cheese is no problem, but we may reach saturation point with yogurt due to the COMA report on the eating of animal fats. Export orders are bright.

FORTHCOMING CONFERENCES

IV International Conference on Goats. This conference, in direct line of succession to previous conferences in the United Kingdom, France and USA, is at last being held in a country where goats have great economic and social importance. Dates are 8-13 March, 1987 and location is Brasilia.

Information can be obtained from:

Conference Secretariat
IV International Conference on Goats
C/O Dr. Odon P. Santana
EMBRAPA/DPP
Supercenter Veraneio 2000, 7° andar, sala 725
70333, Brasilia
DF - Brazil

International Workshop on Goat Production in the Humid Tropics. The West African Dwarf goat project is a collaborative effort by the University of Ife, the Agricultural University of Wageningen and ILCA. The project intends to host a conference in Ile-Ife from 19-24 July 1987 and hopes

to provide funds for 35-40 participants to attend. The presentations and the publication of proceedings will be bilingual French-English.

Further information from:

H.G. Bosman
Department of Animal Science
University of Ife
Ile-Ife
Nigeria

NOTES ON CAMEL REARING IN THE REPUBLIC OF DJIBOUTI

(Extract from a report by Jacques Godet, ISERT, 1985)

This study conducted by a rapid survey in a pastoral environment gives a detailed description as much of the animals as of their characteristics and aptitudes and their method of rearing. For each term, reference is made to the vernacular word or expression.

The author shows the existing opposition between the 'coastal camel', smaller, of a slighter build but well adapted to a particularly difficult environment, and the 'mountain camel' living in the Ethiopian or Somalian hinterland. For each type of camel the different terms and methods of classing by the breeder are reported. The different coat colours are described. The analysis of the control of the behaviour of the herd shows the coherence of the practice of limited intervention by the farmer in reproduction (avoiding only premature mating) permitting a maximum number of births and therefore maximum milk production. The mortality of calves is high (50 per cent) but some of the males are sacrificed at birth.

The structure of the herd (75 per cent) adult animals and 20-25 per cent males responds also to subsistence logic. The techniques of assistance with suckling and weaning are different from those practised by Sahelien and Toureg farmers.

In Djibouti the rearing of camels is always associated with other species of animal, particularly small ruminants. Urbanization has made markets available to transhumant farmers who more and more have a tendency to become semi-sedentary around urban centres or along major roads where

they can be assured of an outlet for their products.

The camel is little used for riding but when ridden the saddle is usually behind the hump. The behaviour of the animal is controlled by a goad. The camel has been largely used for transport since the creation of Djibouti town.

Apart from milk production, the camel is used most of all as a pack animal. In spite of its average, not to say mediocre (80 to 120 kg) carrying abilities, the camel is used for smuggling in the direction of neighbouring countries.

Pathology is treated from the angle of the breeder and the vernacular names for the principal diseases are indicated. A fair number of traditional practices are described showing the cultural Bedouin heritage in this area. Feeding shows the individual aspect of different types of Djiboutian pastures, in particular the consumption of saltbush and mangroves by the 'coastal camel'. Finally the study, having recalled the history of camel rearing in the Horn of Africa, finishes with some thoughts concerning the future of the camel in Djibouti and on future lines of research to be followed.

TECHNIQUES OF MINERAL RESEARCH FOR RUMINANTS

These notes are taken from a lecture by L.R. McDowell, J.H. Conrad and A.L. Ellis from the Department of Animal Science at the University of Florida, presented during an FSSP/ILCA Seminar (24-27 June 85, Addis Ababa) entitled "Livestock in the system of mixed exploitation - methods of research and priorities".

Introduction

Deficiences or mineral imbalances are often responsible for poor performance and fertility problems in domestic ruminants in tropical zones.

Animals fed on pastures very deficient in phosphorus, cobalt or copper suffer more from the absence of these trace elements than from energy or proteins.

Research carried out in tropical zones has shown that mineral

supplements can raise total births from 20 to more than 100 per cent, speed of growth from 10 to 25 per cent and significantly reduce mortality (McDowell and Conrad, 1977)

Fifteen elements are essential for ruminants:

macro-elements: Ca, P, K, Na, Cl, Mg and S (7)

trace elements: Fe, I, Zn, Cu, Mn, Co, Mo, Mn and Se (8)

In certain regions, toxic concentrations of Cu, Fe, and Mo can limit production of ruminants.

The role of supplementary toxic elements (arsenic, lead, cadmium, mercury or aluminium) for ruminants as well as the possible role for new essential elements (chrome, vanadium, nickel, tin, sillican, arsenic) is also reported.

The practical importance of 'new' trace elements for ruminants has not yet been found. The essential evidence is only based on their effects on the growth of animals receiving rations which are strongly deficient. The discussion emphasizes the effect of mineral excess or deficiency for herbivores as well as methods of diagnosis including the use of radioisotopes.

Factors influencing mineral needs

Numerous factors intervene on the level of mineral needs, in particular the type and level of production, the age of the animal, the level and chemical presentation of the elements, interactions with other foods, mineral ration and the species and its hardiness.

A sufficient consumption of fodder for ruminants is indispensable to cover the animals' mineral needs. Factors which reduce the level of ingestion of dry matter, like a very low protein value or a high amount of lignin, diminish the value of the mineral content.

As tropical fodder crops contain less minerals during the dry season, one could think that the animal lacked most minerals in this period. However, numerous reports from Kenya (Hudson, 1944), Brazil (Correa, 1957) and South Africa (Van Niekerk, 1972) indicate that mineral deficiencies appear more often during the wet season. Ruminants tend to show P and

Ca deficiences more severely after the rains when the pastures are green and abundant.

Van Niekerk (1978) notes that a P supplement is essential during the rainy season whereas the amount of P in plants is maximum. The reason for the rise in mineral deficiencies during the rainy season is less connected with the mineral concentration of fodder crops than with the raised level of the animal's mineral needs at this time. The rapid weight gain from the time when energy protein needs are covered, causes an important mineral demand whereas during the dry season the low energy and protein level of the food causes a loss of weight and very low mineral needs.

Mineral sources for grazing animals

Usually, ruminants in tropical regions do not receive mineral supplements other than salt, depending therefore on the pastures for their mineral needs.

It is rare that these fodder crops can cover all the their needs. Out of 2615 South American samples, McDowell et al (1978) state the number of deficiencies as 43 per cent of the samples in Co, 47 per cent in Cu, 35 per cent in Mg, 73 per cent in P, 60 per cent in Na and 75 per cent in Zn.

Animals often consume a considerable amount of earth but mineral amounts in soils are extremely variable.

In New Zealand, Healy, 1978 reports that the annual consumption of soil can reach 75 kg for sheep and 600 kg for milk animals.

Factors influencing the amount of minerals in plants

The amount of minerals in plants depends on the interactions of numerous factors including the soil, species of vegetation, phenological stage, yield, method of exploitation and the climate. Most mineral deficiencies observed in ruminants are connected with a given region and its soil characteristics.

Yellow basic soils are richer in trace elements than old acid soils. Wet soils tend to have more trace elements. When the pH of a soil goes

up, the availability of Fe, Mn, Zn, Cu and Co goes down whereas the concentrations of Mo and Se go up (Pfander, 1971).

Malnutrition of the plant causes a lowering in the amount of minerals by the fact of dilution and migration of the elements towards the root system.

The raising of fodder yields often causes a depletion of soil mineral reserves, which explains the deficiencies often observed on the most intensive farms.

Very heavy use of nitrate fertiliser and potash raises the level of grass tetany considerably by reducing the amount of Na in the fodder.

Mineral deficiencies or excesses in tropical regions

An exhaustive study of tropical countries reveals that P is the element most often insufficient for ruminants followed by Cu and Co. Deficiencies in Na and I are as widespread as those in Cu and Co. But in most cases, the deficiency in Co and Cu is much more harmful to the animal than that in Na or I.

Toxicity in Se and Fe is often found together in the whole tropical zone.

Diagnoses of mineral dificiencies

The expression of mineral deficiencies is very variable going from extreme cases presenting irrefutable clinical signs, to transient drops in performance difficult to diagnose. This latter case is certainly the most important as it affects a large number of animals over vast regions and can be confused with an energy or protein deficiency or a parasitic infection (Underwood, 1981)

Different techniques have been used (clinical examinations, pathological and biochemical, analyses of soil, water and animal tissue) with more or less success in evaluating mineral deficiencies or excesses.

The most reliable method of diagnosing a mineral deficiency is still the response to a supplement of a specific mineral.

But, besides the fact that these studies are long and costly, a satisfactory result is not always obtained. It is therefore necessary

to turn to biological and chemical analyses.

If analyses of minerals in soil can sometimes provide interesting information, more often they remain very difficult to interpret. Finds in Brazil (Conard et al, 1980), Bolivia (McDowell et al, 1982) and the United States (Florida) (Kiatoko et al, 1980) show that correlations of amounts of minerals in soil, plants and animals are extremely variable according to regions and often very weak or non-existent. The most significant fodder-soil correlations recorded in Brazil are for Fe (r = 0-0.12), Mn (r = 0.12) and Zn (r = 0.30) (Conrad et al, 1980).

Difficulties in evaluating mineral rations consumed by ruminants are as follows:

1) The sample is not necessarily representative of what the animal consumes.
2) Estimation of the quantity of food ingested is difficult.
3) There is variation in the availability of the fodder's mineral elements.
4) The possibility of sample contamination by the soil is considerable.

In spite of this fodder analysis remains preferable to soil analysis. The analysis of animal tissue, mineral level, secretions associated with the study of the concentration of certain enzymes of certain metabolites and organic compositions are excellent indicators of an animal's mineral status.

Blood, serum or plasma are widely used for this type of study. Amounts below or above the 'normal' level indicate a deficiency or excess of the element being considered.

However, precautions must be taken in the interpretation of blood analyses; factors influencing mineral content of plasma or serum are not always easy to evaluate in Latin America (McDowell et al, 1983) and Africa (Mtimini, 1982). These factors are stress, physical activity, temperature, time of haemolysis and separation of serum (Fick et al, 1979). The amount of P in the bones seems to be a much more reliable method than the amount in the serum.

In Africa, an increase of 21 per cent in the productivity of cows was obtained due to a supplement of P even though the level of P in the plasma was normal.

As these analyses are costly and sophisticated, it is more convenient to choose a minimum of vegetable and animal tissues which are most representative of mineral feeding.

A mapping technique for determining mineral deficiencies and excesses

At present, the University of Florida is leading, in cooperation with Latin American, African and South East Asian centres, research into mineral feeding of animals by a systematic prospecting including bromatological analysis, analysis of animal tissue and analysis of the response to mineral supplements. These techniques have been widely used in Colombia (Laredo, 1981), Costa Rica (Vargas et al, 1980) and Venezuela (Velasquez, 1979).

The current practice is to locate 2 or 3 regions where livestock productivity is low. In each region 2 to 4 farms are taken and on each farm 2 classes of animal are studied (pregnant or lactating females and growing animals). For these animals, biopsies of the liver and bones are carried out as well as samples of blood and faeces. Soil and plant samples complete the analysis.

Often samples are taken twice a year on the same form to take account of the season.

For the rest of the country, samples are taken at the abattoir but the farm and region of the animal are visited. In order to quantify the mineral deficiency or excess these analyses are indispensable.

The use of radioactive isotopes gives a very accurate analysis for the great majority of minerals and moreover is a non-coercive method. The chart (page 22) gives the geographical locations of principal mineral deficiencies and excesses in ruminants in tropical countries of Latin America, Africa and Asia.

In conclusion, the authors show the problems in formulating mineral complements, their method of distribution and the control of their efficiency. Finally, they draw our attention to the possible drawbacks

GEOGRAPHICAL DISTRIBUTION OF MINERAL DEFICIENCIES OR EXCESSES FOR RUMINANTS IN THE TROPICAL COUNTRIES OF LATIN AMERICA, AFRICA AND ASIA

Deficiencies	
Calcium	Argentina, Bolivia, Brazil, Colombia, Costa Rica, Salvador, Guatemala, Guiana, India, Malawi, Mexico, Panama, Peru, Philippines, Senegal, Surinam, Uganda, Venezuela, Zaire.
Magnesium	Argentina, Brazil, Chile, Colombia, Costa Rica, Guatemala, Guiana, Haiti, Honduras, Jamaica, Kenya, Malawi, Peru, Surinam, Trinidad, Uganda, South Africa, Uruguay, Venezuela.
Phosphorus	Antigua, Argentina, Bolivia, Botswana, Brazil, Ceylon, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Salvador, Egypt, Ghana, Guatemala, Guiana, Haiti, Honduras, India, Indonesia, Jamaica, Kenya, Madagascar, Malawi, Malaysia, Mexico, Nicaragua, Nigeria, Panama, Paraguay, Peru, Philippines, Puerto Rico, Senegal, Somalia, South Africa, Surinam, Swaziland, Tanzania, Trinidad, Uganda, Uruguay, Venezuela, Zaire, Zimbabwe.
Potassium	Brazil, Haiti, Panama, Swaziland, Uganda, Venezuela
Sodium	Bolivia, Brazil, Chad, Colombia, Dominican Republic, Guatemala, Kenya, Malawi, New Guinea, Nigeria, Panama, Philippines, Senegal, Somalia, South Africa, Surinam, Swaziland, Thailand, Uganda, Uruguay, Venezuela.
Sulphur	Brazil, Colombia, Ecuador, Uganda.
Cobalt	Argentina, Brazil, Colombia, Costa Rica, Cuba, Egypt, El Salvador, Guiana, Haiti, India, Indonesia, Katanga, Kenya, Malaysia, Mexico, Nicaragua, North Africa, Peru, Philippines, South Africa, Surinam, Uganda, Uruguay, Zaire.
Copper (or toxicty of molybdenum)	Argentina, Bolivia, Brazil, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Ethiopia, Guatemala, Guiana, Haiti, Honduras, India, Indonesia, Kenya, Malaysia, Malawi, Mexico, Panama, Peru, Philippines, Senegal, South Africa, Sudan, Surinam, Swaziland, Tanzania, Trinidad, Uruguay, Venezuela, Zaire, Zimbabwe.
Iron	Brazil, Costa Rica, India, Panama.
Manganese	Argentina, Brazil, Burma, Costa Rica, Panama, South Africa, Uganda.
Selenium	Bahamas, Bolivia, Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador, Guiana, Honduras, Indonesia, Malawi, Mexico, Paraguay, Peru, South Africa, Swaziland, Thailand, Uganda, Uruguay, Venezuela
Zinc	Argentina, Bolivia, Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador, Salvador, Guatemala, Guiana, India, Indonesia, Kenya, Malawi, Mexico, Panama, Peru, Philippines, Puerto Rico, South Africa, Sudan, Swaziland, Uganda, Uruguay, Venezuela
Toxic elements	
Fluoride	Algeria, Argentina, Ecuador, Guiana, India, Mexico, Marocco, Saudi Arabia, South Africa, Tanzania, Tunisia.
Manganese	Brazil, Costa Rica, Indonesia, Peru, Surinam.
Selenium	Argentina, Brazil, Central Africa, Chad, Chile, Colombia, Ecuador, Honduras, India, Iran, Kenya, Madagascar, Mexico, Nigeria, North Africa, Peru, Puerto Rico, South Africa, Sudan, Upper Volta, Venezuela.

adapted from: McDowell (1976); Fick (1978); McDowell et al. (1983); Mtimuni (1982)

which may exist from available commercial products.

GROUP ASSISTANCE TO NATIONAL ORGANISATIONS

During the last four months SRCG staff have provided assistance to the Congo in the setting up of a systems research programme in the south west of the country. Daniel Bourzat spent about three weeks in Congo training local staff in the use of questionnaires and their interpretation and then assisted them in the setting up of a long-term monitoring study in the traditional sector. Daniel also visited Cameroon and had further discussions with the Institute of Animal Production on protocols for their on- and off-station research.

Trevor Wilson was in Mozambique in early December to look at small ruminant data collected on Chobela research station over a number of years, to advise on its value and to assist in devising methods for analysis. While in Mozambique he also participated in the National Conference on Livestock Production and gave a seminar on small ruminant production systems in Africa.

REARING OF SMALL RUMINANTS IN THE CONGO

The sheep population of the Congo is estimated by the livestock department at about 88 000 head and the goat flock at 190 000 head.

A country situated in the equatorial zone, the Congo is infested with tsetse flies which renders a great deal of pasture under forest and savana useless for the rearing of animals likely to be affected by trypanosomiasis. The country is largely tributary to the world market for its supplies of meat products. The meat consumed in the country has come, and still comes, mainly from hunting. Unfortunately the population of wild animals has diminished considerably in the course of the last 20 years to the extent that numerous species are considered as on the way to extinction.

The Congolese authorities have instituted a certain number of development and research projects on animals with short production cycles

(sheep, goats, pigs and poultry).

In this context, Daniel Bourzat directed a 3 week mission in November 1985 to start a programme of research jointly with the National Council for Scientific and Technical Research over an 18 month period. The area studied is Mayombe in the Kouilou region, a forest zone where small ruminants are represented by Djallonke type sheep and dwarf goats from West Africa. A first series of data analysis on 350 animals is underway.

RESEARCH ON THE GOAT AT THE UNIVERSITY OF KHARTOUM

Dr. Babiker Abbas of the Department of Medicine, Pharmacology and Toxicology, Faculty of Veterinary Science, University of Khartoum, sends us the following information.

Since 1977 I have been interested in the diseases of goats and sheep in the Sudan and have several clinical and research contributions. At the present time I am studying the clinical and immunological aspects of Johne's disease in goats. We have so far encountered an astonishingly high prevalence of this disease (about 15 per cent).

I am also conducting studies on metabolic diseases in goats with emphasis on problems associated with pregnancy. In addition we are conducting surveys on brucellosis. I am also conducting studies on the foreign-body-pica syndrome in goats. This is a very common clinical entity in "Urban" Sudanese goats of which we annually receive about 100 cases (making about 25 per cent of total goat intake). So far the studies indicate depression in both serum protein and glucose; but both factors are generally low in the general population of goats.

I am assisted in these studies with a group of graduate students/research assistants.

NEW TYPE OF MEAT SHEEP IN ENGLAND

Mr. Henry Fell, formerly Farm Manager of the Royal Agricultural College (Cirencester) farms and currently President of the Tenant Farmers Association of Great Britain and a large scale farmer in Lincolnshire in eastern England sends us the following information about his new breed of sheep.

The Meatlinc is bred purely for use as a terminal sire and it all started 24 years ago. The original crossing involved Suffolk, Dorset Down, Ile de France, Berrichon du Cher and Charollais. The breeding, selection and recording programme is tightly controlled and is done in conjunction with the MLC. The objectives are: fast growth under conditions of good nutrition; a high quality carcass when crossed with ewe breeds that do not have good carcass qualities; the ability to finish at a wide range of weights (16kg to 24kg) without getting too fat. Prolificacy is not included in our selection criteria but I can say that we normally expect to wean 170 per cent. At 56 days most pure bred Meatlinc lambs will be in the range of 20 to 25 kg liveweight.

As to carcass quality, I can only say that a group of 10 Meatlinc x Halfbred lambs from one of our customers won the 1985 Royal Show carcass competition.

Selection is based on the use of an ultrasonic backfat scanner. Each year's crop of lambs is tested and grown under commercial large flock conditions in Lincolnshire.

RECENT LITERATURE

Hoste (C), Peyre de Fabregues (B), Richard (D) - The camel and its management. Paris IEMVT 1984, 162 p (Coll. Etudes et Syntheses by l'IEMVT)

This work is the fruit of the analysis of 350 bibliographical references and the field experience of the authors. After a presentation of the rearing zones of the camel, this work describes the species and ways of breeding with particular reference to recent literature concerning size, composition of herd, parameters of reproduction and production. The chapter on feeding points out the difficulties in supplying dependable norms concerning the camel's capacity for ingestion and its needs and note is taken of the small number of works published on this subject.

The particuliarities of the camel concerning its water expenditure and its adaptation to heat are developed. Pathology is treated with a

main focus on trypanosomiaosis and gastro-intestinal parasitism. The authors devote the last chapter to the future of the camel and to the direction of present or future research.

AMEGEE (Y) - Study of the milk production of the Djallonke ewe in relation to the growth of the lambs.

The author has studied 3 to 4 lactations of 34 Djallonke ewes. Estimation of milk production is made by weighing the lamb before and after suckling (6 times a day) then by a manual milking (4 times a day) until the lambs reach 15 kg weight and until the production becomes less than 300 g per 24 hours.

The quantity of milk produced is from 57.44 + 16.6 kg for ewes feeding only one lamb to 86.44 + 29.21 kg for those feeding two.

The duration of lactation is from 105 + 29 days to 112 + 30 days respectively for each type.

The study also includes the average composition of the milk and the relations between the quantities of milk consumed by the lambs and their growth 0 to 30 days.

MOHAMUD HAGI MOHAMED, ABDULHAMID HAGI MOHAMED, LOCATELLI (A) - Water deprivation effects on the hematological and hematochemical pictures of Camelus dromadarius.

The authors have studied the effects of water deprivation (25 days) on 3 camels (a female and two males) fed on hay in Somalia. Only the hematocrite levels, cholesterol, sodium and copper showed significant variations.

PRINCIPAL RESULTS OF ANALYSIS ON SMALL RUMINANT RESEARCH IN RWANDA

The Small Ruminant and Camel Group recently assisted the Rwanda Institute of Agriculture Sciences with analysis of research work carried out on Rwanda stations in the period 1972-1984.

African long-fat-tailed sheep were bred pure over this period on two stations. Age at first lambing was 714 days, lambing interval was 406 days and litter size was 1.38 young per birth. Average daily gain

was 81.3 g to 150 days. Abortions amounted to 2.9 per cent of all parturitions while total mortality to weaning was 17.5 per cent. Litter weight at 150 days was 18.8 kg. Least-squares estimates of production indices were 16.9 kg of young weaned per breeding female per year, 0.50 kg per kg of breeding female and 1.3 kg per kg metabolic weight of breeding female.

Local goats (of the Small East African type) were bred pure and also crossed to Anglo-nubian and Alpine bucks. On the main of two stations where goat research was carried out, age at first kidding was 654 days kidding interval was 318 days and the number of young per birth was 1.58. Average daily gain was 58.3, 69.8 and 62.5 g/d to 150 days for the pure and the two cross-breds. Abortions were 1.9 per cent and total deaths to weaning 20.4 per cent. The productivity index was 15.9, 19.6 and 21.6 kg for local, Anglo-nubian x local and Alpine x local respectively although these differences were not significant. Sexual dimorphism in the cross-bred goats was very marked.

The gains achieved in both species are shown in the table. Further increases in productivity could be achieved in sheep by reducing age at first lambing, shortening the parturition interval and reducing the mortality rate even further. Similar gains could be achieved in goats. It was also concluded for goats that cross-breds would require high standards of management in the peasant sector if they were to achieve their full potential.

Principal changes in production parameters in Rwanda goats and sheep

Parameter	Value per year	
	Goats	Sheep
Litter size (number)	+0.05	+0.04
Birth weight (kg)	+0.07	-0.14
Weaning weight (kg)	+0.66	-0.34
Mortality to 150 days (%)	-0.20	-0.70
Index (kg/female/yr)		+1.61

The results will shortly be published as a joint Research Report by ILCA and ISAR (in French initially). Theophile Murayi, the principal Rwandese collaborator and author would be pleased to provide further information (address: c/o ISAR, BP 138, Butare, Rwanda)

GROUP DOCUMENT NO. 5: SMALL RUMINANTS IN GHANA

Group Document No 5 is an analysis of some aspects of goat and sheep production at the village level in the Kumasi area of south-central Ghana. It is supported by a bibliographic list of documents on small ruminant research in general in Ghana. All items in the bibliography are available on microfiche from the ILCA documentation services.

THE SMALL RUMINANT AND CAMEL GROUP

NEWSLETTER

International Livestock Centre for Africa,
P.O. Box 5689, Addis Ababa, Ethiopia. Telephone: 18 32 15

No. 6 June 1986

GROUP DOCUMENTS: NUMBERS 6, 7 AND 8

Three new group documents have recently been published. Numbers 6 and 7 are, respectively, documents relating to research protocols for on- and off-station research in the Democratic Republic of the Congo (Brazzaville) and in Cameroon. Both these documents result from assistance by the Group to national research organisations in the two countries concerned. They are available in French only.

Document 8 consists of reprints of all articles published internationally by Group and Group-associated staff during 1985. There are eight articles from internationally-refereed journals, four resulting from the publication of international conference proceedings and one from the proceedings of the SRCG conference held at ILCA headquarters in October 1985.

CENSUS OF SHEEP AND GOAT RESEARCH IN AFRICA

Dr Vivian Timon, Animal Production Officer (Small Ruminants) at FAO, Rome, has recently been instrumental in creating two small ruminant networks. One is in Asia and the Far East and the other in South America. The aims and objectives of these networks are very similar to those of our own. Discussions are currently in progress between SRCG-ILCA and FAO to explore the possibilities of a joint network in Africa.

As part of the Asian and South American networks, a cenus of research work is being undertaken by means of a questionnaire. As a preliminary to ILCA/FAO cooperation in Africa, the SRCG has agreed to act as "clearing house" for African research. We would be grateful if all interested people could complete the information sheet attached to this Newsletter and return to us as soon as possible. Instruction for completing the form are on the reverse of it.

CAMELS IN MAURITANIA

Present estimates of the camel population by the Animal Production Department in Nouakchott are about 780 000 head. Over the past few years, it is considered that the cattle population has decreased from 1.3 million to 950 thousand and that of small ruminants from 8.0 million to 6.5 million. Some officials believe that, by the end of 1985, the camel population might even have exceeded that of cattle.

There now appears to be a complete lack of true nomadism in Mauritania, and it is estimated that 57 per cent of herds are transhumant and 43 per cent are sedentary. (Note that other sources, especially the Mauritanian Institute of Scientific Research, do not agree that nomadism no longer exists). Most transhumant herds (97 per cent) are herded by the owners while most sedentary herds (93 per cent) are herded by salaried cameliers but where herding is done by a paid worker, it is usual for him to be accompanied by a child of the owner or even occasionally by the owner himself. Most herds seem to belong to one person which means, in effect, that the management unit is also the unit of ownership. Only 21 per cent of owners obtain their entire livelihood from their livestock. Investment in livestock by businessmen is on the increase and these form the largest group of owners being classed as businessmen/livestock owners (60 per cent).

There are significant differences in herd size between the sedentary (60 head) and transhumant (40 head) types of management. In the sedentary system, business/livestock owner herds averaged 72 head and are larger than livestock owner herds which contain only 59 head. Purchase of animals

from outside sources is more common in sedentary herds (21 per cent) than in transhumant ones (12 per cent). Only slightly more females are purchased than males.

Males comprise 44.2 per cent of the herd: males retained for breeding equal 2.7 per cent of the herd while males for transport and meat amount to 40.9 and 0.6 per cent respectively. Females comprise 55.7 per cent of the herd: females for breeding (actually in a reproductive state or being reared for breeding) equal 55.3 per cent of the total herd and females for transport, 0.4 per cent. There is a ratio of approximately one breeding male to every 20 breeding females.

Age at first calving is estimated at about six years and the interval between calves at 31 months. Fertility is put at 38 per cent. Overall herd mortality is considered to be about five per cent.

In 1984, total registered official slaughterings of camels were 25 292 animals (35 148 cattle, 39 430 sheep, and 32 521 goats) although several times this number must be slaughtered without being recorded. About 42 000 camels were traded through markets in 1984. The number of exports is not known - there is considerable seasonal movement across the Malian frontier - but 225 head were exported by boat to Morocco in January 1986. The average price of camels on the market in 1984 was 20 620 ouguiya compared to 10 000 for cattle, 2 000 for sheep, 1 590 for goats, about 20 000 for horses and about 2 700 for donkeys (1US$ = 73 ougiga).

There is a rapidly expanding camel dairy system on the outskirts of Nouakchott. Camels are brought in from the main herds after calving and sent back when they are dry. A concentrate, mainly of groundnut cake and imported from Senegal, is the principal feed. Camel milk sells for 100-200 ouguiya per litre (sterilized whole milk imported in cartons from Europe costs 40 ouguiya).

The National Livestock and Veterinary Research Centre has plans to buy 50 camels to start a research farm into disease and production aspects.

(Extracted from the 1984 annual reports of the Direction de l'Elevage and the Centre National de l'Elevage et de Recherches Vétérinaires. The data on herd size, composition and reproductive parameters were collected by staff of the Institut de l'Elevage et de Médecine Vétérinaire des Pays Tropicaux working in collaboration with the Mauritanian organizations).

WATER INTAKE BY YANKASA LAMBS

Daily water intake of six male and six female Yankassa lambs aged two weeks at the start of the experiment was measured. Lambs were allowed access to their dams at all times and also had access to concentrates and hay. At the time of the study, the average maximum temperature was 30°C, the minimum 18°C: average relative humidity was 74 per cent.

The average water intake was 117 ± 17.2 g and 103.7 ± 17.2 g for male lambs and female lambs respectively for the first three weeks of the study period while 341.7 ± 14.6 g and 380.6 ± 14.6 g were drunk during the last four weeks. There was no significant difference ($P>0.05$) in water intake between male and female lambs. There was a highly significant difference ($P<0.01$) in intake between the two periods. The average daily gain for female lambs was 50 g and for male lambs was 58 g for the period of study.

(Contributed by: A.A. Aganga, N.N. Umunna, E.O. Oyedipe and P.N. Okoh, Faculty of Agriculture, Ahmadu Bello University, Zaria, Nigeria).

THE SAHARAN MENACE

When Professor E.P. Stebbing spoke recently to the Royal Geographical Society about the menace of the encroaching Sahara Desert, he was not, as some London papers seem to think, announcing a new discovery, writes a Correspondent. It is true that many people in Nigeria, the French Niger and Sudan [i.e. the current Mali] are living on the edge of a menace of drifting sand that promises to engulf their farms. In order to remedy the situation, French and British governments have made efforts at forest preservation on both sides of the border. And while the French Colonial Office has been constructing wells, the British Geological Survey has inaugurated work of immense value in prospecting for water.

(from the journal "West Africa" of 16 March 1935 (yes 1935!).

GOAT RESEARCH IN ZIMBABWE

Goat research in Zimbabwe is currently being underaken by the Department of Research and Specialist Services of the Ministry of Agriculture and by the Animal Production Department, Faculty of Agriculture, University of Zimbabwe.

Department of Research and Specialist Services

Farming Systems Research Unit. The objectives of a livestock monitoring programme are to do a census of ownership patterns, flock sizes and composition and an assessment of the reasons for offtake. In addition, growth patterns, reproductive performance and mortality in two Communal Areas (traditional farming areas) are being studied. The study is planned to last three years from July 1985 and 56 farmers owning 709 goats are being followed in Chibi in the dry southern lowlands with a further 23 farmers with 91 goats cooperating with the FSRU in Mangwende in the medium potential central area.

Makoholi Experimental Station. Reproduction, viability growth and carcass characteristics of indigenous (Mashona) and Boer goats under range conditions without browse are being studied. About 150 does of each breed will be bred in three periods (summer - January/March; Autumn/winter - May/July; and spring - September/November) in single sire groups of 25 females. Each group will be mated in the same season every year. Bucks will be used across seasons and replaced annually. Data to be collected included: birth weight; linear measurements at birth, weaning and one year; reproductive performance; age at puberty of males and females using testosterone and progesterone assays on blood plasma; milk yield and lactation length; and ejaculate volume, sperm concentration, sperm motility and semen pH at the beginning, middle and end of the breeding season.

Matopos Research Station. The feeding habits of goats with special reference to selectivity, browsing behaviour and chemical composition of selected species are being studied. Additional studies include the reproductive performance of indigenous goats (Matabele) and the growth of their progeny. In the reproductive study, animals will be mated three times in two years and prolificacy, reproductive efficiency, kidding interval and oestrus characteristics will be analysed.

University of Zimbabwe

Two principal studies are being undertaken, the one on current levels of production in indigenous flocks and the other on the production potential of local goats. Flocks in three Communal Areas are being followed in the first study with respect to: flock structure and dynamics; reproductive performance; mortality and its causes; and body mass development. The objectives of the second study, being undertaken on the University farm are: to assess the effect of dietary supplementation on reproductive performance and milk production; and to evaluate the influence of level of feeding at different stages of gestation on birth mass, survival and post-natal growth of kids and on mammary development and milk production of does.

CAMELS AND THE KENYA VETERINARY ASSOCIATION

The KVA is the professional body of the veterinary profession in Kenya. On 13 and 14 March 1986, it held a two-day scientific meeting at which camels were the theme. The first morning was devoted to technical presentations on productivity in general, milk production in particular (butter and cheese is being successfully made from camel's milk), reproduction, and the role of the camels in the northern Kneyan pastoral economy. During the first afternoon, groups of diseases - viral, bacterial and parasitic - were presented and discussed. Young stock morbidity and mortality and abortion were given particular emphasis: in addition to management and nutrition, camel pox and trypanosomiasis are important in abortion and early mortality. An evening session devoted to discussing and trying to establish some priorities for research - there are about 20 national, international and non-government organisations doing something with camels - closed the first day.

The second day consisted of practicals and demonstrations on live and dead camels on one of the commercial ranches which keeps them. Kenya camels are equivalent to only about five per cent of the total domestic herbivore biomass of Kenya but this meeting clearly demonstrated the

importance attached to its role in the dry northern and north-eastern areas of the country - it was anticipated that attendance at the meeting would be about 30 people, but 130 turned up!

RECENT BIBLIOGRAPHY

Chartier, C. 1985 Enquêtes séro-épidémiologiques sur les avortements infectieux des petits ruminants en Mauritanie. IEMVT: Maisons-Alfort, France/CNERV: Nouackchott, Mauritanie.

Methodological aspects for the study of a little understood disease are dealt with in detail. The methodology could serve as a model for use elsewhere.

Brucellosis and salmonellosis were not found but chlamydiosis, Rift Valley Fever and Wesselobron disease were common. The discussion attempts to place these diseases and their importance in the larger small ruminant pathology picture as a whole.

Pagot, J. 1985 L'élevage en pays tropicaux. Editions Maisonneuve et Larousse: Paris.

The author - veterinary surgeon, docteur-ès-science, Honorary Director of IEMVT, animal scientist of world renown and first Director-General of ILCA - unfortunately died before this monumental work was complete. It is an adequate valedictum, based on an enormous literature survey and on his own personal experience in many countries. Some chapters where the author thought he was perhaps not the most competent person in the world have been contributed by others: these include one by P. Auriol, Head of Animal Production Divison of FAO and one by H. Serres of IEMVT.

The book, available only in French, is in seven parts comprising: climate; relations between systems and climate; water resources; feed resources; diseases; genetics; systems of production.

The book is mainly concerned with African problems but draws on experience from other hot continents in addition.

SHEEP BREEDING CENTRES IN ETHIOPIA

Two centres for sheep breeding and improving the quality of the species have been opened in Menz-Gishe province of Shoa region in an effort to regain animal resources that had perished during the drought.

The centres, established jointly by the Relief and Rehabilitation Commission (RRC) and UNICEF were opened at the beginning of 1986 in Gera Midr and Mama Midir districts of Menz-Gishe province.

The centres have at present 1,050 local and foreign breeds.

The establishment of the centres was aimed at enhancing peasants' income from sheep products such as wool, meat and skins and producing handicrafts.

The centres, expected to benefit over 1,000 peasants, are making preparations to train 30 peasants in improved animal husbandry and to organize about 100 peasants in handicraft cooperatives.

(from "The Ethiopian Herald", 22 January 1986)

BIBLIOGRAPHY ON SOUTH AMERICAN CAMELIDAE

The Centre for Information on South American Camelids attached to the Tropical and High Altitude Veterinary Institute of the National University of San Marcos, Lima, Peru, has recently published a bibliography on South American Camels.

There are 2431 references listed (although many appear more than once) which are classified into general literature; Alpaca, Llama; Guanaco; and Vicuna. Each of the species accounts has sections on: anatomy and histology; physiology; biochemistry; haematology; nutrition and feeding; reproduction; genetics and breeding; husbandry and management; health; pharmacology, therapeutics and toxicology; economics; production; development plans and projects; protection, conservation and protected areas.

The bibliography is not annotated and there are one or two unfortunate errors in some of the English language entries. Nonetheless, this is a very useful source, especially for those of us interested in the comparative aspects of Old and New World Camels.

Also just published by the Centre are the summaries of papers presented at the International Conference on South American Camelids held at Cusco in Peru from 16-21 June 1985. There are 104 summaries - mostly in Spanish - arranged in themes similar to those described for the bibliography. This is a veritable mine of information for those who can understand Spanish or with handy access to a dictionary.

Single copies are obtainable from CICCS/IVITA, P.O.Box 4270, Lima I, Peru.

GOAT RESEACH AND DEVELOPMENT IN KENYA

In recent years, the value of the goat has been increasingly recognised in Kenya and there are quite a number of projects in which goats are the principal or a major component of research and development thrusts. Government departments, international bodies, non-government organisations and private individuals all showed an increased interest in recent years.

FAO/UNDP/Government of Kenya Sheep and Goat Project

Started in 1972, this project was continued through an expanded second phase initiated in 1978. Negotiations are currently in progress for a third phase. The main objectives of the project were to:

establish multiplication flocks of the major sheep and goat breeds;

implement pilot marketing operations and assist in the development of a marketing system;

implement strategic extension activities in four priority areas;

improve the methods of control and prevention of diseases through a programme of investigation and field studies;

determination of the economics of various small stock production enterprises under both intensive and extensive systems.

The breeding objectives were to give priorities to meat production characteristics, but the improvement of milk production in dairy goats and their cross-breds was also included. By February 1984, a total of 11 stations were being operated under the project.

In retrospect, it appears that the programme was too ambitious and optimistic. Supervision at the stations proved difficult and the reliability of performance records was therefore of doubtful value. Sales of improved breeding stock have been disappointing.

Work by the Veterinary Unit on the cost/benefit of disease control and trypanotolerance showed that prophylactic therapy was cost effective for all sheep and goat breeds but particularly for exotics. Based on results from Naivasha on the incidence of helminthiasis and on the economics of control, it has been shown that subclinical and chronic helminthiasis is of more economic importance than the acute disease. The project investigated the use of vaccines for the control of brucellosis and found that vaccination of goats agains B.melitensis allowed this disease to be virtually eliminated from project stations. Other disease work showed that vaccination against contagious caprine pleuro-pneumonia could also be very effective.

In line with the project's emphasis on meat production, the Marketing Unit's work was concerned mainly with market research, the operation of a small number of pilot auction markets, staff training and the design of a system for records. No work was done on the marketing of milk from goats.

A final task of the project was to assist the formulation of an investment project for funding by the African Development Bank. The project, which is currently being negotiated, contains provisions for credit mainly for bigger farmers, investment in marketing infrastructure and training for Country Council and Ministry staff and farmers.

EMI Goat and Sheep Project

The overseas Development Administration of the UK is currently assisting the Government of Kenya with a number of development projects in Embu, Meru and Isiolo districts (EMI). The Goat and Sheep Project is one such. The main objectives are to improve small ruminant husbandry in the semi-arid areas of lower Embu and lower Meru in order to provide increased income on a sustained basis. The project was first approved in 1980 and in 1982 the Meru District Council allocated 1 000 acres (400 ha) of land at Marimanti for the establishment of an improvement centre.

By 1984, most of the infrastructure for this centre had been completed and the project manager was in residence. Currently, work is being undertaken to test the performance of Galla goats under local conditions and a herd of 500 animals has been established for this purpose, from which selected males are distributed to local farmers. The performance of these has not yet been monitored but a start is to be made on this shortly. Short training courses are given at the centre to recipients of improved bucks and other farmers. Work is also proceeding with the crossing of Galla and Toggenburg goats for sale to farmers as milk producing animals and with the production of Dorpers for crossing with local sheep for meat. By using additional land at nearby Kirurini, it is intended to increase the breeding herd of Galla goats to 1 000. A further area of land is to be inspected and assessed for its possible use in further expanding the breeding programme. The project has apparently had a considerable impact locally in terms of acceptability. The demand for breeding goats far outstrips the supply but it is as yet too early to draw any conclusions from the experience of the local farmers with the improved goats.

The SR-CRSP Project

The Small Ruminant Collaborative Research Support Programme in Kenya is a joint programme between the US Agency for International Development (USAID) and the Kenyan Ministry of Agriculture and Livestock Development. The aim of the SR-CRSP is to develop and assess the potential of dual-purpose goats for small-scale farmers. It is a combined research programme involving scientists from different disciplines and has a number of components:

production systems	research on feed production, nutrition and management for dual-purpose goats;
breeding	research on genetically improved high yielding animals for local conditions, mainly using Toggenburg goats crossed on the Small East African
agricultural economics	research on the profitability of goats in smallscale farming systems;

rural sociology	research on people's attitudes and the acceptability of goats and their products;
systems analysis	research to develop mathematical models and simulations of goat production systems to assist biological, social and economic evaluations.

Research activities are located on the Maseno Research Station and on small farms in Kakamega, Kisumu and Siaya districts. Animal breeding experiments take place at Naivasha and additional animal health and systems research activities are conducted at the Central Veterinary Laboratory at Kabete, near Nairobi.

SR-CRSP workshops have been held annually since 1982 and proceedings have been published of each one. The SR-CRSP training programme has already ensured that Kenyan nationals have been able to specialize in goat production and will contribute to the creation of a pool of skills in the future.

Non-government organisations (NGOs)

The Catholic Diocese of Kitui Sheep and Goat Project. A successful project is run by the diocese on 5 000 acres of typical Kitui shrub land. The objective is to assist the Akamba who are keen smallstock farmers and are struggling to survive on land with a low and unreliable rainfall. Somali Deguen goats (one of two types of the White Somali) are being graded up using Boer bucks to produce a type adapted to the local environment. Breeding females from this flock are in great demand locally and recipient farmers are given a short training course at the centre. A monitoring system to follow up progress is to be established shortly.

Action Aid. Action Aid is sponsoring goat production through the 4-K clubs (Young Farmers' Clubs) and primary schools.

Catholic Mission Project at Kosetei. The Catholic Mission in East Pokot is trying to assist farmers with grade Boer meat goats.

National Christian Council of Kenya. NCKK has introduced some good quality Boer goats to the settlement area of Ngarua in Laikipia district, a former "White Highlands" ranching area.

CARE. A significant dairy goat project is operated by CARE in the Kitale area. The project aims to assit the Maendeleo ya Wanawake (Women's Progressive Movement) groups to acquire milk goats and to learn how to keep them. A feature of this project has been the excellent support given through the Kitale Research Station which has supplied planting material for forage crops and supervised their planting. Towards the end of 1982, CARE was assisted by OXFAM to buy a flock of 260 grade does from a private ranch. This flock was then joined to five Toggenburg bucks purchased from the foremost dairy goat breeder, Mrs. Olivia Rodwell of Mtwapa, Mombasa. The flock was later distributed to women's groups in Trans Nzoia district. Results of these operations have been encouraging but experience has shown that there was probably insufficient discussion and involvement of the recipients at the start. Those receiving the goats had expected an early return and had been inadequately prepared for the additional effort and expenditure required before results were apparent. In the event, two of the eight groups originally involved have sold their goats to the SR-CRSP project. CARE staff have pointed out the desirability of previous experience with goats in those who receive improved stock and are currently intending to switch emphasis to the pastoral areas.

Commercial farms

A small number of the larger commercial farms have become involved in goat production, mainly for meat, but in some cases for experimenting also on a pilot scale with improved milk production using exotic blood on local foundation stock. A few improved progeny are available for sale but demand for outstrips the supply. Some large-scale commercial ranches in Laikipia also rear Angora goats and sell good quality mohair to the world market at grades and prices comparable to those achieved from traditional mohair producing areas.

TOXOPLASMA ABORTION IN EWES

About 10 per cent of abortions in sheep are as a result of infection by toxoplasmas, the main organism being T. gondii. The parasite can be

collected from live-born lambs and an attenuated vaccine made from it. Significant differences in abortion rates have been shown between non-vaccinated and vaccinated animals with a previous history of Toxoplasma-related abortion. Further work is being undertaken to improve the efficiency of the vaccine.

GOAT RESEARCH IN TUNISIA

The Institute of Arid Zones Research in Tunisia, in collaboration with FAO, has imported a number of exotic goat breeds with a view to improving the milk production of the indigenous Tunisian Black. The Tunisian Black is considered to have relatively poor performance and low genetic potential. Prolificity is of the order of one young per birth, milk production 700 g/d for a lactation of 100 days and growth is about 50-75 g/d. These are performance levels under traditional management in south Tunisian oases. Under station conditions with improved management, daily milk production was increased to 900 g/d but growth rates did not increase. The poor performance on station was considered to be due to: excessive inbreeding (in the oasis stock brought in from the traditional system); absence of selection; low reproductive levels leading to long generation intervals; and absence of good quality males.

Data relating to the productivity of the imported, local and crossbred stock under station conditions are given in the accompanying table. Note that in their own native environment, the exotic breeds give better performance than when imported to Tunisia (Alpine in France a lactation yield of 570 kg in 245 days, Murciana Granadina in Spain 500 kg in 210 days and Damascus in Cyprus 200 kg in 90 days after kids are weaned).

The results achieved by IRA are considered to be encouraging and it is planned to continue "absorbing" the Tunisian Black into the exotics by continuous top-crossing where improved management practices can be assured.

(Adapted from final report of FAO/Near East Collaborative Project - AG: NECP/TUN/502/QAT).

Goat performance levels in Tunisia

Breed and origin	Duration of experiment	Milk production (kg/d)	Lactation length (d)	Litter size	Birth weight (kg)	Growth (g/d)
Alpine/France	1982-1984	2.12	180	1.25	3.6	116
Murciana Granadina/Spain	1983-1984	1.35	162	1.28	2.1	70
Tunisia Black/Tunisia[a]	1982 1983	0.70 0.91	100 160	1.12 1.15	2.1 ?	77 ?
Alpine x local	1983-1984	1.20	?	1.20	2.8	155[b]

Notes: a) under traditional conditions in 1982, station in 1983
b) considered to be due to heterosis

No data presented for Damascus goats imported from Cyprus

A SYNTHESIS OF RECENT PUBLICATIONS ON REPRODUCTION IN CAMELIDAE

(D. Bourzat)

Introduction

The productivity of a domestic animal is largely dependent on a number of factors affecting reproduction. Age at first birth, birth interval and fertility and mortality levels are the factors which determine lifetime production of the female. In the male, the ability to produce sperm capable of fertilizing eggs all the year round or during the breeding season of the female is the major factor governing reproductive success.

For the majority of domestic species, considerable research has been undertaken which has led to an understanding of the major factors governing reproduction. Unfortunately, this is not the case in the Camelidae and much has still to be learnt. In this presentation, we synthesize recent articles on spermatogenesis in Camelus dromedarius, on the induction of ovulation in C. bactrians and on a field study on the productivity of 12 000 females of C. dromedarius in Niger.

Puberty and age at first parturition

The one-humped camel is considered to reach sexual maturity at a relatively late age. Although numerous authors consider that puberty can be attained at three years, it is not usual for females to be mated before four years and first parturition generally therefore takes place at five years.

Males first came into "rut" at five years.

Seasonality, oestrus cycle and ovulation

Most research shows that there is a marked seasonality of breeding in the female but that the picture is less clear in the male.

Few studies have been undertaken on the oestrus cycle and those that exist show some divergence. For example, Joshi, Vyas & Pareek (1978) give a duration of 23.4 $\pm$ 0.22 days while Musa & Abusineina (1978b) provide a figure of 28 days.

In the Bactrian camel, the follicular cycle form a follicle size of 5 mm diameter through maturity and regression is 19.1 $\pm$ 4.25 days (Chen et al, 1980).

Ovulation is induced by the sexual act (e.g. Shalash, 1965; Musa & Abusineina, 1978b) but studies of the actual mechanism which causes an egg to be shed are still in their infancy. Some authors suggest the possibility of excitation of the uterine tube during intercourse. South American work on Lama pacos shows that the rupture of the follicle can be caused by an intervenous injection of HCG or by intercourse. Musa & Abusineina (1978a) were not able to provide ovulation by manual stimulation of the uterus in C. dromedarius and in C. bactrianus ovulation could not be induced by use of a vaginal probe or by an equine insemination catheter (Che et al, 1983). The same Chinese workers did, however, induce ovulation in C. bactrianus by means of artificial insemination and studies are still continuing on 63 females to determine the actual mechanism of ovulation (Chen, Yuen & Pan, 1985). The aim of these expemiments is to inseminate (when the follicle reaches 12 mm diameter) by one of fresh semen, seminal plasma, a highly concentrated solution of spermatozoids, a solution of accessory genital glands, or skimmed milk, in order to see if any of these materials induced ovulation. Control animals were served naturally and a further group were given intra-muscular injection of LH, HCG or LHRH. The results show that ovulation is induced by the seminal plasma and that a minimum quantity of 1 ml is required for this to happen. Intra-muscular injection of hormones also induced ovulation even in those animals which did not ovulate following artificial insemination. However, the actual compound in the seminal plasma responsible for the release of the egg is not yet identified and the LH liberation mechanism is also not yet known.

"Oestrus" lasts four to five days and, where ovulation is induced, this occurs 30 to 48 hours after intercourse or insemination.

Birth interval and percentage fertility

Gestation is about 380 days and generally therefore the breeding and the calving season occur at the same time of the year. Post-partum anoestrus appears to be fairly long, this frequently resulting in females not getting pregnant in the years they give birth. In Niger (Planchenault, 1984), intervals varied from 24 to 38 months with a mean of about 30 months. Planchenault calculated a fertility of 45 per cent.

Spermatogenesis in males

Ultrastructural studies of the intratesticular seminiferous epithelium, canals and Sertoli cells have shown that the camel has unique histologic properties (Osman, 1986; Osman & Ploen, 1986a; 1986b).

In the camel, the intratesticular ducts do not serve solely as vessels for the passage of spermatozoids and the spermatic liquid but also have an important function in the maturation of the spermatozoids by modification of the chemical composition of the liquid secreted in the seminiferous tubules. Only the distal part of the Tubuli recti have a structure different from other animals. The external skin and cover are undulated and the lumen is convoluted, but there is no reason to believe that modification of the spermatic liquid and the resorption of spermatozoids are not the principle functions of the Tubuli recti as in other mammals.

In camels, the Sertoli cells do not have a nuclear vacuole but, again, they seem to have the same functions as in other mammals and are the receptors of FSH and testosterone. They also assist in the metabolism of glucose, act as a blood-sperm barrier and create a specific micro-environment which prevents contact between the immune system and the seminal cells during the meitotic and post-meiosis phases.

The stage of spermatocytogenesis of the seminal cells can be estimated by the area of contact with the Lamina basali, the size and shape of the cell and its core and the number of chromatic inclusions. Three phases can be distinguished: spermatogonoids Type A; spermatogonoids Type B; and intermediate type spermatogonoids. Spermatogonoids then commence mitotic division and at the prophase of meitotic division spermatocytes type 1 pass through leptotene, zygotene, pachytene and diptotene stages before becoming spermatocytes type 2.

The spermatids pass through the classic phases as described for other animals. These are: the Golgi phase; cap phase; early, middle and late acrosome phases; transition from acrosome to maturation; and the maturation phase.

This detailed examination of male gametes has enabled the peculiarities of the camel to be defined. In the spermatocytes the Golgi

apparatus is very important and at the pachytene stage very large pro-acroseme vesicles are clearly evident. In the spermatozoid, the acrosome form is distinct for the dromedary (as it is for other species). The intermediate phase is shorter than in other mammals.

Spermatogenesis, the authors conclude, is similar to that in other species. They did not note, in camels from Sudan, any marked seasonality. [However, note that this last finding should be verified in live animals by examining sperm quality - Editors].

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SMALL RUMINANT RESEARCH AND DEVELOPMENT

PROJECT QUESTIONNAIRE

COUNTRY: _____

TITLE OF PROJECT: _____

OBJECTIVE(S) OF PROJECT: _____

_____

_____

SCALE OF PROJECT: No. of Animals /___/ PROJECT CODE /___/ RESEARCH /___/

No. SMY /___/ /___/ DEVELOPMENT /___/

/___/ TRAINING /___/

MANAGEMENT SYSTEM: _____

STARTING DATE: _____ TERMINATION DATE: _____

SOURCE OF FUNDING /___/ National /___/ Bilateral /___/ International

(name of agency) (_____) (_____) (_____)

NATIONAL INSTITUTION: _____

(implementing the project) _____

_____

	Name	Specialisation Code
PROJECT STAFF : Leader	_____	_____
Scientists	_____	_____
	_____	_____
	_____	_____
	_____	_____

SUMMARY REPORT/ACHIEVEMENTS _____

_____

_____

_____

_____

_____

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Notes on Completing Questionnaire

1. Definition of project: Avoid describing broad programmes as projects; Avoid describing individual specific experiments as projects.

   Examples
   (a) Selection for increased fleece wight in Romney ewes
   (b) Evaluation of Suffolk and Texel rams in crossbreeding on native ewes.
   (c) Evaluating the use of by-products in the nutrition of dairy goats.
   (d) Strategic drenching in the control of stomach parasites in sheep.

2. Scale of project:

   (a) SMY = Scientist man years over the life of the project
   (b) Project Code - the project encompasses a number of areas of specialization list the three most important areas under Project Code.

3. Areas of Specialisation or Special Interest

Area	Code	Area	Code
Administration/ Policy Formulation	1	Genetics/Applied Breeding	11
Behaviour/Husbandry/ Management	2	Marketing/Product Development	12
Biochemistry/Physiology	3	Mechanisation/ Automation	13
Biometrics/Statistics	4	Nutrition/Applied Feeding/Pastures	14
By-products: (a) fibre (b) meat (c) skin	5	Product Quality/ Processing	15
Disease Prevention/ Control	6	Sociology/Labour Relations	16
Economics/Farm Management	7	Teaching/Tertiary Education	17
Reproductive Physiology: (a) male (b) female	8	Environmental Impact	18
Environment Control/ Housing	9	Population Dynamics/ Survey	19
Extension Methods/ Communication	10	Metrology/Histology/ Laboratory Techniques	20

NOTE

If your address is incorrect or if a colleague would appreciate receiving a copy of this Newsletter, please fill in the form below.

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The Small Ruminant and Camel Group
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P.O.Box 5689
Addis Ababa, ETHIOPIA

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Name: .....

Address: .....
.....
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Please note my new address:

Name: .....

Address: .....
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THE SMALL RUMINANT AND CAMEL GROUP

NEWSLETTER

International Livestock Centre for Africa,
P.O. Box 5689, Addis Ababa, Ethiopia. Telephone: 18 32 15

No. 7 Date. October 1986

GROUP DOCUMENTS 9, 10 AND 11

Group document SRC 9 comprises a research protocol prepared for and at the request of the Animal Production and Fisheries Department of the Republic of Djibouti.

Group document SRC 10 was prepared as a background paper for the course recently held at ILCA headquarters on standardization of data collection and provides information on the animal production parameters required, the estimation of other parameters from them, and the use of the results.

Group document SRC 11 is dealt with in more detail in the following section.

RESEARCH ON THE ONE-HUMPED CAMEL IN AFRICA

During January to May 1986 visits were made by the Group to 12 African countries which have large numbers of camels. The visits were in part financed by the United Nations Sudano-Sahelian Office. They were undertaken in order to find out what future plans for research were. At the same time a review of the more than 3000 literature items relating to Camelus dromedarius was carried out in order to try and determine their merit and to identify areas where additional research might be needed.

A report presented to, and provisionally accepted by, UNSO has now been published by the Group as Group Document N° 11. It contains an analysis of the literature, a description and review of present research by country, recommendations for the setting up of a Network to coordinate and carry

out research in the future and appendices which list institutions carrying out camel research and provide brief biographical details of workers actively involved in camel research in Africa.

Single copies of the document can be obtained on request to the Group.

BOOK REVIEW: SHEEP PRODUCTION IN THE TROPICS AND SUB-TROPICS

It is usual when reviewing books to conclude with some platitudinous statement such as "this book fills a long-empty gap and should find its place on the bookshelves of every animal scientist". Let us start this review by saying it and then it is out of the way.

This is the latest book in the very popular and very well produced "Tropical Agriculture Series" published by Longman's. The author, Ruth M. Gatenby, is young and relatively new to the tropics and has unfortunately let this show in feeling that she must list all the countries she has visited (seven!) and use only photographs taken by her on these visits. A two-week visit to Ethiopia, for example, in late 1982, has provided much of the illustrative material, all of which is not necessarily entirely appropriate.

But in spite of the lack of extensive experience of the author in the tropics and sub-tropics, this really is a very good book. The review and interpretation of the existing literature is excellent in spite of a tendency to treat secondary sources as if they were prime data. The writing style is generally clear and concise although there are occasional lapses into convoluted negative statements which might be expressed more simply in the positive. There are very few typographical and printer's errors and only very minor bibliography discrepancies between the citations in the text and those in the extensive references section of more than 800 items. Most of the bibliographic items are recent to very recent -- have Longman at last realised the necessity for getting books out as soon as possible after the manuscript is delivered to them by authors?

The book has 11 chapters. An Introduction has sections on geographical distribution, breeds, genetics and environmental physiology. The second chapter on Management was contributed by the writer of this review. Chapters

on Health, Nutrition, Feeding, Reproduction, and Growth and meat production follow. Chapter 8 on Wool production is a further contributed chapter (by Marca Burns). Chapter 9 is devoted to Milk and other products while the two last chapters are very useful ones on Sociology and economics, and Improvement. Appendix I is a Glossary of technical terms which could have been expanded: it would also have been useful to indicate in the main text the words which appeared in the Glossary. Appendix II is a simple listing of breeds with only very scant information provided about them and might possibly have been better left out. The Index is generally very good and provides rapid access to most of the subject matter.

This book is an excellent buy at UK £27.50. If you don't have that amount, beg or borrow it -- and persuade your library to stock the book too or your own copy will be forever absent from your desk.

(Gatenby, Ruth M. 1986 Sheep production in the Tropics and Sub-tropics. Longmans: London and New York. ISBN 0 582 40404 5. Price UK £27.50 in UK only. Reviewed by Trevor Wilson).

DORPER SHEEP IN KENYA

(Sent by Mr Peter Faull, a Kenya Dorper breeder and a member of the SRCG. This article appeared in the Kenya Daily Nation on Thursday 20 February 1986 and is reproduced without further editing).

The Dorper sheep is rapidly gaining recognition in Africa and at present the demand for quality breeding animals cannot be met.

The Dorper breed was developed in southern Africa during the 1930s for the production of high-quality lambs under arid conditions.

Numerous investigations were carried out at agricultural colleges and experimental farms, while co-operative breeding experiments were done by interested farmers on their own farms in dry areas.

Several cross-breeds were exhaustively tested, but these were all found to have too restricted a breeding season. After further investigation into the sexual activity, hardiness and growth rate of various crosses, it was found that the Dorset Horn ram crossed with the Persian Blackhead ewe, had all the required qualities, and these became the foundation parents of the modern Dorper -- a coupling of the first syllables of the names of the parent breeds.

The experiments had proved that whenever sheep were bred above the half-blood level to British mutton breeds -- those with more wool than hair in the coat texture -- the conformation continued to improve, but the all important characteristic of adaptability to harsh conditions was lost.

Consequently, it was decided to develop the new breed out of the half-bred Dorset Horn cross Persian Blackhead, and by strict selection of the desired type, the Dorper was finally established in 1942.

It was then recorded that the new Dorper produced, on average, three times more milk than the purebred Persian Blackhead ewe.

The Dorper is well-distributed in the countries of southern Africa and is the most popular breed in Zimbabwe today. Dorpers have also been introduced to the Middle East. In Kenya, the breed made no progress for many years through lack of new blood and outcrossing. The first Dorper importations to Kenya were in the early 1960's.

The ADC farm Njoro maintains a fine flock, and six excellent pedigree rams were imported in 1984 by Dorper breeders in Kenya. This will greatly improve the Dorper flocks they had maintained over the years, as well as selectively produce quality breeding stock on a par with any from Zimbabwe.

The registration of a Kenya Dorper Sheep Breeders Society would go a long way towards promoting the breed.

The outstanding characteristics of Dorper sheep are as follows.

Mutton production. A purebred lamb on good grazing can weigh around 36 kilos liveweight at four months of age -- without supplementary feeding.

Adaptability.

Hardiness.

Dry grazing utilisation.

Good mothering qualities. Lambing intervals can be eight months. Under good grazing conditions and with good management, the Dorper ewe can lamb three times in two years.

This then is why, more than ever before, the spotlight of small stock production in dry areas is focussed today on using the potential of Dorper sheep.

REPLIES TO SMALL RUMINANT R + D QUESTIONNAIRE

A number of replies to the questionnaire which appeared in Newsletter N°6 have been received but there are certainly many more projects than those. The questionnaire is again included in this Newsletter. Please complete and return to us if you have not yet done so.

CAMEL RESEARCH IN KENYA AND SUDAN

Kenya

In Newsletter N° 2 (p.6) we reported on the holding of a conference in Marsabit in Kenya during April 1984. The proceeding have now been published by the University of Nairobi's Institute for Development Studies (IDS occasional paper N° 45, editor S.E. Migot-Adholla). In his introduction the editor states that "the specific objectives of the workshop were (1) to pool together scientific information pertaining primarily to socio-economic aspects of subsistence oriented camel pastoralism; (2) to identify research gaps, and (3) to draw some tentative conclusions and suggestions about future production systems involving the camel" and that "an important aim of the workshop was to promote interdisciplinary research cooperation by bringing together participants representing different social science disciplines. It was recognised, however, that some very important studies of camel production systems had been carried out by animal production specialists, range ecologists and veterinary specialists. Thus it was necessary for more comprehensive and fruitful discussion, to include persons representing the relevant biological and veterinary sciences. Altogether there were eight participants representing the social sciences and six representing the biological and veterinary sciences. Although many of the participants were University based researchers, the majority of all participants had worked for UNESCO/IPAL, whose research and operational projects are concentrated in Marsabit district in northern Kenya. We also arranged with three camel owners from Garba Tula and Gafarsa in Isiolo district to attend. The slightly unusual approach to invite members of the communities under study to attend was a remarkable success. The camel owners made valuable contributions and indeed, local administrators and

politicians praised the fact that the workshop was held within the camel area and that it provided for local participation".

The proceedings, as presented, do scant justice to the considerable amount of research that has been carried out on camels in Kenya. In the late 1960s and 1970s much physiological work was undertaken by Professor Maloiy, now Dean of the College of Agricultural and Veterinary Sciences at the University of Nairobi. Research at the College continues in both the Department of Animal Production (mainly by Jürgen Schwartz and his colleagues and students) and Range Management (mainly by Christopher Karue). The UNESCO/IPAL project has, however, been responsible for most of the recent research on camels and their Technical Report series -- and several publications in international journals extracted from these reports -- are a valuable source of data on the productivity, diseases and economics of camels in Kenya's arid lands.

The potential use to the scientific research community of camels owned and managed by commercial ranches in Laikipia district of Rift Valley Province and at Galana in Coast Province (as an example of the type of use that can be made of data collected by livestock owners see, for example, Wilson, R.T. 1986 Reproductive performance and survival of young of one-humped camels on Kenya commercial ranches. Anim.Prod. 42: 375-380).

Sudan

In Sudan virtually all of the published research results on camels comes from the Faculty of Veterinary Science of the University of Khartoum. Dr Babiker E. Musa is the prime mover of research there, his own personal interests being mainly in reproduction. Since 1983, a Camel Research Unit at the University has been funded in part by the National Council for Research but the project was due to expire in April 1986. There is a large number of papers in both Sudanese and international journals as a result of research work at the University although many of these papers are much more of academic than of practical interest.

The research activities currently engaged in by the camel unit cover three main categories: research on the unit's own animals; research on samples obtained from slaughtehouse material; and field surveys |editor's note -- these have been very limited so far because of funding and transport

problems|. The work of the unit is multidisciplinary in nature and comprises:

Research in basic sciences
- anatomy
- biochemistry

Paraclinical research
- bacteriology
- pathology
- parasitology
- mycology

Production
- meat
- sausages

Clinical research
- reproduction
- husbandry and reproduction
- nutrition.

The annual report of the unit (October 1985) contains 23 research papers plus summaries of six theses being prepared as advanced degree submissions.

GOATS IN GREAT BRITAIN

Commercial goat farming is one of the United Kingdom's fastest growing enterprises. The main points from the most comprehensive survey ever done on farm stock in England, Scotland and Wales are presented here. There are 7976 goat-keepers and 75 386 goats in the United Kingdom.

Those are two of the main statistics to emerge from a nationwide goat survey carried out in August 1985 by the Islay and Jura Goat Society. Its organisers say it is the most comprehensive survey and realistic estimate of the number of goats in the U.K. The last Ministry of Agriculture, Fisheries and Food census of goats in June 1983 put the national goat population at 48,000.

The new survey recorded 16 404 goats in 1734 herds, giving an average herd size of 9.46 goats. These figures were multiplied up from the response rate, 21.76 per cent, to give total national figures. The survey showed an enormous range in herd size, from people keeping just one goat to a herd of 498, the largest. The biggest single group of goat-keepers (16.5 per cent) keep just two goats. The largest herds of from 100 to 498 goats are owned by 0.6 per cent of goat-keepers, but account for 15.5 per cent of the goat population. There are about 200 herds keeping 40 or more goats.

The most popular breed is the British Saanen, accounting for 21 per cent of all goats. Next are the British Toggenberg (14 per cent) and the Anglo-nubian (12 per cent).

The U.K.'s goats are estimated to produce 30 million litres of milk a year at an average daily yield on the survey date, August 15 1985, of 2.69 litres. Most goat-keepers keep goats for pleasure or for their own milk supply according to the questionnaire replies. Twenty-two per cent said they kept goats for commercial reasons. In the commercial goat-keeping sector, the survey indicates that goat farming is only a part-time occupation for most of them. Only 3.4 per cent of the respondents said they were full-time goat farmers. Excluding owners, it is estimated that there are 170 full-time, 556 part-time and 110 seasonal workers on commercial goat farms.

A total of 88 per cent of goat-keepers milk by hand but it is considered that there is considerable potential for expansion using milking machines.

The survey also revealed the following points:

- Less than 20 per cent of goat-keepers regularly have their milk tested.
- Most keepers would like to use A.I. if it was commercially available throughout the U.K..
- Twenty-two per cent of male kids are killed at birth.
- More than 30 per cent of goats in Britain are not registered with the British Goat Society.
- More than 60 per cent of the female goats in Britain are less than four years old.
- The oldest goat in Britain is 19 years old and lives in Berkshire.
- The most popular fencing for goats is modified sheep netting.

- About 60 per cent of goats are vaccinated against clostridial infection.
- The mastitis incidence in goats is estimated at 8.5 per cent.
- The 12 most troublesome diseases are acetonaemia, coccidiosis, enterotoxaemia, foot rot, goatpox, ketosis, mastitis, mineral deficiency, orf, scour, pregnancy toxaemia, udder ailments.
- Five per cent of goat-keepers artificially extend the breeding season with artificial light, sponge and hormone injections.
- The selling price of unregistered goatlings ranges from £28 to £102 a head and for unregistered milkers from £28 to £50 a head.
- About 60 per cent of goats are kept on holdings of between one and 50 acres, while 0.06 per cent of goats are kept on a canal or narrowboat.

(Abstracted from the Goat Husbandry Survey Report 1985 which is published by Islay and Jura Goat Society, Carraig Fhada Farm, Port Ellen, Isle of Islay, Argyll, Scotland and published in the U.K. "Farmers Weekly" of 10 January 1986).

CAMEROON SHEEP DEVELOPMENT PROJECT

(Professor J. Hardouin, Head of Animal Production at the Institute of Tropical Veterinary Medicine, Antwerp, Belgium, has sent us the following data.)

A sheep development project is managed jointly by the Institute, the Cameroon Livestock Research Institute, a Non-Governmental Organisation and the Belgian Ministry of Cooperative Development. It is based at Mankon, near Bamenda in north-west Cameroon. The objectives of the project are to improve the environment for sheep production, using what is locally available, and by instituting controlled breeding, improving nutrition and providing a prophylactic programme against prevalent diseases.

The results so far attained are considered to be very encouraging and include a litter size of 1.3 lambs per birth, a lambing inteval of 10 months an an average daily gain of 149 g/d for single males from birth to 80 days and of 120 g/d for single females. The principal diseases (which are not thought to be a major constraint) are general lameness, diarrhoea, conjunctivitis and a few cases of heartwater and contagious ecthyma. Streptothriacsis is very prevalent but benign.

The report provides plans of a sheep pen and mobile fencing made from local materials.

FEEDING BEHAVIOUR AND DIET SELECTION OF GOATS IN EASTERN SENEGAL

(Contributed by Maryam Niamir, formerly Team Leader of the Bakel Project in eastern Senegal. Present address: 55 via Gino Funaioli, Int.2, Roma 00151, Italy).

Feeding Behaviour

The daily movements of livestock in rangelands during the dry season were observed to be generally centrifugal from the village, that is, as the dry season advanced, the livestock walked farther away from the village. However, the movements in the rainy season did not seem to follow the same pattern. Since the impact of range degradation due to excessively high grazing pressure is more severe in the rainy rather than dry seasons, a survey was initiated to understand the pattern of livestock movement in the rainy season. It is to be noted that in this area, there is no herding of livestock in the rainy season and none in the early part of the dry season.

The survey was conducted by a villager who knew the local habitats and who had also graduated from the project's functional literacy program. The researcher followed a flock of goats and sheep (and a herd of cattle on alternate weeks) on three consecutive days every two weeks. He would record what the animals were doing in five-minute observation periods every half-hour. He would also record his geographical position on a 1:25,000 scale aerial photograph, using easily visible landmarks such as baobab trees or termite mounds.

The data showed that unlike the cattle, the sheep and goats did not tend to change their directions much in any part of the season, and used the same pastures for all three months of the season. It also showed that their daily movements were centripetal, i.e. the livestock moved closer to the village as the season advanced. The average distance travelled by goats and sheep was about 6 km away from the village in mid-May to mid-July, 4 km in mid-July to mid-August, and 2 km from mid-August to the end

of September. This phenomenon may be due to the fact that at the beginning of the rains, the newly germinating plants have relatively less total biomass, forcing the livestock to travel farther to get their full ration. Finally, the data showed that 62 per cent of the grazing pressure was concentrated on a range type that comprised only 25 per cent of the accessible rangeland. This is the floodplain range type where villages are always located because of their high potential for cultivation. But it is also the most fragile and easily degraded range type. Of the floodplain range type in a 7 km radius around the village, 12 per cent was already completely denuded and another estimated 20 per cent was in various stages of degradation.

These and other data reported in the project's final report show that the consequences of not herding the animals in the rainy season have an immediate impact on the degradation of the preferred rangelands.

Diet composition

A bite-count survey was conducted by the range manager once every three months on a flock of goats (and a herd of cattle). The method involves following a flock for the whole day and recording the number of bites taken from each plant species, the distance travelled and the time spent on other activities. Three goats were selected and data recorded for five-minute observation periods every half-hour. Unfortunately time did not permit a similar study of the sheep. Table 1 provides the data on time spent on

Table 1 Average amount of time (hours:minutes) spent on different activities and distance travelled by goats

Period	Activity					Distance walked per day (km)
	Sleeping and standing	Walking only	Grazing and walking	Scavenging at village	Licking soil	
August	16:45	0:10	6:45	0:05	0:03	5.0
November	18:05	0	4:0	1:40	0:15	2.5
March	16:15	0:10	6:10	1:10	0:05	13.7
May	19:05	0:20	4:0	0:20	0	9.0

different activities and total distance travelled per season.

In general 15 minutes were spent every day for watering or resting at the watering source. Licking soil was done every day at a special site where erosion had exposed the C horizon of the soil, thus revealing the more calcareous, mineral rich layer. The goats spent more time licking this soil at the end of the rainy season (November) than any other time. This result supports L.R. McDowell et al.'s observations (SRCG Newsletter N°5, Feb. 1986). Scavenging around the village was greatest at the end of the rainy season, i.e. during the harvesting of the sorghum and millet crops, when crop residue was available. In March, some crop residue remained, but not as much as before, and the animals had to spend more time (and farther distance) in grazing the rangelands. By May, most of the deciduous shrubs and trees start to bud and put forth new, high protein leaves thus reducing the goats' requirement to travel as far, and spend as much time grazing, as before.

Table 2 provides the results of the diet composition of the goats. The data indicate that the goats consume more forbs in any season than any other type of forage. This is not very surprising when one considers that

Table 2 Daily diet composition of goats.

Period	Grasses		Forbs		Browse	
	%	dominant spp.	%	dominant spp.	%	dominant spp.
August	13	DiHa + AnPs	57	ZoGl	30	AcSey + AcAt
November	4	PePe + litter	88	BoSt	9	MiIn + Baobab fruit
March	0		67	BoSt	33	fruit of PiRe + AcNi
May	0		85	LeAn	15	GrBi + BoSe

Notes: Abbreviations

AcAt = Acacia ataxacantha
AcNi = A. nilotica
AcSey = A. seyal
AnPs = Andropogon pseudapricus
BoSt = Borreria stachydea
BoSe = Boscia senegalensis
DiHa = Diheteropogon hagerupii
GrBi = Grewia bicolor
LeAn = Lepidagathis anobrya
MiIn = Mitragyna inermis
PePe = Pennisetum pedicellatum
PiRe = Piliostigma reticulatum
ZoGl = Zornia glochidiata

the forbs in question, especially BoSt and LeAn have very large and rich seeds during the dry season. ZoGl is a short but highly nutritious annual legume which loses its value very soon after the end of the rains. The relatively high consumption of grasses in August (13 per cent) indicates that goats will graze if the grasses are in their young, vegetative stage.

SMALL RUMINANT AND CAMEL RESEARCH UNIT, UNIVERSITY OF NAIROBI

This unit is recently created and expanded from the former Small Ruminant Research Unit. It is jointly financed by the University of Nairobi, GTZ and some other sources. The Second Progress Report of the Unit lists an impressive number of collaborating scientists from several German Universities and from Sweden.

The main theme of the Unit is "improving utilisation of semi-arid and arid rangelands in northern Kenya through combined stocking with domestic ruminants, camels and donkeys to increase off-take of animal products". Within this overall theme the research projects have a wide scope and preliminary results from the first 12-24 months of study have either been presented at conferences or in the two progress reports. Research projects include:

Determination of botanical, chemical and physical characteristics of the ingested diet of Small East African goats using the "empty rumen technique";

Dietary preferences and feed intake behaviour of Small East African goats during one full seasonal cyle on a semi-arid thornbush savannah;

Milk yields and the lactation curve in a herd of Small East African goats;

Morphological adaptations of the forestomach of Small East African goats to seasonal changes of forage quality;

Mortality levels and causes for a herd of Small East African goats;

Seasonal changes of particle size of freshly ingested rumen content in Small East African goats;

Effects of seasonal forage supply on semi-arid pastures on herd productivity in the Small East African goat;

Seasonal changes of rumen fluid volume and retention time of fluid and particles in Small East African goats compared to Somali Blackhead sheep;

Adaptive strategies to seasonal changes of forage supply of the Small East African goat in comparison to the Somali Blackhead sheep;

Investigations of seasonal variations of intestinal parasite burdens in camels and the presence of L3 larvae on experimental pastures;

The ecological role of the goat in pastoral production systems in northern Kenya;

Feeding strategies of goats on an arid thornbush savanna in north Kenya;

Seasonal changes of some fertility parameters in Small East African goats on semi-arid pasture.

GOAT IMPROVEMENT PROJECT IN BURUNDI

(Sent by Dr S. Althoff, Head of the Ngozi Goat Improvement Project, funded by GTZ).

The project is a collaborative one between the Burundi Ministry of Agriculture and Livestock and GTZ. It has three principal activities which are:

a breeding station which acts as a logistic base and where exotic Alpine and Boer goats are kept and different levels of crossbreds are tested. The station also acts as a training and extension centre;

a forage improvement programme where different species (Leucaena diversifolia, Trysacum laxum, Pennisetum purpureum, Panicum maxicum, Desmodium spp. and Stylosanthes spp) and different combinations of species are being tested.

the distribution of improved bucks and an extension programme in the better use of milk in the family diet.

A programme of data collection (production and economics) both on station and in the traditional system complements the activities of the project. Minor activities of the project include rabbit, pig, bee and poultry production.

The pure Alpine has an annual fertility rate of 117 per cent (kidding interval 329 days) and a litter size of 1.55 with annual mortality rate

of 27.7 per cent. Lactations average about 290 days for all parities combined and milk production is almost 600 kg per lactation. Purebred Alpine bucks have a very low survival rate after being put into the traditional systems.

The Alpine x Small East African F_1 has a lactation length (first parity only) of 213 days and a lactation yield of 227 kg. Data on the F_2 (3/4 Alpine/1/4 Local) are not yet available in detail as most animals are only at first parity.

Attempts to produce cheese from both station and farmers' milk have run into some difficulty mainly on account of the irregular supply but it is considered that once this problem can be overcome cheese production (1 kg cheese = 9.95 kg milk) will provide a good income for farmers.

Daily growth rates (to 365 days) of purebred Alpines, at 104 g do not differ significantly from 3/4-breds (88 g) but both these genotypes are significantly superior to the F_1 (72 g) and the half-bred Boer x Local (52 g) and the Alpine F_1 is also significantly better than the Boer F_1. The purebred Small East African has a growth rate to one year of 49 g/d.

A manual produced by the project and entitled "Guide pratique pour l'éleveur des chèvres" has practical information on: feeding; housing; breeding; milking and weaning; general management; diseases; marketing.

PRODUCTIVITY OF DJALLONKE SHEEP IN RELATION TO COAT COLOUR

Introduction

At the Livestock Research Centre at Kolda (Senegal) one of the bases of selection is coat colour. Normally the coat colour should be white but due to a variety of reasons a very small number of coloured males have been kept. Coloured (mainly white with spots) females are kept in the breeding flock but males are culled at different ages. This analysis compares some production parameters of "coloured" animals with white ones.

Materials and methods

Animals. All males born at the Station between 1976 and 1983 were considered in the analysis as were all females in the flock at the time of the analysis.

Experimental design. Males were divided into white and coloured animals and into two periods, these being all animals with data prior to 1982 and those with data for 1982 and 1983. The years 1984 and 1985 were excluded because there would have been confounding from the results of other experiments related to nutrition and reproduction. Weights at birth, 3, 4 (weaning) and 6 months were analyzed. Weights at 12 months were not used as coloured males were culled before this age.

Data were analyzed from the offspring of coloured or white females but the colour of the offspring themselves was not taken into account. Sex of young and type of birth were also considered as sources of variation but because of the limited number of coloured young of multiple births the final analyses included only "all young" and "young born as singles".

Results

Table 1 shows the results of the analysis for males born prior to 1982. Coloured males were significantly heavier than white ones at birth, at 3 months and at weaning at 4 months but not at 6 months. The weight advantage of coloured males to weaning could be due to better milk production

Table 1 Weights-at-age of Djallonké males born before 1982, in relation to coat colour

Age	Colour											
	White						Coloured					
	All births			Singles only			All births			Singles only		
	n	x	s.d.	n	x	s.d.	n	x	s.d.	n	x	s.d.
Birth	170	1.7^a	0.44	130	1.8	0.46	34	2.0^b	0.41	30	2.0	0.39
3 months	130	8.2^a	2.65	95	8.4	2.68	31	9.7^b	2.48	27	9.7	2.52
4 months	120	9.7^a	3.25	88	9.9	8.32	31	11.1^b	3.10	26	11.3	3.11
6 months	96	13.1^a	3.81	68	13.2	3.86	26	12.9^a	3.41	22	13.1	3.49

ab in the same row (for all births only) means with different superscripts differ significantly (P at least 0.05).

by their dams or to a better conversion rate by coloured males themselves. The lack of significance at 6 months could be due to the more favourable treatment provided to the (selected) white males in the post-weaning period. The standard deviation is similar in both groups which probably indicates that the heterogeneity of the two groups is not due to coat colour.

During 1982, ewes were flushed before mating and given a steaming-up ration prior to parturition and their offspring were provided with crep feed during the suckling period and supplemented to the age of 6 months. There were no significant differences between white and coloured animals at any of the four ages. It would therefore appear that under good nutritional conditions white animals can compensate for their inherent inferiority. Animals born in 1982 were heavier |no tests of significance were undertaken - Ed| than those born prior to that year.

With regard to female performance, it was found that white females gave birth to young that were significantly ($P < 0.005$) heavier than coloured females but there were no significant differences between offspring of the two types of coat colour at other ages. Males born of white females were generally heavier than females of white dams but both sexes of young from coloured dams weighed the same. There were no significant differences in early reproductive performance of white (age at first lambing 647 days; interval for first to second parturition 372 days) and coloured (676 days and 375 days) females.

The results show that coloured males have better growth performance than white males under natural conditions and that reproductive performance is not related to coat colour. The colour of the coat as a criterion for selection for meat production in the Djallonké sheep should not be used.

(Contributed by: Cheikh MBaye Boye, Jean Ehemba and Elhadji Omar Diack, Livestock Research Centre, Kolda, B.P. 53, Kolda, Senegal).

RECENT BIBLIOGRAPHY

Chamoiseau, G., Bah, S.O. & Ahmed Vall, S.M.O. 1985 Un cas de tuberculose pulmonaire chez un dromadaire. Rev.Elev.Méd.Vét. Pays Trop. 38: 28-30

This is one of the few cases of pulmonary tuberculosis yet reported in the one-humped camel. The value of this report is that it draws attention to the possibility of an outbreak of tuberculosis in the urban camel herds now being created following the years of African drought. Such herds are kept under crowded conditions, are entirely sedentary and are fed on imported concentrates and roughages.

Kilani, M., Hadj Kacem, H., Dorchies, P. & Franc, M. 1986 Observations sur le cycle annuel d'Oestrus ovis en Tunisie. Rev.Med.Vet. 137: 451-457

Although the Sheep Nostril Fly (Oestrus ovis) is very widespread and is commonly accepted as not being much of a problem, it can have important pathological consequences. Rhinitis and a purulent sinusitis are common sequels to O.ovis infestation. The parasite can also cause opthalmyiasis in man.

A total of 93.6 per cent of 110 sheep were infested by 3433 larvae (31 per animal). Most larvae (76.9 per cent) were found in the nasal cavities and 81 per cent of these were L1, 16 per cent L2 and 3 per cent L3. The remaining 23.1 per cent larvae were found in the frontal sinuses of which 1 per cent were L1, 57 per cent were L2 and 42 per cent L3 stages. Monthly variations in the infestation rate were low. The structure of the larval populations indicated that there were two generations per year with the offspring of the first (spring) parent generation having a rapid and uninterrupted development phase. A second generation of summer and autumn adults gave rise to a larval population with arrested development during the winter.

Richard, D., Guerin, H., Mbaye, Nd., Friot, D., Juarez, A. & Fall, St. 1985 La composition chimique des régimes des ruminants sur pâturages sahéliens. Proc. 36th Ann. Meeting EAAP.

The chemical composition of natural pastures in Senegal was studied with a view to determining the potential for animal production from these pastures. Structure and biomass were registered at two sites over three years. Three different methods of determination were used, these being: total cutting of the above ground biomass over several square metres; grab sampling by the herdsman to imitate grazing by cattle, sheep and goats at

the principal feeding times; and the use of oesophageal fistulae. Chemical determinations included: ash; total protein, crude fibre, neutral detergent fibre, acid detergent fibre, cellulose, ether extract and some minerals.

The total cutting method yielded an organic matter content of 88-90 per cent of the dry matter during the rainy season and of 95-96 per cent in the dry season. Total nitrogen, crude fibre and ADF changed rapidly during the rainy season (although there were year and site differences) from 20-8.5, 22-47 and 30-56 per cent for the three constituents respectively. In the dry season, total protein dropped slowly from 8.5-3 per cent. In areas where legumes were an important constituent of the field layer, total protein remained above 8 per cent. Crude fibre and ADF remained more or less stable throughout the dry season.

The grab sample method which took into account the plants selected by the animals showed differences with the total cutting method and also by species of animal. Organic matter, total protein and crude fibre varied from 86-93, 6-18 and 15-39 per cent for sheep and 86-90, 12-17 and 18-30 per cent for goats. For the same site and in the same year, small ruminants selected a diet richer in protein and lower in fibre than cattle. Total protein levels were lower than 8 per cent during 7 months of the year for both cattle and sheep.

Fistula samples always yielded results higher in ash, total protein and ADF higher than the other methods but lower in crude fibre.

SMALL RUMINANT RESEARCH AND DEVELOPMENT
PROJECT QUESTIONNAIRE

COUNTRY: _____

TITLE OF PROJECT: _____

OBJECTIVE(S) OF PROJECT: _____

SCALE OF PROJECT: No. of Animals /___/ PROJECT CODE /___/ RESEARCH /___/
No. SMY /___/ /___/ DEVELOPMENT /___/
/___/ TRAINING /___/

MANAGEMENT SYSTEM: _____

STARTING DATE: _____ TERMINATION DATE: _____

SOURCE OF FUNDING /___/ National /___/ Bilateral /___/ International
(name of agency) (_____) (_____) (_____)

NATIONAL INSTITUTION: _____
(implementing the project) _____

	Name	Specialisation Code
PROJECT STAFF : Leader		
Scientists		

SUMMARY REPORT/ACHIEVEMENTS _____

PREVIOUS PAGE BLANK

Notes on Completing Questionnaire

1. **Definition of project:** Avoid describing broad programmes as projects; Avoid describing individual specific experiments as projects.

   Examples
   (a) Selection for increased fleece wight in Romney ewes
   (b) Evaluation of Suffolk and Texel rams in crossbreeding on native ewes.
   (c) Evaluating the use of by-products in the nutrition of dairy goats.
   (d) Strategic drenching in the control of stomach parasites in sheep.

2. **Scale of project:**

   (a) SMY = Scientist man years over the life of the project
   (b) Project Code - the project encompasses a number of areas of specialization list the three most important areas under Project Code.

3. Areas of Specialisation or Special Interest

Area	Code	Area	Code
Administration/ Policy Formulation	1	Genetics/Applied Breeding	11
Behaviour/Husbandry/ Management	2	Marketing/Product Development	12
Biochemistry/Physiology	3	Mechanisation/ Automation	13
Biometrics/Statistics	4	Nutrition/Applied Feeding/Pastures	14
By-products: (a) fibre (b) meat (c) skin	5	Product Quality/ Processing	15
Disease Prevention/ Control	6	Sociology/Labour Relations	16
Economics/Farm Management	7	Teaching/Tertiary Education	17
Reproductive Physiology: (a) male (b) female	8	Environmental Impact	18
Environment Control/ Housing	9	Population Dynamics/ Survey	19
Extension Methods/ Communication	10	Metrology/Histology/ Laboratory Techniques	20

NOTE

If your address is incorrect or if a colleague would appreciate receiving a copy of this Newsletter, please fill in the form below.

The Editor
The Small Ruminant and Camel Group
Newsletter
I.L.C.A.
P.O.Box 5689
Addis Ababa, ETHIOPIA

Date: .....

Please send the Newsletter to:

Name: .....

Address: .....
.....
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Please note my new address:

Name: .....

Address: .....
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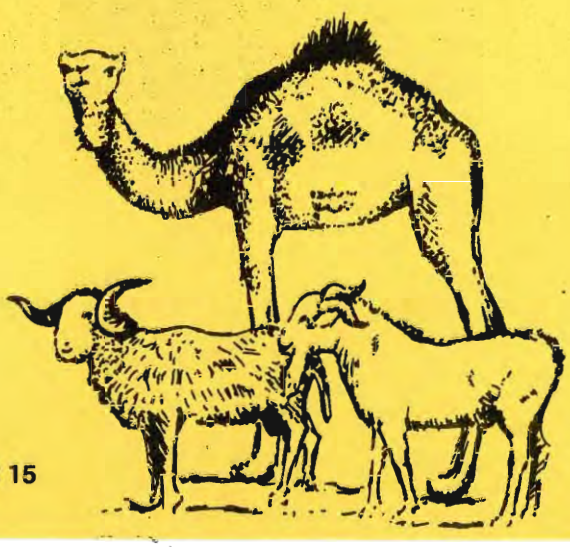
THE SMALL RUMINANT AND CAMEL GROUP

NEWSLETTER



International Livestock Centre for Africa,
P.O. Box 5689, Addis Ababa, Ethiopia. Telephone: 18 32 15

No. 8 Date February 1987

NEW STAFF JOIN THE GROUP

Our small group now has two new members. Barbara A. Porter is a student in veterinary science carrying out research into the effects of different reproductive strategies in sheep and goats on total productivity. Aster Araya has been employed as a research assistant and is currently engaged in the processing and handling of data from our various research projects.

CONFERENCES AND SEMINARS

The Inter-African Bureau of Animal Resources (IBAR) of The Organization for African Unity held a seminar from 18-20 August 1986 in Nairobi (Kenya) on the potential of small ruminants in Southern and Eastern Africa. Numerous recommendations were made concerning genetics, nutrition, breeding management, health and marketing.

During October and November 1986, D. Bourzat and R.T. Wilson participated in conferences on the organisation of research networks.

From 13-17 October in Montpellier (France), GTZ, IEMVT, TCA and the DG12 of the EEC held a conference to ascertain the present state of research into small ruminants, and to consider the possible coordination of the work of the different European and African research groups. Some 35-40

African and European researchers participated in this conference, and after a week of interesting and animated discussions, the following general recommendations were agreed upon:

- the different research programmes should be coordinated and this could be achieved most effectively by organising on a network basis;
- existing research networks should be reinforced and greater use should be made of them;
- networks should be kept small and have great flexibility of management;
- in future research programmes more consideration should be given to the socio-economic aspects of small ruminant production.

From 22-24 October 1986, at the head office of FAO in Rome (Italy), the inaugural meeting of the research and development network for small ruminants in the Near and Middle East was held. Five countries (Cyprus, Egypt, Iraq, Pakistan and Tunisia) took part in this first meeting. The objectives of this new network are:

- to promote the exchange of information and data on research and development programmes in progress;
- to undertake joint research programmes into sheep and goat production;
- to facilitate the exchange of documents;
- to organise joint meetings, training courses and study trips and to encourage the exchange of research and technical personnel.

A seminar on the Camelidae was organised from 20-23 October in Kuwait, by the MINEADEP and the Kuwaiti Agriculture and Fisheries Service. The purpose of the seminar was to evaluate current camel production within the region and identify and analyse the technical and socio-economic constraints affecting the development of the production.

The recommendations made were:

- to evaluate the importance of camels in combatting the spreading of desert areas and in the exploitation of grazing land;
- to increase research into nutrition, physiology, husbandry and health;

- to establish technical services for camel breeders and organise the training of technical cadres to facilitate the popularisation of necessary veterinary measures;
- to find funding for the establishment of a research network;
- to draw up a synthesis of the available information on camel production.

FORTHCOMING CONFERENCES

First African Veterinary Days: 30 May-2 June 1987 Hammamet (Tunisia)

The veterinary council of Tunisia is organising the First African Veterinary Days, the principal theme of which will be the influence of parisitism on animal production. Other topics covered will be Rift Valley Fever and aflatoxins.

Annual Meeting of the European Association of Animal Production: 27 Sept-10 October 1987 Lisbon (Portugal)

For information and registration, contact:

Secretariat of the Organising Committee
National Zootechnics Station
2000 Vale de Santarem
Portugal
Telex: 18280 EZNP

3rd World Congress on the Reproduction and Selection of Meat Sheep and Cattle: 19-26 June 1988 Paris (France)

This Congress will be held in the Cité des Sciences et de l'Industrie La Vilette, Paris, France, under the auspices of a Franco-German and an International scientific committee. The provisional agenda comprises topics common to both sheep and cattle and also two topics specific to sheep and two to cattle. The general topics come under the headings: (i) the consequences of genetic migration in the meat cattle and sheep of Western Continental Europe; (ii) the influence of modern breeding techniques on genetic improvement methods; (iii) the organisation, the effectiveness

and the future of performance checks on the farm; (iv) the improvement of the quality of carcasses; (v) pathology and genetic improvement. Topics specific to cattle are: (i) potential for meat production of fast-growing breeds of cattle; (ii) the efficiency of and prospects for cattle selection for meat production. Topics specific to sheep are: (i) the efficiency of and prospects for the selection of sheep according to the purpose and context of production; (ii) reproduction and the husbandry system.

Further information can be obtained from the General Secretary:

Mr R. Ortavant
INRA
37380 Nouzilly
France
Telex: INRATOU 750954 F

Course on Productivity of Small Ruminants: 4-5 May 1987 Addis-Ababa (Ethiopia)

This course is organised by the Small Ruminant and Camel Group and will be held at ILCA headquarters in Addis Ababa. It is a training course intended for experienced Francophone zootechnicians. The course includes: (i) adaptation of small ruminants to different ecological zones; (ii) breeding performance and methods in the traditional environment and possibilities for improvement; (iii) weight gain and growth performance; (iv) nutritional needs, traditional and intensive feeding and fattening methods; (v) infectious and parasitic pathology specific to small ruminants; (vi) genetic improvement, crossbreeding experiments and selection programes; (vii) current and future research and the coordination and distribution of results.

Applications must be lodged by 1 March 1987. Each candidate must be nominated by his employer. The application must include: full name, address, telex and telephone numbers, telegraphic address, diplomas obtained, present post and intended future career. Incomplete or personal applications will not be considered.

Fees

Registration	500 $US
Accomodation and meals	350 $US per week
Equipment and transport	100 $US

Return air tickets (according to country of departure)

As ILCA is able to provide only a limited number of grants, candidates are requested to seek financial assistance from their government or other sources.

Request for further information and applications should be sent to:

The Director of Training and Information
ILCA
P.O.Box 5689
Addis-Ababa
Ethiopia

NEWS IN BRIEF

Research networks are being developed in Europe. We have received information of the creation of the French Pastoralism Association, along with a short note explaining the activities of the INERM division (National Institute for Mountain Studies) of CEMAGREF in the field of pastoralism. For ten years the INERM division has concentrated some of its work on the effects of grazing on high mountain pastures, in order to form a rational basis for the management of the 3 000 000 hectares of high pastures used by wild or domestic herds in the mountain regions of France.

To begin with, research was concerned with the implementation of theoretical, statistical and methodological principles, and the main themes of the work were the identification of the mountain vegetation communities and their potential for forage production, and the grazing behaviour of animals in this environment.

Work is currently directed towards the following basis areas: new limits to or possible developments in the efficiency of grass in alpine pastures,

the dynamics of the vegetation under grazing, the role of pasture in erosion, the validity of using certain soil conservation methods, multiple-use and the compatibility of the wild and domestic fauna, the feeding behaviour of animals, the introduction of simplified methods for recognising vegetative associations on a micro-regional level, in particular the use of remote sensing.

The methodology developed for studying the composition and dynamics of pastoral vegetation at high altitude presents similarities with that used for the study of pastures in the arid or semi-arid zones.

For further information contact:

M. Dubost
Engineering Studies, CEMAGREF
CEMAGREF, INERM
P.O.Box 76
38402 St Martin d'Hères (France)

SMALL RUMINANTS IN THE REPUBLIC OF ZAIRE

(Extract from a report of the Animal Production and Health Service)

The census of 1970 showed 2 312 000 goats and 700 000 sheep. More recent estimates (1984) suggested a goat population of 2 800 000 in Zaire. Unlike cattle, which are concentrated in the regions of Kivu, Ituri and Northern Shaba, small ruminants, and in particular goats, are widely spread throughout all the villages of the country. As in many other African countries, no programme is specifically concerned with this type of breeding.

Meat production in the country is very low (2 kg of meat per person on average from all species combined in 1983). The Zairan authorities have therefore decided to concentrate their efforts in the period 1984-1991 on the development of small ruminants and poultry. They have identified the following constraints on sheep and goats breeding:

- absence of a specific research programme;
- low level of technical knowledge of the breeders;
- lack of management for the herds;

- no animal health programme;
- high mortality rates in young animals;
- financial constraints in certain parts of the country;
- no credit facilities and no production extension services specifically for the breeding of these animals.

The development programme includes:

- genetic improvement of local breeds of sheep and goats;
- improvement of management techniques (training of breeders, extension service);
- creation of cooperative type organisations;
- training of breeding cadres;
- organisation of research;
- organisation of a national fund for the promotion of small ruminants.

BIBLIOGRAPHIC NOTES

Peters, K.J. (1985) Principles for the evaluation of goat populations in a tropical or sub-tropical environment. In: 36th Annual Congress of the European Association of Animal Production, in Kallithea, Greece.

The author begins by reiterating the essential elements in the evaluation of the performance of a breed and the role of goats in farming systems. He goes on to develop an argument based on the necessity of these evaluations including complementary data gathered in the village situation, in on-farm trials, and trials in a controlled environment on research stations. Checks carried out on stations enable the evaluation of the performance potential of goats, this potential being calculated according to fertility, lactation level, growth rate, dietary efficiency, and to more specific points such as the tolerance of or resistance to certain diseases on the adaptation to certain environmental conditions.

Farm trials enable the evaluation of specific local performances and the possibilities for improving the breed. This evaluation is carried

out on the basis of an analysis of weight gain, numerical productivity and knowledge of the population parameters (i.e. genetic parameters such as repeatability, heritability and variability).

These different approaches have been made possible by computer analysis and the results must lead to a better estimation and understanding of the formulation of the productivity of a herd, which is the result of the genetic potential of the breed and the influence on this potential of factors such as breeding management, feeding, availability of labour etc...

Opasina, B.A. (1985) Pathological constraints on village goat production in South West Nigeria. In: Rev. Elev. Med. Vet. Pays Trop. 38: 284-294.

Goats constitute an essential source of protein in Nigeria. They are bred by a significant number of families in the South West. The major obstacle to this enterprise has always been mortality from pathological causes. The results of a preliminary survey carried out over 18 months in the villages of Badeku and Eruwa indicated the importance of PPR and mange due to Sarcoptes scabiei. A complementary 12-month survey showed the importance of PPR, helminthiasis, trypanosomiasis and ectoparasitic infestation by lice. This survey comprised a health monetoring component under experimental conditions in the Fashola region.

A serological study in the same region indicated the importance of the following viruses: contagious ecthyma, bluetongue, adenovirus type 5, PPR, para-influenza type 3, bronchial rhinitis. However, only PPR and contagious ecthyma have shown themselves to be important from a clinical point of view.

PPR and mange caused high mortality and morbidity in the rural goats of the South West. A 12 month campaign against PPR in these animals produced a 75 per cent reduction in mortality in the animals vaccinated. In contrast, dips against mange had no effect whatsover.

GOATS IN SWAZILAND

(from the "Ethiopian Herald" of 7 December 1986. Article signed by Jackie Mavuso, based largely on information from our Group member Dr Lebbie of University of Swaziland).

Swaziland, the smallest country in southern Africa with an area of 17 364 square kilometres, has a high potential and favourable conditions for goat production.

The country has so far concentrated on beef, making available such facilities as fattening ranches where the best feed and veterinary services are provided. The production of goats is largely managed by the small farmers using traditional methods, and without formal support. The livestock industry is a vital component of the economy. It accounts for about 4 per cent of national export earnings. This contribution is attributed to beef exports to neighbouring countries and the European Economic Community (EEC).

Whilst goats may not contribute directly to the official cash economy, they play an important role in the lives of people in the rural areas. As in most African countries, goats are kept for cash income, meat, skins and for ceremonial purposes. Income derived from their sale is used to buy food, clothing and to pay school fees. In an average Swazi family more goats are sold and slaughtered per year than cows.

According to the 1985 livestock census there were 268 422 goats compared to 648 332 cattle and 25 215 sheep. About 89 per cent of goats are in the rural areas where 85 per cent of the population lives.

A preliminary survey on goat production was undertaken in 1984 by the University of Swaziland's Department of Animal Production. Assisted by a final year student, Dr H.B. Lebbie, a lecturer in animal production, studied goat production in the Middleveld, the country's centre of agricultural activity. The figures and information obtained showed that there was scope for increasing the number of goats. The majority of goat owners had small flocks of between 1 and 20 animals.

Dr Lebbie used the information he obtained to prepare a research project which he presented to the government for approval. Then he requested funding

from the IDRC which made available 17 000 Canadian dollars, while the government of Swaziland provided local resources such as the project personnel.

About 40 farmers in each of the country's four districts were interviewed. In the survey the farmer's situation was looked at, his source of income, the animals he kept, his management skills and his social life. It was found that cows were the most favoured animals followed by goats, pigs and sheep. The survey identified some of the problems facing the farmers. About 57 per cent of deaths were attributed to diseases, 14 per cent to predators (mainly dogs, snakes and crocodiles), 12.5 per cent to starvation, 12.5 per cent to negligence and 4 per cent to "unknown". The study indicated a mortality rate of 32 per cent. Highest numbers of deaths occurred during the early days of life. Low birth weight and inadequate food could be the major cause of deaths.

The researchers found that diarrhoea, emaciation, worms, foot rot, ticks and coughing were the most common health problems. When animals fell sick, 88 per cent of the farmers used drugs recommended by the veterinary extension officers. The rest used traditional herbs. All the farmers interviewed said they dipped their goats as this was a compulsory practice in Swaziland. However, few drenched and vaccinated them because this was not mandatory in the communal grazing areas. Farmers kept their goats in 'kraals' overnight and released them the following morning. Only 15 per cent covered their 'kraal' to protect animals from rain. All farmers interviewed grazed their goats in the communal areas. Only one farmer provided supplementary feed to his flock. The feed was made from ground maize which was given to the goats during winter when both the quality and quantity of grass were lowest.

To increase production, programmes for improving the quality of local goats need to be established. The farmers will require money to purchase better animals, provide better housing and improve feed supplies. Health programmes for the animals will be needed. Farmers will have to be convinced to use non-conventional feeds such as maize stalks, pineapple wastes, citrus wastes and molasses to supplement natural grass which is of low nutritional quality.

According to Dr Lebbie this project is important to the country, particularly in the face of degradation of land caused by overstocking by cattle. Swaziland is one of the most heavily stocked countries in Africa, with two hectares for one cow or five goats. As land for grazing decreases, it is becoming more practical to accommodate goats and sheep than cattle.

More information on the role of goats in the economy of the rural areas is being collected. This information will be used to make the government and the farmers aare of the benefits of producing goats on a larger scale than is done now.

RESULTS OF RESEARCH ON SMALL RUMINANTS IN TUNISIA

(from Dr Gley Khaldi)

In spite of its economic importance, the small ruminant sector has preserved an extensive character. Livestock is still considered a means of accumulating wealth. Feeding of flocks is based essentially on natural vegetation and fallows. In summer, only cereal stubbles are available. As the rainfall is very irregular, these food resources are often quantitatively and qualitatively insufficient and animals suffer from chronic underfeeding. To improve productivity, research programmes have concentrated on performance control and selection, milk production under different nutritional conditions, reproduction and the possibilities of the use of unusual food resources.

Genetic Improvement

The programme started in 1964 on the three meat sheep breeds (Barbary, Noire de Thibar and Queue Fine de l'Ouest) and the only dairy sheep breed (Sicilo-Sarde). The criteria used for the meat breeds are the growth rates of lambs between 10 and 30 days and between 30 and 90 days. The first criterion varies between 119 and 255 g/day and the second between 120 and 190 g/day according to breed, sex and type of birth (single or twins). This programme of selection allows a current production of about 2 000 improved rams which are distributed by the Office de l'Elevage et des Pâturages at State-subsidised prices.

Lactation and growth of Barbary sheep under normal conditions of management

Milk production of Barbary ewes, recorded by weighing lambs before and after suckling, was measured during the first 13 weeks of lactation. The ewes grazed on natural pastures and did not receive any supplement. Results showed that dry pastures in summer allowed only the maintenance requirements of animals. The sex of lambs had no significant effect on the milk production of their mothers. Adult ewes (mean age about 5 years) had higher performance than young females, the average milk yield being 91.3 kg and 80.6 kg in the two categories respectively. During the first four weeks, lambs from adult ewes had approximately the same growth rate (about 230 g/day) as those from young females. Later, this growth rate decreased dramatically to reach 95 g/day at the 13th week of lactation. It was concluded that suckling ewes should be supplemented with concentrate during lactation to improve the growth rate of their lambs.

Effects of nutritional level during late pregnancy and lactation on the milk yield of Barbary ewes

The object was to study the effects of two nutritional levels, high (H) and low (L), during the last 6 weeks of pregnancy and the first 13 weeks of lactation. A total of 80 ewes was divided into 4 groups (LL, LH, HH, HL). All ewes were grazed on natural pastures; supplemented females received concentrate (400 g/ewe/day) and hay ad lib.

Lambs from HH and HL ewes were heavier (single males (3.99 v 3.56 kg), single females (3.55 v 3.32 kg) and twins (3.39 v 2.48 kg) but the difference was only significant in the last case).

Pre-partum nutritional level had no significant effect on total milk yields of ewes suckling single lambs. In contrast, milk yield was significantly higher in well-nourished (HH: 103.8 kg; LH: 98.1 kg) than in underfed ewes after parturition (HL: 65.7 kg; LL: 61.7 kg). Total milk production of ewes suckling twins was significantly influenced by both pre- and post-partum intake levels (HH: 106.9 kg; LH: 94.6 kg; HL: 87.0 kg; LL: 67.8 kg). Mean growth rates of lambs were closely related to milk production of their dams and ranged between 110 and 230 g/day in singles and between 80 and 110 g/day in twins.

Seasonal variations of oestrus and ovulation in Barbary ewes

Seasonal variations were studied for 15 months in 26 ewe-lambs and 25 ewes 4 to 5 years old. Signs of oestrus were checked twice daily and ovarian activity was determined by endoscopy every 17 days.

Sexual activity in ewe-lambs started at 10 months of age; weight at puberty was about 65 per cent of adult weight (50 kg). The duration of the breeding season was approximately 100 days (from beginning of September to beginning of December). Adult females had a longer season (240 days from mid-July to end of February). In both ewe-lambs and adults silent ovulations were observed before the onset of the sexual season, at the end of the breeding period and also during the anoestrous season. Ovulation rate was low (1.1) and nearly constant in the ewe-lambs. In adult females, ovulation was lowest in March-April (1.1) and highest in September-October (1.6).

There were three periods of lambing in February, June and October. For each period, weaning was at either 45 or 90. In October, lambs were also weaned at two days. The interval from parturition to the first ovulation was not affected by time of weaning (2, 45 and 90 days). Intervals were approximately 45, 31 and 17 days for lambings in February, June and October respectively.

Duration of the suckling period (45 or 90 days) had no effect on the interval from parturition to the first oestrus, but this latter was significantly affected by the month of lambing (February: 120 days; June: 75 days; October: 60 days). After 2-day weaning in October the interval from parturition to the first oestrus was shortened to 33 days.

Influence of age and nutritional level on response to the ram effect

In a first experiment the response of 160 adult ewes and 40 yearlings under usual conditions of management (grazing without supplementation) was studied. Rams were introduced at the end of April and ovarian activity was checked by endoscopy. The age of females had a significant effect on spontaneous ovarian activity before the introduction of rams. The presence of a corpus luteum was observed in 50 per cent of adult ewes and 22.5 per cent of yearlings. Previously anovular females responded to teasing

by a silent ovulation (97.5 per cent of adult ewe and 75.0 per cent of yearlings) which occurred within the first 4 days of exposure to rams. This first cycle was short (6 days) in 23.4 per cent of ewes and 34.8 per cent of yearlings. The proportions of anovular females responding to the ram effect and displaying oestrus within the first 26 days of testing was 87 per cent and 73.9 per cent in adult and young females respectively.

A second experiment studied the influence of nutritional level and body condition of ewes on response to the ram effect. It was undertaken on 122 adult females with very different liveweights 9 weeks before teasing (39.3 kg and 52.0 kg) and receiving nutritional levels which would induce changes or not in their weight during this period. The liveweight 9 weeks before the introduction of rams had a significant effect on the percentages of spontaneous cyclic ewes (heavy ewes: 40.8 per cent; light ewes: 6.1 per cent). In anoestrous females, ovulation was induced in about 90 per cent of well-nourished females and in about 70 per cent in underfed females irrespective of their bodyweight at the beginning of the experiment. Bodyweight had a significant effect on the duration of the induced ovarian cycle, this being short (6 days) in about 20 per cent of heavy ewes keeping constant or loosing weight and about 65 per cent in light ewes keeping constant or gaining weight. The induced ovulation rate was closely related to liveweight changes before the introduction of rams. It ranged between 1.10 in loosing weight females and 1.43 in flushed ewes.

It was concluded that anoestrous Barbary females could be mated during the anoestrous season (spring) by teasing, but their response to the ram effect decreases dramatically when they are submitted to severe undernutrition.

Feeding value of crude and exhausted olive cake and whole grape marc

Studies showed that daily intake was high for exhausted olive cake (110 to 119 g DM/kg $W^{0.75}$) and relatively low for crude olive cake (52 to 77 g DM/kg $W^{0.75}$). For whole grape marc, the daily intake was intermediate. The consumption of 300 g of concentrate/animal/day singnificantly increased the daily intake of crude olive cake when the concentrate was composed of barley and urea and a similar result was obtained

with exhausted olive cake when the concentrate contained wax bean instead of urea. An increase of 20 per cent of the daily intake of whole grape marc was obtained by the use of 400 g of either of the two concentrates. The nutritive values was estimated at 0.29, 0.21 and 0.19 FU/kg DM for crude olive cake, exhausted olive cake and whole grape marc.

GOAT DEVELOPMENT PROGRAMME IN MALAWI

(from M. Kasowanjete, D. Stotz and H.P. Zerfas of the Malawi/German cooperative programme).

General

Malawi is a typical smallscale arable farming country. More than 50 per cent of all farms are too small to warrant keeping of cattle of which there are about 1 million head. The goat population is about 1 million animals and they are found in almost all parts of the country. Sheep are not as popular as goats. Goats are mainly used as a source of meat supply for subsistence purposes. Since the milk yield of the local goats (Small East African type) is low, goats are rarely milked.

Enhanced goat meat and milk production could contribute to an improved diet of the rural and urban populations, help alleviate protein deficiency and provide cash income for many smallholders.

With the aim of making smallholder goat keeping more attractive, the Malawi German Livestock Development Programme started a goat project in September 1983. The project was recently evaluated and planned for another three years (ZOPP).

Objectives

The major objectives are:

- to develop and test profitable smallholder goat husbandry techniques;
- to implement a smallholder goat breeding programme;
- to improve marketing structures;
- to formulate appropriate extension packages and;
- to itensify staff training.

Activities

During the first three years (Phase I) the Project embarked on the following activities:

monitoring and analysing traditional small scale goat production systems;

starting a large scale goat breeding farm where breed evaluation and cross breeding programmes are carried out and where genetically improved bucks are produced for smallholders;

training station staff and extension personnel.

Present scale of implementation

The Breeding Centre. This covers about 1400 ha and slopes gently towards Lake Malawi and all of the farm is covered by medium thick natural forest. On open lands natural pasture species, such as Hyparrhenia, prevail. Annual rainfall is between 750 and 1000 mm. There is one rainy season from November to April. The mean temperature throughout the year is 23°C.

About 1000 breeding does plus their followers can be accommodated. Initially the ranch was stocked with 700 females which were bought from different places in the country. A Boer stud flock (60 animals) was also established and recently German Alpines were introduced through AI. The flock strength and the breed composition is depicted in Table 1. In addition to 1272 goats, the station keeps about 200 local sheep and 6 work oxen.

Table 1 Flock composition by type and breed (August 1986)

Type	Breed				
	Local L	Boer B	Crosses B x L	Crosses French Alpine x L	Total
Breeding bucks	66	5	-	-	71
Breeding females	536	14	99	-	649
Kids (< 4 months)	112	4	76	27	219
Maiden ewes (4-12 months)	93	5	41	139	
Weaner bucks (4-12 months)	131	1	62	-	194
Total	938	29	278	27	1272

All animals depend entirely on natural vegetation for their feed. The centre currently has several breeding flocks which are kept in 11 goat houses ('kholas'). Flocks are scattered over the whole farm in order to exploit the browsing/grazing potential optimally and to ease herding and breeding problems.

In addition to breed improvement activities, trials are carried out to assess the impact of a continuous versus a seasonal breeding regime. Various disease control measures are carried out within the group of male goats not used for breeding (different drenching regimes, dipping versus not dipping, etc...). The development of the breeding centre involved capital investment costs of approximately Malawi Kwacha (MK) 400 000 or MK 400 per breeding doe (equivalent to US$ 250 000 total or US$ 250 per doe).

The goat breeding centre is also used for many teaching and staff and farmer training purposes.

Field Activities. Parallel with the development of the breeding centre, an intensive smallholder survey comprising 50 farms has been carried out. The aim is to establish a complete picture of smallholder goat farming and farming in general.

Recently the first pure bred Boer bucks have been distributed to smallholders with the aim of monitoring the impact of the cross breeding programme under field conditions. Field trials, such as internal parasite control and housing, have also been initiated.

Results

Results achieved during the first 3 years can be categorised into results achieved at the goat breeding centre and in the field. A selection programme within the local breed has achieved encouraging results. The selection parameter applied for the identification of outstanding animals is the LPW which means: yearly liveweight production per female breeding goat.

Unfortunately breeding animals have not been definitely rated because two to three kiddings per goat at least are needed for a final assessment. Preliminary results show that there is a tremendous scope for selection

within the local breed due to the very wide fluctuation of production characteristics. Results achieved by the cross breeding programme (Boer bucks mated with local does) are also encouraging as indicated by birth weight (Table 2) and the daily liveweight gain (Table 3).

Table 2 Birthweights of various breeds by sex

Breed		Singles		Twins	
		Males	Females	Males	Females
Pure local (L)	n	143	137	51	47
	x	2.1	1.9	1.6	1.6
Pure Boer (B)	n	4	3	6	8
	x	2.4	2.8	2.4	2.8
B x L (½ breds)	n	85	65	16	12
	x	2.2	2.3	2.0	1.8
B x ½ breds (3/4)	n	6	4	12	10
	x	2.8	3.1	2.8	2.7

Table 3 Weaning weight, weights day 280 and weight gains 0-Day 280 of female weaners (x ± s.d.)

Breed	n	Weaning weight[a] (kg)	Weight Day 280 (kg)	Weight gain 0 - day 280 (g)
Pure local	49	8.3 ± 2.4	12.2 ± 2.4	36 ± 8
Boer x local	17	8.2 ± 2.5	15.0 ± 3.2	44 ± 10

Note: a) Weaning was carried out at constant weight and not at age |Editor|

As the Tables indicate, crossbred kids do very well, particularly as mortality rates are not markedly higher than in local goats. Mortality rates in pure bred Boers and 3/4 breds tend to be higher than with local and ½ breds if kept under the same management system. Though twins are welcomed by breeders young stock mortality rates were much higher in twins than in singles.

The dairy goat cross breeding programme has so far resulted in 27 crossbred kids out of 125 local goats inseminated.

Small Holder Farm Surveys and Observations

Traditional goat husbandry practises are well defined and production parameters have been established. The most important parameters are:

Average flock size	9 animals (60 per cent of farmers kept less than 10 goats)
Average weight of breeding does	29.1 kg
Kidding interval	317 days
Twinning rate	15 per cent
Pre-weaning mortality rate	20 per cent
Weaner mortality rate	15 per cent
Net offtake rate of meat/doe/year	7.5 kg liveweight

Major factors limiting smallholder goat development are:

high losses due to insufficient disease control especially internal parasites and coccidiosis;

inadequacy of housing;

low market prices;

land tenure system (communal land ownership and the village situation does not encourage farmers to invest in forage production);

limited access to improved breeding bucks/does.

Discussion of results, problems and experiences

State Farm Versus Smallholder Farm Approach. The Project decided to approach the two fields simultaneously. The adoption of this strategy proved to be beneficial because:

the problem sets differ completely; and

both fields seem equally important in their contribution towards making smallholder goat farming more attractive under Malawi conditions.

There is general agreement that a breed improvement programme cannot be effectively implemented without access to large populations kept in a uniform environment. Under Malawi conditions, in the absence of large flock owners and private ranches, this implies the use of government-owned large scale farms and a flock composed of about 1000 does. One should, however, be aware that this approach is costly and cumbersome. In the case of Malawi, capital investments for the breeding station amounted to about 250 US $ per breeding doe plus followers. Annual operating costs account for another 25 US $ per doe. If everything goes well in the future, the Malawi Government will recover about 50 per cent of the operating costs (assuming a price increase of improved stock by 100 per cent) through sales of breeding stock and culls. The questions remain whether a relatively poor country like Malawi can afford to maintain a breeding farm without long term external assistance and whether farmers are willing to pay twice as much for genetically improved animals as for local goats.

Indirect benefits which can accrue from a national goat breeding centre can partially offset breeding costs. For instance, if the breeding station fulfills at the same time extension and farmers' training functions.

Secondly, expenditures of the government-owned farm can be considerably reduced in future if the crossbreeding excercise is transferred to the field and the station's duty is reduced to the maintenance of nucleus breeding herds only.

Problems Encountered in Building up the Goat Breeding Centre. Based on the assumption that breeding progress can be maximised and the risk minimised, the project adopted the following approach:

selection within the local breed (Small East African goat, Malawi type);

cross breeding local goats with Boer for which a nucleus purebred Boer goat flock is maintained.

In order to maximise the selection basis, the project bought about 700 females from different places in Malawi. Before the animals entered the station, they were quarantined, drenched and dipped. As shown by the figures in Table 4, the project experienced enormous losses during the first and second years but the situation improved considerably in the third year. A thorough investigation into the possible causes of death revealed that general adaptation problems contributed most. Over the years the station management improved which contributed to declining mortality rates. However, the fact remains that apparently it is very risky to start a large scale breeding station from scratch.

Table 4 Goat mortality over the first three project years

	1st year	2nd year	3rd year
Breeding females kept	750	600	650
Breeding females died	261	117	50
Mortality rate (breeding female)	0.35	0.20	0.08
Kids born	115	133	202
Mortality rate (stock < 1 year)	0.91	0.33	0.27

NOTE

If your address is incorrect or if a colleague would appreciate receiving a copy of this Newsletter, please fill in the form below.

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The Small Ruminant and Camel Group
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THE SMALL RUMINANT AND CAMEL GROUP

NEWSLETTER

International Livestock Centre for Africa,
P.O. Box 5689, Addis Ababa, Ethiopia. Telephone: 18 32 15

No 9 June 1987

COURSE ON SMALL RUMINANT PRODUCTION TECHNIQUES

The first ILCA French-language training course in small ruminant production techniques was held in Addis Ababa from 4 May to 15 May 1987. There were 25 participants from 17 francophone African countries. First indications from the participants are that the course was successful and considered to be extremely useful.

The course comprised 22 formal lectures over an 8-day working period, with each session lasting from 1½ to 3 hours. The lectures were divided into five groups which covered: systems of production and methodologies of data collection and analysis; livestock performance; nutrition; health aspects; and genetics and selection. On a scale of one to four, participants scored most of these groups of subjects at about three.

The Group wishes to acknowledge the willing assistance and participation in the lectures of: Olivier Faugère, Adama Faye and their Senegalese colleagues of the Institut sénégalais des recherches agricoles for assistance in the sessions on data collection and analysis; Adama Traoré of the ILCA arid and semi-arid zones programme for taking on the onerous task of the animal health lectures; Pierre-Luc Pugliese of the French Veterinary Mission to Ethiopia for presenting the sessions on nutrition and Tray Richardson and John McIntire of ILCA headquarters for lectures on sampling techniques and economic analysis. The staff of the Group (Trevor Wilson, Daniel Bourzat and research associate, Klaus Gautsch) particularly wish to thank the 25 participants for the lively formal and

informal discussions and for teaching them as much as they were able to impart. The success of the course was largely due to the enthusiasm of these participants.

The lecture materials are currently being edited and revised and will be issued as an ILCA training manual (in French and then in English) as soon as possible. An English-language training course (based on the manual) will be held in May of 1988 and there will then be French and English language courses in alternate years for 1989 onwards.

A NEW JOURNAL - SMALL RUMINANT RESEARCH

The International Goat Association (IGA) proposes to have an official journal entitled "Small Ruminant Research". The new journal will be published by Elsevier and it is hoped that the first issue will appear during the first quarter of 1988.

To be successful, the new journal will require papers of high quality to be offered to it for publication. These will be refereed according to international standards before being accepted. Good quality papers will ensure the scientific acceptability of the journal to the world academic and research community. Commercial success will require that a high number of subscriptions be achieved. Please try and purchase the journal yourself or persuade your institution library to subscribe.

The editor-in-chief has been named as Dr George Haenlein of the University of Delaware (048 Townsend Hall, Nework Delaware 19717, USA). Trevor Wilson of the SRCG has also been asked to join the editorial board. Further information can be obtained from either of these two.

SOMALI CAMEL RESEARCH PROJETC

Three new working papers have recently appeared as a result of continued collaboration on camel research by the Somali Academy of Sciences and Arts and the Swedish Agency for Research Cooperation with Developing Countries (SAREC).

These papers are:

N° 12 Watson, R.M. 1986
A photo-grammetric sampling of camels to deduce the structure of their populations in southern Somalia.

N° 13 Hjort, A. & Mohamed Ali Husein 1986
Camel herd dynamics in southern Somalia: Long term development and milk production implications.

N° 14 Krokfors, C. 1986
Spatial aspects on seasonal distribution of camels in southern Somalia.

Copies can be obtained from:

Mohamed Ali Hussein
Somali Project Coordinator
Somali Academy of Sciences and Arts
P.O.Box 1228
MOGADISHU SOMALIA

or

Anders Hjort
Swedish Project Coordinator
Scandinavian Institute for African Studies
P.O.Box 1703
S-751 47 UPPSALA SWEDEN

GOAT AND SHEEP PRODUCTION IN LESOTHO

(Abridged from a paper of the same title presented by L. Makhooane at the SACCAR "Workshop on Research on Smallholder Dairy, Small Ruminant and Pig and Poultry Production in the SADCC Countries" held in Maseru, Lesotho, 23-27 November 1986).

Lesotho is the fourth largest producer of mohair in the world and also produces considerable quantities of fine wool. The importance of Angora goats and Merino sheep in Lesotho is reflected in the prohibition of importation of any other types of small ruminants into this southern African mountain kingdom.

Angora bucks were first imported into southern Africa in 1838 and by 1900 the breed was widespread over the whole of what is now the Republic of South Africa. Angora goats had already been introduced to Lesotho by this time, as evidenced from the annual report of the Mafeteng district which noted that mohair was being sold at 5 pence per pound. It is believed

which noted that mohair was being sold at 5 pence per pound. It is believed that Angoras arrived in Lesotho to improve the short-straight haired native "Mabiriboko" goat by two major routes -- the one being thefts from South African farms and the other by purchases from these farms by returning migrant workers. Merino sheep have an older history in southern Africa but probably entered Lesotho at about the same time as Angora goats and by the same routes. Payment of labourers with livestock in lieu of cash wages was probably also responsible for some of the animals entering the country.

Recognition of the status quo and of the importance of the fibre-producing small ruminants to the Lesotho economy was implicit in the purchase from South Africa, by the administration in 1908, of 85 Merino rams and 35 Angora bucks for distribution to traditional small scale producers. In 1910 importations from South Africa were 286 Merino rams and 140 Angora bucks.

The fibre industry remains important in Lesotho today and fibre production is the major objective of small ruminant production. There were estimated to be 1.5 million sheep and about 1.0 million goats in the country in 1986. In 1978 sheep were estimated at 943 thousand and goats at 618 thousand. Wool production increased from a total of 2.4 million kg (2.5 kg per head) in 1978 to 3.4 million kg (2.2 kg per head) in 1986, the value of this output being 1.45 million dollars (current value) in 1978 and 5.64 million dollars in 1986. Mohair production increased from 507 thousand kg (0.82 kg per head) to 788 thousand kg (0.80 kg per head) over the same period, the values of exports being 2.45 million dollars and 6.07 million dollars in 1978 and 1986 respectively.

The government maintains two Merino studs at Quthing and Mokhotlong which not only serve as centres for ram production and distribution but also as demonstration and training centres for farmers. Lambing percentages at these centres over the last four years have averaged about 90 per cent, birth weights about 3.5 kg and greasy fleece weights about 4.3 kg for an average ewe flock size of about 500 animals at both stations combined. A continuing commitment to improvement of the wool industry is evident in the importations of 1799 Merino rams and 707 ewes from the RSA in 1986.

There is currently no Angora stud in Lesotho and, in 1986, 275 Angora rams were imported.

Government policy aims at self-sufficiency in breeding stock as soon as possible. It is hoped that this will be achieved through the establishment of producer cooperatives. Membership of wool and mohair producer groups increased from 1877 farms in 1982 to 4234 in 1986. In addition to this main policy aim, research will be pursued on the effects of using locally produced supplementary feeds on fibre production, production of fat lambs at four months of age and the effects of flushing on conception and lambing rates.

FURTHER NEWS FROM THE YEMEN ARAB REPUBLIC

(A short article on the Range and Livestock Improvement Project in Dhamar appeared in Newsletter Number 3. Further information is provided here by Klaas Wagenaar, a former colleage of the Group at ILCA in Mali (1981-1983) and at headquarters (1983-1986)).

The station has 130 ha on which it keeps 400 Dhamari sheep. Management level is rather high: irrigated fodder crops, health care, management groups, selection in male and female breeding stock, two breeding seasons a year. The Dhamari seems to be a productive breed. Some parameters are an adult ewe weight of around 30 kg, weaning weight at 90 days of 15-20 kg for female lambs, fecundity rate in the last breeding season was 87 %, twinning rate is rather low at around 6 %. Of 156 lambs born, 155 were weaned and one had to be slaughtered. Dressing percentage seems to be quite good. So far we slaughtered 7 young rams weighing on average 17 kg and including all organs (intestines, lungs, testicles, rumen) the percentage was 53. We have to slaughter quite a few more of both sexes, different ages and conditions before we can draw any firm conclusions.

There is a lot of research under way, on the station as well as in surrounding villages: general sheep productivity under village conditions, control of black quarter/liver fluke, feeding of urea-treated stover and of poultry litter/stover silage, potential of Dhamari sheep, age-dentition relationships, fattening rations etc. There is so little known about

livestock in the Yemen that almost every bit of information is welcome, which is a nice position to work in. What we need most in the Middle East are contacts with other researchers. Do you think you can help me with that? In your last newsletter (N° 8) you referred to an inaugural meeting in Rome for a network in the Near and Middle East. Could you bring us in contact with this network? It would be of great use to my two counterparts in particular. Our address is: RLIP, P.O.Box 87180. Dhamar, Yemen Arab Republic.

CAMELS IN BOTSWANA

For many years the Botswana Police Force has maintained camels for patrol work in the remoter parts of the Kalahari. Management of the unit appears to have been good up until the end of the 1970s and, late in that period, males for breeding were still being imported from Namibia. All the camels are now kept at Tsabong, about 600 km south-west of the capital, Gaberone. Three camels were stationed at Bokspits in the extreme south-west of the country but were transferred to Tsabong on 1 October 1986. The camels, which number 58, have not been used on patrol since 1981, their role now having been assumed by horses. It appears that the herd will now gradually disappear through natural wastage and by slaughter for meat.

If anyone has any additional information on this unit (history, location, importations, use, breeding performance), the SRCG would be pleased to hear from them.

AUSTRALIAN MERINO SOCIETY TO DEVELOP NEW SHEEP BREED

(Adapted from "Western Farmer and Gragier" 4 September 1986)

Sheep from about 50 Australian Merino Society cross-breeding flocks were on display recently. Flocks on show were run apart from the society's main merino breeding programme. About 250 AMS members from all over Australia inspected the sheep, each group of which represented a flock with a different breed or breed combination.

Speaking at a field day, AMS founder Jim Shepherd said the aim was to cross every breed in Australia and New Zealand with the AMS merino in a giant mix. The programme was an attempt to prevent a plateau being reached in Australian wool production and to incorporate benefits such as fertility and mothering genes from other breeds into the system.

Members were told that AMS now had five special programmes - fine wool, cross-breeding body weight, cross-breeding fleece weight, merino high fertility, and cross-breeding high fertility. Sheep from these programmes eventually would be crossed with top AMS ewes to provide the AMS meridale - top in wool production, wool quality, fertility, mothering ability and producing a good suckler lamb.

Dr Helen Newton Turner, geneticist and special guest speaker, congratulated AMS members for what she called their vision, enthusiasm and dedication. She praised the special sheep development project and the commitment of members to the principle of selection of sheep by measurement. Dr Turner, said she was impressed with what the AMS had achieved with its measurement programme and the enthusiasm of its members. She said sheep were animals which would respond to whatever selection criteria a breeder sought but it was obvious that one day the response of the ordinary AMS merino would cease and the society then would be ready with its new super meridale sheep.

She outlined her twin selection programme and her work with booroolas, and said the ultrasound scan technique now helped with management strategies. This countered the argument that commercial merinos found it hard to rear more than one lamb, she said. Farmers now could identify and draft out twin-carrying ewes for special treatment. Even with losses, the ewe-lamb unit still was more efficient if it produced twins, she said.

RECENT PUBLICATIONS

Small Ruminant Production Systems in South and Southeast Asia (edited by C. Devendra and published by IDRC Regional Office for Southeast Asia, Singapore. ISBN 0-88936-493-1).

This publication is the proceedings of a joing IDRC/SR-CRSP workshop held in Bogor, Indonesia, in October 1986. It contains 21 papers in 3 sections. The first section deals with production systems and includes papers on socio-economic aspects, systems based on annual cropping, on tree cropping and intensive systems based on crop residues and cultivated fodders. The second section deals with country case studies in Nepal, South India, Sri Lanka, Bangladesh, Northern Thailand, Malaysia, Indonesia, the Philippines and Fiji. The third section relates to strategies and research methodologies. There are useful discussion and recommendation sections. A number of the papers have relevance to the Africa situation, particularly for the humid zones.

Proceedings of the IV International Conference on Goats, 8-13 March 1987, Brasilia (general editors Odon P. Santana, Aliomar Gabriel da Silva & Warren C. Foote. Published by the Departamento de Difusion de Tecnologia, Brasilia, Brazil).

The editors state "... the most current information is presented, evaluated and interpreted. This includes the relationship of goats to their environment, levels and methods of production, products, socio-economic implications, and their usefulness to man. This information is developed and presented by established and emerging leaders in their fields from over 45 countries."

The proceedings comprise 8 papers presented as plenary sessions, 71 papers given in symposia dealing with different topics, and abstracts of 340 posters which should have been presented at the Conference (but considerably less than half actually were).

As is usual in these types of publications, there are one or two very good papers, a sprinkling of average ones and lots of not very good ones. Many of the "established leaders" have little or no experience of goats

but this has not prevented them from providing their views. There were 16 authors of the 8 plenary papers and 5 of these were based in the USA (2 papers), 5 in Europe (3 papers), 3 in Israel (1 paper), 1 in Singapore and 1 in Egypt.

The 71 symposia papers were contributed by 117 authors. Authors based in the USA totalled 34 (29%) and they contributed 22 (31%) of the symposia papers -- the USA has 1 550 000 goats (0.3 % of the world total). France had 16 authors contributing to 9 papers and Brazil also had 16 authors also contributing to 9 papers but of these latter 13 authors and 6 papers were in a special Brazilian symposium. Australia had 9 authors (7.7%) contributing 4 papers (5.6%) for an infinitesimal 0.1 % of the world's goats. Sub-saharan Africa, with about 30% of the world's goats, had only 4 authors (3.4%) contributing to 3 papers (4.2%) and there were authors from a total of 15 other countries. There were said to be authors from 45 countries contributing to the poster sessions.

The international aspects of the conference were stressed by the organisers. There were 520 registered participants from 45 countries, of whom 333 were from Brazil. The Brazilian contingent is quite acceptable. The 51 USA citizens out of the remaining 187 participants are out of all proportion to the importance of goats in that country as is the representation of only 7 black African countries. If the International Goat Association, which proudly states that it is responsible for organising this International conference wishes to be taken seriously in future, it will need to do much more to ensure that participation is not only international but that representation is much more in proportion to the distribution of the goat population of the world.

Few readers of this newsletter will be able to afford the US$ 115 (including postage) that the 2-volume proceedings costs. They should not worry too much -- more relevant information is available more cheaply elsewhere.

A CAMEL RACE IN AUSTRALIA

A gruelling 3260 km camel race from Ayers Rock to Surfers Paradise will be staged during the Australian Bicentennial celebrations in 1988. It will carry guaranteed minimum prize money of Australian 100.000 $, and so far there are 90 entries - from the Arab sheikhdoms of the Persian Gulf, Egypt, East Africa, Pakistan, Britain, the U.S., West Germany and, of course, Australia.

Linking Ayers Rock (south west of Alice Spring in central Australia) with the Gold Coast of Queensland south of Brisbane, competitors in the 10-week marathon will combat the Simpson Desert with its twisting trails along stone-ridden gorges and dry creekbeds. The organisers have said "It's going to be the ultimate adventure. Two years early planning has got us well down the track".

Highlights will include:

- Festivals at all seven stopover towns featuring contests to decide an "Ultimate Ironman".

- Quests for a camel prince and princess to be crowned at the international grand ball after the race

- A proposed camel sprint "grudge match" between Queensland Premier Sir Joh Bjelke-Petersen, who says he will be in it, and Australian Commonwealth Prime Minister Hawke or ACTU leader Simon Crean near the finish.

U.S. television rights are already being negotiated. Documentary films, a book, travel and tourist packages, an international "outback" art auction and product merchandising are also being negotiated. The Northern Territory Government has expressed support for a Totalisator Agency Board coverage of the event. The Queens land T.A.B. will also be invited to participate. A trust has been formed to hold money raised to finance the race with surplus funds going to the Royal Flying Doctor Service.

People may ak "why a camel race?" Early Australian explorers such as Burke and Wills, and the early settlers, followed the camels' footprints through the mulga, spinifex, salt marshes and wattle scrub to start up mining fields in Australia's vast interior in the 19th century. They all owe a debt of gratitude to the camel and this is one way to recognise it.

RESULTS OF FIVE YEARS OF RESEARCH ON PEUL AND TOUABIRE SHEEP AT DAHRA (SENEGAL)

(Contributed by R. Sow, P.I. Thiongane and L. Tchamitchian of the Livestock Research Centre, Senegalese Agricultural Research Institute, Dahra, Senegal)

Introduction

The sheep improvement programme was started at Dahra in 1975. Two methods have been followed in order to improve meat production in local sheep: crossing Touabire rams on Peul ewes to increase size; and hormonal treatment to improve reproductive parameters.

The results have been published in various interim reports as well as a major summary report. Some of the principal achievements are presented in the current note.

Materials and methods

Peul sheep were bought in 1975 in villages surrounding the station while Touabire sheep were bought in the region of Kaédi in Mauritania. By 1978 the crossbreeding programme of Touabire on Peul had produced a crossbreed known as "Waralé".

The principal source of food is the natural rangelands of the research station. Some supplement is provided, based on the stage of the animal's physiological cycle and the time of the year.

Mating is carried out in groups using natural service, with or without synchronization of oestrus. Synchronization is affected by a vaginal sponge in place for 17 days followed by an injection of 400 IUs of PMSG.

Data collected relate to reproductive and growth performance. Fertility and prolificity are the traits registered in females as well as the mortality of their young from 0 to 30 and from 31 to 120 days. Growth is measured from birth to four months by weighing every 20 days. For purposes of analysis five seasons were recognised: cold dry (December to February); hot dry (March to May); early rains (June and July); rains (August and September); post-rains (October and November).

Two methods were used for analysis of reproductive traits these being: a chi-squared test for fertility, prolificity and mortality rates; and

a least-squares maximum likelihood model for fertility ($Y_{ijk} = P_{ij} + E_{ijk}$).

A model of the form: $Y_{ijklm} = + B_j + C_k + D_l + E_m + Z_{ijklm}$ was used for weight (0, 30, 60 and 90 days) and growth (0 - 30, 30 - 60, 60 - 90 days) where A was breed, B was sex, C was year, D was season and E was type of birth.

Result and Discussion

Fertility. Both analatycal methods showed that the hot dry season was the least favourable period for Peul ewes. At this time fertility was 53.8 per cent in non-synchronized and 60.7 per cent in synchronized ewes. The early rains showed fertility levels of 92.0 per cent and 75.3 per cent and the rains 85.3 per cent and 91.2 per cent for the two treatments. There appeared to be a similar trend in Touabire ewes but no firm conclusion could be drawn because of confounding between year and season.

Least-squares analysis showed a significant ($P < 0.05$) interaction between year and (natural or synchronized) mating and also between season and type of mating. Overall fertility was 69 per cent in synchronized and 75 per cent in non-synchronized ewes. These differences were not significant and there were no differences between breeds. The low fertility levels may result from attempts to shorten the breeding cycle from 1.00 to 1.12 parturitions per year. Weight at conception did not affect the fertility level: Touabire ewes were significantly heavier (34.4 kg) than Peul ewes (30.7 kg).

Prolificity. Without synchronization prolificity was low at 102 per cent. Hormonal treatment increased prolificity but this was very variable -- from 107 to 180 per cent in Peul and 118 to 125 per cent in Touabire ewes. There were significant between year differences in prolificity but none between seasons.

Lamb mortality. From 0 to 30 days 6.9 per cent of Peul lambs died and 10.4 per cent of Touabire: the crossbred Waralé had a rate of 4.0 per cent in this period. From 31 to 120 days the respective rates were 4.6, to 6.7 and 3.1 per cent. All these data relate to single born lambs.

For twin born lambs the rates for the two principal breeds and the crossbred were 23.0, 25.0 and 13.5 from 0 to 30 days and then 6.5, 11.1 and 12.0 from 31 to 120 days.

Overall mortality (all birth types included) to weaning at 120 days was 11.2, 16.4 and 7.0 per cent for singles and 28.0, 39.3 and 21.3 per cent for twins. Touabire had significantly ($P < 0.05$) higher mortality than Peul or Waralé between which there was no difference ($P > 0.05$). There were no significant differences between seasons but mortality appeared to be lower for animals which were in the period 31-120 days during the rains and appeared to be high for animals born in the cold dry season.

Weight and Growth. Table 1 provides the principal results relating to weight-at-age and growth. With the exception of sex between 30 and 60 days and genotype, sex and year between 60 and 90 days all other variables significantly influenced all the traits.

At 90 days Touabire weighed 2.9 kg more than Peul and males weighed 2.0 kg more than females. Twin litters were 3.4 kg heavier than singles at 90 days.

Season effects were marked from birth onwards and followed logical trends as animals moved through seasons at different ages.

Productivity index at 90 days. An index was calculated for weight of young weaned at 90 days this being: $Pr = F\ (2-P)\ V_1W_1 + 2(P-1)\ V_2W_2$ where F is fertility, P is prolificity, V_1 and V_2 are viability of single and twin lambs and W_1 and W_2 are weights at 90 days of single and twin lambs. The productivity of naturally bred and synchronized ewes is provided in Tables 2 and 3.

In non-synchronized ewes the differences due to season of mating were small except for ewes mated in the late hot dry season (and lambing in the post-rains) where the index was only 6.5 kg. Following synchronization there was not a great increase in productivity due mainly to a higher death rate and a slower growth of lambs. Seasonal effects were similar to those observed for naturally bred ewes.

Conclusion

Although these studies have been of relatively short duration the main conclusions so far are:

seasonal effects on overall productivity are not very great except for ewes mated in the hot dry season whose production is least;

individual components contributing to the index vary considerably;

synchronization of oestrus results in more young being born per birth but this is subsequently accompanied by a higher death rate - synchronization by hormonal treatment does not therefore appear justified at present at Dahra and if a short lambing period is required this can be achieved by using teaser rams;

the Touabire has better weight and growth characteristics than the Peul but a lower viability and further crossbreeding between the two is still required to determine which is the best type for total productivity.

Although the productivity index in terms of weight does not seen to be very much affected by season (except for the hot dry season breeding period), greater numbers of young seem to be produced following mating in the early and main rains seasons. Traditional owners may prefer more animals to greater productivity per individual. If this is the case research needs to be undertaken to determine how best to achieve the greatest number of young per animal and whether an accelerated cycle will have long term deleterious effects on the ewe.

Future research will therefore be carried out both in the traditional sector and on station. The on-station research will concentrate on providing optimal conditions to characterise the local breeds, it will use the best males identified in the traditional system studies in an attempt to broaden the base and improve the rate of genetic progress and it will serve as a logistical base for the research-development-extension team which will work in the traditional system and transfer the results of station research to it.

Table 1 Least-squares means of weight for age (kg) and daily gains (g) for Senegal lambs

VARIABLE	Weight				Daily gain		
	Birth (n=248)	30 days (n=244)	60 days (n=242)	90 days (n=205)	0-30 days (n=244)	30-60 days (n=226)	60-90 days (n=198)
Genotype							
Peul	2.9	6.7	2.7	12.3	122	26	73
Waralé	3.3	8.8	11.4	13.2	173	87	67
Touabire	3.7	9.8	15.0	15.2	176	115	73
Sex	**	**	**	*	*	NS	NS
Males	3.3	7.8	11.1	13.7	147	102	73
Females	3.1	7.2	10.3	12.7	135	97	72
Year	**	**	**	**	**	*	NS
1976	2.9	5.9	8.3	10.6	97	84	72
1977	3.1	7.7	11.1	13.3	149	108	72
1979	3.4	8.6	11.5	14.1	168	98	73
Season of birth	**	**	**	**	**	**	**
Cold dry	3.1	6.7	9.7	12.7	117	91	71
Early rains	3.1	6.8	10.6	13.5	123	125	92
Rains	3.2	9.0	12.6	15.0	190	128	73
Post rains	3.4	8.0	10.5	12.6	154	79	59
Type of birth	**	-	**	**	**	**	*
Single	3.3	7.7	11.0	13.6	146	102	74
Twin	2.7	5.4	7.9	10.1	94	71	59

Table 2 Productivity Index at 90 days in relation to mating season for non-synchronized ewes

Mating season	Birth season	Productivity parameters						Index (Wt at 90 days)
		Fertility	Prolificity	Viability at 90 days		Weight at 90 days (kg)		
				Singles	Twins	Singles	Twins	
Cold dry	Hot dry	0.75	1	0.95	0.80	12.0	8.5	8.55
	Early rain	0.75	1	0.85	0.70	13.1	10.1	8.67
Hot dry	Rains	0.60	1	0.97	0.85	15.1	11.6	8.79
	Post-rains	0.60	1	0.85	0.80	12.7	9.2	6.48
Early rain	Post rains	0.90	1	0.85	0.80	12.7	9.2	9.72
	Cold dry	0.90	1	0.80	0.60	12.6	9.1	9.07
Rains	Cold dry	0.90	1.1	0.80	0.60	12.6	9.1	9.15
Post rains	Hot dry	0.80	1	0.95	0.80	12.0	8.5	9.12

Table 3 Productivity Index at 90 days in relation to mating season for synchronized ewes

Mating season	Birth season	Productivity parameters						
		Fertility	Prolificity	Viability at 90 days		Weight at 90 days (kg)		Index (Wt at 90 days)
				Singles	Twins	Singles	Twins	
Cold dry	Hot dry	0.75	1.25	0.95	0.80	12.0	8.5	8.96
	Early rain	0.75	1.25	0.85	0.70	13.6	10.1	9.15
Hot dry	Rains	0.6	1.20	0.97	0.85	15.1	11.6	9.40
	Post rains	0.6	1.20	0.85	0.80	12.7	9.2	6.95
Early rain	Post rains	0.75	1.25	0.85	0.80	12.7	9.2	8.83
	Cold dry	0.75	1.25	0.80	0.60	12.6	9.1	9.30
Rains	Cold dry	0.90	1.30	0.80	0.60	12.6	9.1	9.30
Post rains	Hot dry	0.75	1.35	0.95	0.80	12.0	8.5	9.13

PASTEURELLA IN MALI CAMELS

(Contributed by Dr M. Kané of the Central Veterinary Laboratory, B.P. 2295, Bamako, Mali)

Samples were taken from 138 camels originating in northern Mali (Nara district) and from Adel Bagron in southern Mauritania. They were tested for the presence of Pasteurella multocida types A, B, D and E. Standard tests for establishing the presence of the parasite were carried out.

None of the animals from which serum was taken showed any clinical signs of infection with pasteurellosis. None of the 138 samples was positive for serotype B. Antibodies to serotype A were not found in 107 samples (77.5 per cent) but were present at low titres (maximum 1:40) in 22.5 per cent of the sera. Serotype D was detected in 6 sera (4.3 per cent) with one at a titre of 1:160 and two of 1:640. A total of 21 animals (15.2 per cent) reacted positively to serotype E of which 17 had relatively high titres of from 1:20 to 1:1280.

The high titres found indicate that some animals had either been clinically infected in the past or were subject to repeated low challenge.

KARAKUL SHEEP IN SOUTH-WEST BOTSWANA

(This communication has been received from Christine Martins, a doctoral candidate at Gottingen University and a research associate of the SRCG)

Introduction

The Kalahari or Kgalagadi District lies in the south-west of Botswana and amounts to 19.1 per cent of the area of the country but only 2.5 per cent of all inhabitants live there. Karakul sheep are kept in the southern part of the Kalahari District around Bokspits and Middelpits.

The soils in the southern Kalahari district are sandy and infertile and are classified as Arenosols. Rain declines from north-east to south-west, with high fluctuation between years and months. The main rainy season extends from November to April. The average yearly rainfall is less than 200 mm and in the last 6 years it has been less than average. Average maximum temperatures in summer are 34°C, in winter 23°C, and in winter the average minimum is 4°C.

The vegetation is dry shrub savanna. The grass cover is sparse and in the loose sand the vegetation is endangered by intensive grazing. There are large overgrazed areas around the villages and boreholes.

Karakul Sheep

Syria, Palestine and West Mesopotamia were the countries of origin of the pelt producing sheep. About 1200 years ago the original Karakul sheep were brought by nomadic tribes to Bokhara and Chiwa where the breed was established. At the end of the last century Karakul sheep were exported to Germany and thereafter to almost all parts of the world. The main Karakul pelt producing countries today are the USSR, Afghanistan, Namibia, the Republic of South Africa and Iran.

The first Karakul sheep were brought to southern Africa in 1907, to what is today Namibia. Karakul husbandry expanded in a short time owing to:

climatic conditions favourable to the breed;

the adaptability of this breed;

the availability of local breeds for use for crossing towards increasing the number of Karakul sheep, e.g. Blackhead Persian and Namaqua Africander;

the high value of the product (pelt).

About 40 years ago Botswana farmers obtained their first experience with this breed from neighbouring countries and introduced Karakuls to their own farms. Karakul sheep proved superior to cattle, especially in drought years. In Botswana there are currently 30 000 Karakuls and Karakul-crosses on more than 200 farms.

Production Techniques

Husbandry. The majority of Karakul farms are managed in the traditional way without individual possession of land. There are, however, 11 fenced farms of commercial character (average area: 7100 ha), which were developed between 1974 and 1979 with credits from the World Bank, within the scope of the First Livestock Development Project of the Ministry of Agriculture of Botswana. Average flock sizes are 150 Karakuls in the traditional sector and 720 in the commercial. Inputs of capital and labour are minimal.

Shepherds control the watering and penning at night. Lambing takes place throughout the whole year, but mainly in winter due to a stimulation of oestrus in the rainy season owing to better nutrition.

Breeding. The Karakul flocks are very heterogeneous. About 20 per cent of breeding males are bought from the Republic of South Africa or from Namibia. The Botswana rams are mostly of inferior quality. The ewes are mated without control, in some cases by rams of other breeds.

Nutrition. In most cases the natural rangeland is the only source of feed. The causes leading to the starvation of animals, as well as to the low reproductive rates, are due to the frequently occurring droughts. The Livestock Advisory Centres in Bokspits and Middelpits supply the farmers with livestock feeding stuff sold at reduced rates (subsidized by the government) to assist the farmes during drought but the turnover of these centres is low owing to the financial difficulties of the farmers. The supply of energy, proteins, minerals and vitamins varies for each farm.

Hygiene. The health of the Karakul sheep is endangered by:

- ectoparasites (Blue Lice, Nasal Worms, Gedoelstia Flies, Blue Wildebeest Eye Disease);
- endoparasites (to a lesser degree);
- enterotoxaemia (=Pulpy Kidney Disease);
- pasteurellosis.

A dip treatment against Blue Lice is carried out regularly. Neguvon A against nasal worms or Blue Wildebeest Eye Disease is cheap and effective, but seldom used in practice. Vaccination against enterotoxaemia and pasteurellosis varies from farm to farm and treatment against worms is not generally done.

Productivity. The productivity of Karakul sheep farming is expressed by the number of Karakul pelts per ewe per unit time. In Botswana this is affected by low reproductive and high mortality rates leading to a high number of animals for the purpose of replenishing the flocks and consequently a decrease in the number of pelts. The high mortality rate of 22 per cent is caused by malnutrition, jackals, diseases and aging.

Pelt Production

Technical aspects. Karakul lambs used for pelt production are slaughtered the first day after birth, otherwise the characteristic curls and patterns disappear. Slaughtering and skinning of the lambs is done by knife and by hand. Tissue and fat is removed with a knife and blood and dirt is washed out with cold water. The wet pelt is spread out on a frame covered with jute and dries in this form in the air.

Pelts, marked with the code-number of the farmer, are collected at centres at Bokspits and Middelpits. South African Cooperatives deliver them to Uppington and from there they are transported by air to London. Pelts from Namibia, the Republic of South Africa and from Botswana are sold under the trade name SWAKARA (South West African Karakul). About 6 weeks after auction, farmers get their proceeds and the corresonding invoice related to the pelts.

Invoice specification. The invoice consists of 3 parts:

the description of the pelts and their prices;

the proceeds-total, deductions and nett;

analysis of pelts sold by the farmer and comparison with the SWAKARA average.

In London the pelts are sorted into groups in order to offer the clients pelts of uniform quality. The economic characteristics are: colour; size; curl development; hair length or curl size; hair quality; and pattern.

An example taken from an invoice gives a clear representation of the sorting system:

574	2 SWART NF 2	5.55	11.10

The farmer offers 2 pelts class 574. The price for a pelt of that quality was fixed during the auction at R 5.55, so that the farmer gets R 11.10. The description of this pelt is:

black colour (in Afrikaans "swart");

normal size;

shallow developed or developed shallow curl development;

long hair or large curl;

grade 2 in hair quality and pattern.

This tabulation gives a precise description of all pelts concerned.

The last part of the invoice gives a general view of the pelts sold for each farmer with information regarding pelt types; pelt sizes of grey and black colour; curl type of grey and black pelts: (curl, ribbed, developed, and shallow); hair length of black pelts (short, medium, long and ovegrown); pelt quality of grey and black pelts (excellent ("selected"), grades 1 to 4, other).

The final statement is a comparison of the average prices of the auction with the farmer's average in all colours (black, grey, white, brown, chequered and the percentage difference between the auction average and the farmer's average.

The sorting system was developed by Hudson's Bay and Annings Ltd (Figure 1). This system has been used since 1982 for all Karakul pelts. The sorting is done by Hudson's Bay and Annings while Eastwood and Holt organizes the auctions.

Figure 1:

THE HUDSON'S BAY AND ANNINGS SORTING SYSTEM FOR SWAKARA PELTS

Decreases ← Hair length and spacing (curl size) → Increases

Increases — Curl development — Decreases

	Short (small curl)	Medium (medium curl)	Long (large curl)	Overgrown
Galliac Water-silk Shallow	S D light P	D flat D	O	RF
Shallow developed and developed shallow	F ↑ M	KF	NF	RB
Ribbed	C	T	V	↓
DS/PC and Pipe curl	G	KC	NC	RC

Illustration of the typing (lettering) of black SWAKARA pelts according to curl type and hair length (curl size) — each type is subdivided into grades according to hair quality and pattern.

BEST AVAILABLE

Quality of Botswana pelts. A random sample of 17 pelt invoices of 12 farmers was roughly investigated to show tendencies of the Botswana Karakul pelt production. The results are related to:

Colour: Grey pelts are better priced than black ones. The prices for chequered pelts are very low owing to a low demand and inferior quality. The Botswana production of black and chequered pelts is higher than the SWAKARA average, whereas the production of grey, white and brown pelts is lower. A comparison of the prices between the Botswana and the SWAKARA prices shows the inferior quality of the Botswana pelts (Table 1).

Pelt size: Pelt size depends on litter size and the nutrition and age of the ewe. Pelts of a size smaller than a special standard get much lower prices than the normal ones. The sample of Botswana Karakul pelts has twice as many small pelts as the average at the SWAKARA auction.

Curl type: The breeder distinguishes between the shallow types in Galliac (almost without curls), Watersilk, Shallow and Shallow developed, and among the curl types in Developed shallow and Pipe curl, with many intermediate types. The shallow types were developed out of the curl types in the 1920s in cooperation with

Table 1 Comparison of 847 Botswana pelt prices compared to the SWAKARA average

Colour	n	Difference of the averages in p. cent (SWAKARA is taken as a null standard)	
		Mean	Scattering
Black	710	-17.1 p. cent	-46 p. cent to + 3 p. cent
Grey	108	-12.5 p. cent	-73 p. cent to +27 p. cent
Brown	12	-68.0 p. cent	-71 p. cent to +18 p. cent
White	9	- 4.8 p. cent	-72 p. cent to +20 p. cent
Chequered	8	+17.5 p. cent	-56 p. cent to +67 p. cent

the breeder A.D. Thompson. There are only 4 classes on the market: Shallow, Developed, Ribbed and Curl. Better prices are offered for the more shallow types. In Botswana the amount of ribbed and curl pelts is somewhat higher than in all SWAKARA production.

Hair length and curl size: Prices are affected by the hair length and the curl size owing to their influence on the character and the impression of the pelt. "Good" is short hair or small curls and "bad" is overgrown hair or overgrown curls. The problem of overgrowing shows a higher development at the time of birth and appears very often in years of good nutrition. It also appears when the pelted lambs are too old. The ratio of pelts with short hair or small curl size is lower in the Botswana pelts than in the whole SWAKARA production.

Hair quality and pattern: Hair quality is determined by lustre and texture of the hair, both very important attributes. The pattern has a considerable influence on the attractivenes of a pelt. Hair quality and pattern therefore have a high economic value. In the invoices these attributes are expressed as grades. The result of the grading of the Botswana pelts is worse than that of the whole SWAKARA production, but the grey Botswana pelts are graded better than the black ones.

Meat Production

In the past the proceeds of Karakul pelts produced in Botswana were in most cases much lower than the auction averages and two per cent of the investigated pelts were priced lower than the deductions, so that the expenditure of the farmers exceeded their income. It is recommended that lambs with inferior pelts should be fattened. This has a positive effect for the single farmer and also for the total economy of Botswana. In 1983 the value of imported sheep meat (mutton and lamb) was P 148 964. The production of high grade meat by the fattening of Karakul lambs would automatically reduce the imports.

The meat performance of Karakul sheep has been until now insufficiently investigated. It appears lower than that of meat types such as Dorper, but this is of little relevance. The Karakul is kept for the production

of pelts, and the rearing of lambs for fattening is only important for lambs with pelts of inferior quality.

The ideal age for slaughter seems to be at 4 months. The meat is by that stage of the best quality and the older the animals become the higher the requirements for maintenance. Competition with the breeding animals indicates that they should not be kept longer.

Wool Production

Wool is a by-product of Karakul farming and the wool yield is accordingly low (about 2 kg per sheep per year). Since 1978 the Karakul farmers of Botswana have sold their wool to Tiro ya Diatla in Lobatse, a Norwegian project to help the farmers of the Kalahari. The wool is woven for carpets or spun for garment manufacture. The products are mainly sold locally. In Botswana, Karakul sheep have to be shorn twice a year because of the thorny vegetation. Most farmers shear their sheep themselves. The farmers assist the marketing with a pre-sorting of the wool. Prices are set, according to colour and dirt, at between P 0.70 and P 2.70 per kg. Only 10 per cent of the delivered wool is of good quality. The high degree of pollution by seeds, sand and other particles causes problems in manufacture.

Economics of Pelt and Fattened Lamb production

After the birth of a lamb the farmer has to decide on slaughtering for the pelt or rearing for breeding or fattening. The best lambs should be used for breeding. In Botswana the use of Karakul sheep for pelt production is superior to production of meat by fattened lamb but all lambs with pelts of estimated value of less than P 7.37 should be reared for fattening.

Problems occur, however, in the classification of the pelts and in the variable pelt prices. For example the average price for black pelts increased from R 8.02 in September 1982 to R 25.17 in September 1984. At the high price level of the latest auctions the proceeds even of inferior pelts were higher than those of the border price. The slaughter or rearing of lambs is not a matter of free will, but a question of market competition regarding quality, etc., and therefore this can only be decided by the

SWAKARA organisation. It should be made clear that the reason SWAKARA do not accept defective material is due to the challenge of the Russian Karakul pelts.

Conclusion

The development of a Karakul industry in Botswana took place owing to:

the close location to the Karakul breeding areas of the Republic of South Africa making the transfer of breeding animals and the marketing of pelts relatively easy;

labour on the Karakul farms of the neighbouring countries led to knowledge of the techniques of production;

the Karakul sheep is superior to cattle in this region.

The productivity is still low owing to high mortality and low fertility leading to a low number of pelts per ewe. The pelt quality is low from bad breeding management.

Karakul husbandry in Botswana is very extensive. The production risk is high owing to droughts, diseases and variable pelt prices. A high degree of cost-intensive production would endanger the yield. The decrease in yields as a result of drought or lower prices in extensive systems might lead to a surplus, whereas in intensive systems it would lead to a loss. With low input costs the interest on investment can be very high. Basically the production should maintain its extensive character. Large effects in productivity would follow provided there are slight changes in the management of farming, without a large financial input.

Currently it is not economical to fatten lambs but if lower prices for pelts return the farmers can convert without high cost. These lambs should be fed with supplements that do not endanger the feed of the flock. If all lambs were reared without supplementary feed, the number of ewes would have to be reduced by 40 per cent.

Farmers should realized the importance of efficient hygienic treatment. With little cost and some care the high losses resulting from disease can be reduced. The sale of the wool covers the costs of the medicines. Only a low effort in labour arises for shearing and transport of wool.

Investigation of the pelt invoices shows that Botswana pelts are inferior to the SWAKARA average. This refers to all economic characteristics: colour; pelt size; curl type; hair length of curl size; hair quality; and pattern. An exact investigation of the standard of the Botswana Karakul pelt production is necessary to give detailed recommendations for an adequate breeding strategy.

The first step in improvement is to standardise the flocks. A breeder should never allow rams of other breeds into his Karakul flock. All unnecessary male Karakuls should be sold. Only the best rams (shallow type, good in hair quality and pattern) should be kept. For this purpose the animals should be marked at birth with different ear-notches: the farmer gets information concerning the pelt quality of the lamb in the adult animal and he is able to select the best ones in times of drought. Farmers can buy good rams from the government Field Station at Lobu (subsidized prices of P 40.00), from Namibia or from the Republic of South Africa, although here costs as well as transport prices are considerably higher.

In Karakul breeding, success can be reached in a relatively short time because the selectivity characteristics are available at the birth of the animal. The evaluation of the lambs requires "know-how" and skill, because the pelt features can only be estimated subjectively. The skills of the farmers in the evaluation of lambs should be improved in order to have a more effective selection. Courses for this purpose are held at the Lobu Field Station. On these occasions farmers should get advice in interpreting the pelt invoices so as to obtain the necessary information regarding the main problems of their flocks. Clear breeding planning, the use of high quality rams and correct selection of the lambs will lead to better results in pelt quality in a short time without large inputs of capital and labour.

NOTE

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THE SMALL RUMINANT AND CAMEL GROUP

NEWSLETTER

International Livestock Centre for Africa,
P.O. Box 5689, Addis Ababa, Ethiopia. Telephone: 18 32 15

N° 10 October 1987

THE ILCA STRATEGY AND THE SMALL RUMINANT MEAT AND MILK THRUST

Many of you who receive other material from ILCA and particularly the ILCA Newsletter will be aware that the Centre has recently defined a new strategy. Full details are provided in ILCA Newsletter, Volume 6, Number 3 of July 1987.

The major points in the new strategy are that ILCA will:

- strengthen the ability of NARSs to conduct research and to develop their own technical solutions to production problems;
- develop, through its own research and that of collaborating organisations, technical packages to increase livestock production; and
- contribute to the scientific knowledge necessary to solve livestock production problems.

To maximise the use of resources, the operational strategy has limited the research priorities, and established a set of criteria against which research proposals will be assessed. Priority will be given to three species, cattle, sheep and goats; two target groups, smallholders and agro-pastoralists; four zones (where the potential is higher), semi-arid, subhumid, humid and highland; and four products, meat, milk, traction and manure.

The criteria to be adopted in the choice of individual research projects are:

- Is the problem a researchable one, and how widely applicable will the research results be?
- Does ILCA have a special advantage over other institutes in solving the problem?

- Are there other organisations able and willing to work with ILCA on the problem?
- Does ILCA have the critical mass necessary to tackle the problem?
- Is ILCA likely to achieve a sizeable impact by devoting its resources to solving the problem?
- Will the research contribute to increased production that is sustainable, both ecologically and economically?

Using these criteria, several major topics, or thrusts, were selected for the majority of future ILCA activities. These were:

Cattle milk and meat

Small ruminant meat and milk

Animal traction

Animal feed resources

Trypanotolerance

Livestock policy and resource use

The first three thrusts are classified under the heading of "Commodity Thrusts" and the last three as "Strategic Thrusts".

Research priorities will be closely coordinated with the Centre's training and information activities. Training and publications, which are instruments of programme delivery as well as means to strengthen the NARSs, will be closely linked to the six thrusts. Documentation activities will continue to provide a range of information services to livestock researchers in sub-Saharan Africa.

Since collaboration with NARSs is an integral part of ILCA's future research programme, an urgent task in the short term is to strengthen national research capabilities through intensified training. Training activities will focus initially on research techniques, and later, as new technological packages are developed, on technology transfer.

To ensure coordination between the headquarters' research divisions and the different research sites, each thrust is 'superimposed' on the administrative structure of the Research Department. This approach will

strengthen the relationship between the Director of Research and the disciplinary and administrative units at ILCA, and clarify the priorities of the research programme in relation to budget expenditures.

Each thrust will have a coordinator who, together with the Director of Research, will be responsible for directing the research. The thrust coordinator will have a major responsibility for establishing the programme planning and review mechanism for a thrust and for extending the results to NARSs. Thus the Director of Research will be assisted by six thrust coordinators in the leadership of the research programme.

Thrust coordinators will set the goals and objectives of the thrusts, organise the work programme across different sites, schedule the planning and review activities, coordinate the programme with research partners in Africa and overseas, prepare sets of research protocols in line with thrust budgets, and ensure the publication of research results.

Small ruminants will command approximately 20 per cent of ILCA's research budget in the future -- a considerable improvement on what these animals have been accorded in the past. The reasons for this change of emphasis are many. It has at last been realised that 30 per cent of meat consumed in Africa is from sheep and goats. Meat and milk from these two small ruminants are important both for subsistence and as potential sources of additional income for resource-poor smallholders. The small body size, high reproductive capacity and rapid growth rates make it easy to integrate these animals into production systems. The research should concentrate in three major zones: the semi-arid, where most small ruminants are raised at present and where there is considerable potential to export live animals to markets in other zones; the highlands, which provide a major opportunity to produce and market sheep; and the humid zone, which contains both markets and a high potential for forage production.

Dr Kurt J. Peters has been named as Coordinator of the Small Ruminant Meat and Milk Thrust. A Thrust Planning Meeting was held at ILCA headquarters in Addis Ababa from 31 August to 4 September 1987. At this meeting were 13 ILCA staff and 15 external staff from National Agricultural Research Services and other organisations. The meeting discussed main project areas and, within these, sub-project areas for which outline protocols were established. The project and sub-project areas are shown in the list on page 4.

SMALL RUMINANT THRUST

PROJECT AND SUB-PROJECT AREAS

1. SOCIO-ECONOMICS + PRODUCTION SYSTEMS
   - 1.1 Small ruminant productivity
   - 1.2 Identification of key management techniques
   - 1.3 Technology transfer
   - 1.4 Improved housing
   - 1.5 Training curricula
   - 1.6 Economics of technology
   - 1.7 Demand for small ruminant products

2. EVALUATION OF BREED RESOURCES
   - 2.1 Genetic characterization
   - 2.2 Characterization of breeds: existing data
   - 2.3 Characterization of breeds: performance recording
   - 2.4 Comparative breed and crossbreed performances: existing data
   - 2.5 Comparative breed and crossbreed performances: performance recording

3. WITHIN-BREED IMPROVEMENT
   - 3.1 Revolving nucleus flocks
   - 3.2 Selection objectives
   - 3.3 Genome mapping in small ruminants
   - 3.4 Genetics of adaptation

4. REPRODUCTIVE WASTAGE AND HEALTH MANAGEMENT
   - 4.1 Pre- and post-natal mortality
   - 4.2 Epidemiology of pneumopathies in West Africa
   - 4.3 Management of fascioliasis

5. NUTRITIONAL IMPROVEMENT
   - 5.1 Mineral metabolism
   - 5.2 Testing forage germplasm
   - 5.3 Nutrition in semi-extensive systems
   - 5.4 Nutrition in intensive systems

The protocols will be further discussed and refined at ILCA's Annual Internal Programme Review in October 1987 and it is hoped that thrust implementation will start in early 1988.

PRELIMINARY NOTICE — SMALL RUMINANT CONFERENCE

It is planned to hold a conference on small ruminants, probably in Cameroon and probably in January of 1989. The conference will be co-sponsored by ILCA and the International Foundation for Science and it is possible there will be additional funding from GTZ and IDRC. Numbers will be strictly limited and participants will be selected on the basis of abstracts of the papers they would like to present.

Titles and abstracts should be sent to R.T. Wilson at ILCA as soon as possible. Full papers will be required before the start of the conference and minor corrections to these will be allowed during the meeting. There will be a conference secretariat at the venue to finalize papers for publishing and it is hoped that, as usual with meetings organized by the SRCG, the Proceedings will appear within weeks of the Conference.

It is probable that the meeting will also be used as a forum for the election of Steering Committee members for the collaborative research programme which it is proposed to establish under the auspices of the newly created Small Ruminant Meat and Milk Thrust.

NATIONAL RESEARCH AND DEVELOPMENT NETWORK FOR SMALL RUMINANTS IN BURUNDI

(Contributed by Professor René Branckaert, Head of the Department of Animal Science, Faculty of Agriculture, University of Burundi).

The recommendations of the Montpellier Conference [see Newsletter 8, February 1987] were that research and development networks could be useful at all levels -- national, regional and international. Following numerous informal contacts between senior staff and field workers of different ministries and projects, it was decided to form a small Ruminant Network in Burundi. Currently 7 projects or sub-projects, belonging to

four different organizations form the network but it is hoped that others will join in the future.

The objectives of the Network are to:

1. Establish personal contact between scientists and field workers in order to facilitate information exchange.

2. Define and develop common methodologies for the analysis and evaluation of data.

3. Organize informal meetings and provide for in-service training.

At present exchange of information by means of personal contact has proved possible. It now seems, as a matter of urgency, necessary to promote other aspects of the Network including:

4. Organization of workshops of people with complementary or similar interests.

5. Establishment of efficient and long-term relationships between people of different disciplines (reproduction, genetics, nutrition, health, socio-economics) in order to create a common strategy for the development of research methodologies.

6. The design of a common format for the collection and analysis of data and for the continuous evaluation of progress; (the ILCA software programme IDEAS could be used and Burundi has already been selected to test this programme as a densely populated highland area).

7. Name a Network Coordinator who could coordinate activities and ensure adequate dissemination of information.

50th ANNIVERSARY OF THE VETERINARY FACULTY OF KHARTOUM UNIVERSITY

The Faculty of Veterinary Science of the University of Khartoum will celebrate its 50th Anniversary in January 1988.

As part of the festivities (which will include a Graduation Ceremony), it plans to hold a conference for 2-7 January 1988. The two major themes of the Conference will be Camel Research, and the Development of Animal Production Research in the Sudan. One session, hosted in common by the Veterinary Faculty, the Veterinary Research Administration and the University of Hannover will concentrate on vaccine production.

Further details can be obtained from Professor B.E. Musa, Faculty of Veterinary Science, University of Khartoum, P.O.Box 32, Khartoum North, Sudan.

REPORT ON "INTERNATIONAL WORKSHOP ON GOAT PRODUCTION IN THE HUMID TROPICS" (OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA; 20-23 JULY 1987)

(This report has been written by Dr Klaus Gautsch, Post-doctoral Associate with the Small Ruminant and Camel Group, who represented the Group at the Conference)

The conference was jointly sponsored by the Animal Production Department of Obafemi Awolowo University, the Department of Tropical Animal Production of the University of Wageningen and the International Livestock Centre for Africa.

Day 1 -- Socio-economics and Production Systems

Papers were presented by A.A. Ademosun, L. Reynolds and P. Montsma. It was pointed out that the West African Dwarf goat plays an important role as a cash resource for the farmers in the humid areas of Nigeria. In general, WAD goats are not integrated in the prevailing cash crop shifting cultivation system. Because of severe land pressure and high population density in many areas, goats are no longer allowed to range freely and the animals have to be confined or tethered. Possible solutions for the constraints were presented:

a) A new goat keeping house developed by the University of Ife and Wageningen where the goats are kept in a zero grazing system the whole year. The houses have slatted floors, are partly roofed and are made from locally available materials. The floor is about 1 m above the ground; manure is collected and returned to the land. Feeding is based on Panicum maximum, Leucaena leucocephala and Glyricidia sepium which are grown in feed gardens.

b) Alley farming where crop production is integrated with livestock keeping. It involves the planting of Leucaena leucocephala and Glyricidia sepium in rows with food crops planted between the tree rows. Foliage cut from the trees can be used as mulch for food crops and for animal feed. Alley cropping can reduce soil erosion and stabilize soil fertility.

Day 2 -- Nutrition and Health.

Papers were presented by H.G. Bosman, W.S. Alhassan, B. Tolkamp, A.B. Codjo, L. Reynolds, Y. Amégée, E.A. Adebowale, O.B. Smith, K.L. Morgan and A.O. Ayeni.

Nutritional studies with WAD goats mainly involved Cynodon dactylon, Panicum maximum, Leucaena leucocephala, Glyricidia sepium, Echinochloa pyramidalis and Cassava. Different levels and ratios were tested and the effects on intake, growth rates and carcass quality were presented. In general, supplementation with Leucaena leucocephala and Glyricidia sepium led to higher dry matter intakes and growth rates and better carcass qualities.

Further study subjects were the utilization of untreated crop residues and agro-industrial by-products for goat feeding. Supplementation with CSC or brewer's dried grains led to high growth rates while supplementation with molasses alone gave unsatisfactory results. Crop residues such as cowpea leaves and groundnut straw seemed to be very suitable for goat keeping.

The dressing percentage of WAD goats ranged between 34.0 and 52.3 per cent. In general WAD goats were found to deposit considerable amounts of fat, especially subcutaneously and in the abdominal cavity.

Major disease problems in WAD goats were detected to be PPR, rickets, pneumonia, coccidiosis, enteritis, mange and injuries. For kids, enteritis and pneumonia appear to be the major causes of death while mange and pneumonia caused more deaths in the adults.

Day 3 -- Management and Reproduction

Papers on management and reproduction were presented by O. Chiboka, Y. Amégée, I.F. Adu, H. Bosman, T. Alimi and P. Francis.

The age at first kidding is about 15 months. The mean kidding interval is 7 to 8 months. About 23 per cent of the kidding intervals ranged from 5 to 6 months enabling two kiddings per year. 27 per cent of the kids were single born and 63 per cent were multiple births. Kidding is distributed throughout the year. The litter size was significantly higher in goats that kidded during the dry season.

Litter weight at birth and at weaning were highest for second parity does. Weight was found to be more important than age for the weaning of the kids. The productivity indices of does bearing singles, twins, triplets and quadruplets were 3.8, 4.5, 2.9 and 3.0 kg respectively. Thus, the highest productivity was obtained from does kidding twins while further increases in prolificacy seem to have detrimental effects.

Day 4 -- Management

Papers were presented by S.W. Handayani, Y. Hadzi and A.S.B. Rajaguru.

Comparable to the goat house developed at Obefemi Awolowo University, the design of Java-goat houses from Indonesia was presented. The Java-goat house is divided into several compartments each accommodating one doe plus its offspring. Therefore the space per goat is reduced to 0.625 to 1.0 m^2 compared to 1.0 to 2.5 m^2 in the Nigerian goat house. The floor is made of split bamboo and is about 0.6 m above ground level. Manure and urine are collected in ditches placed under the goat houses. The roof covers the whole house. The Java-goat houses have a steeper roof angle than the Nigerian goat houses, which enables a better air circulation and reduces the inner air temperature.

In Sri Lanka goat production plays an important role in the smallholder farming system. Sri Lanka has about 520 000 goats including an indigenous dwarf goat which is highly prolific and resistant to many diseases. 73 per cent of all goats are kept in the dry and intermediate climates. Breed improvement of indigenous goats is mainly done by cross-breeding with Jamnapari, Saanen and Boer goats. Major objectives are the improvement of milk production in the humid zone and meat production in the dry and intermediate zones.

TECHNICAL AND ECONOMIC STUDY OF THREE METHODS OF REPRODUCTION IN SAHEL SHEEP AT DAHRA, SENEGAL

(Contribured by R.S. Sow, I. Diallo, K. Ndiage and A. Ngom of the Dahra Livestock Research Station of the Senegalese Agricultural Research Institute).

Introduction

An old English adage states that "ewes yearly by twinning rich masters make" and clearly underlines the economic importance of high reproductive

rates in sheep. The ideal of high reproductive rates is clearly understood by livestock owners who aim for as many young per ewe as possible in order to increase the cash revenue generated by their sheep.

In the sylvo-pastoral zone of Senegal, however, there are several constraints, both economic and practical, to maximising revenue. This note compares two different modern technologies with natural breeding in an effort to calculate the profitability of increased reproductive rates.

Materials and Methods

All animals were in the flock of the Dahra Livestock Research Station. The studies were carried out in the 1984-1985 season: Table 1 shows the experimental design.

Ewes in the group that were flushed received on a daily basis 1000 g groundnut haulm, 200 g wheat bran, 300 g groundnut cake and 300 g cotton seed, in addition to natural grazing. The synchronized and control groups had access to natural grazing only. Synchronization was achieved by use of a vaginal sponge of 30 mg of fluorogestone acetate, without any injection of PMSG.

The programme for each group is shown in Figure 1. All services were recorded. Embryonic mortality was estimated indirectly by the formula: number of ewes served but not holding/number of ewes served. Analysis was undertaken by chi^2 using a contingency table with a binomial random variance of Y_{ijk}. The null hypothesis was that the reproductive parameter under consideration was not influenced by the breeding method.

Table 1 Experimental design for reproductive studies at Dahra in 1984/85

Treatment	Breed		
	Peul	Touabire	Overall
Flushed	29	29	58
Synchronized	31	31	62
Control	76	20	96
Total	136	80	216

Results

Reproductive performance. Results are shown in Table 2. Synchronization had a significant effect on fertility (number of ewes pregnant/number

Figure 1 Reproductive events for three groups of sheep at Dahra

Group	Date
Flushed	5 April flushing started, 8 May-23 May rams in, 7 June-21 June rams in
Synchronised	18 April sponges inserted, 3 May sponges removed, 3 May-11 May rams in, 24 May-8 June rams in
Control	2 May-15 June rams in

of ewes served) whilst fecundity (number of young born/number of ewes served) was best in the flushed group. Prolificity (number of young born/number of ewes lambing) was also highest in the flushed group, 1.18 litter size against 1.02 in the control group. Embryonic mortality was significantly higher in both treated groups in comparison to the control group.

Economic performance. Costs were calculated to include cost of feed, veterinary inputs and sponges. Costs for the flushed, synchronized and control groups were 6035 FCFA (200 FCFA = 1US$), 4523 FCFA and 4313 FCFA. Costs per lamb produced in each group were thus 58,56 and 47 FCFA respectively.

Discussion

Synchronization results in a high level of embryonic mortality and cannot be recommended for farmers with low incomes. In general the other reproductive parameters compare with those generally quoted for Sahel type sheep but with flushing and synchronization it is possible to increase one or other of the traits so that they are comparable with the forest Djallonke type.

Table 2 Reproductive performance (%) of three groups of sheep at Dahra

	Fertility	Fecundity	Prolificity	Embryonic mortality
Flushed	88[a]	104[a]	118[a]	3.7[a]
Synchronized	77[b]	80[b]	104[b]	18.6[b]
Control	89[a]	92[c]	102[b]	10.4[ab]
Overall Mean	85±7	92±12	108±9	11.0

In the same column means followed by the same superscript do not differ (P>0.05)

The control group produced lambs at least cost. The flushed group would have required a fecundity of 123 per cent to compare with the control group. The genetic make-up of Sahel sheep does not apparently allow this level to be reached.

Conclusions

Although both natural (flushing) and artificial (hormone treatment) synchronization of heat in Sahel sheep allow greater numbers of lambs to be born than open breeding, the economic cost is greater. Under extensive grazing as currently found in Senegal, such interventions cannot yet be recommended.

Improvement in reproductive performance should be attempted through better health measures and improved management. Improved nutrition, at a cost affordable by the farmers, would also improve the reproductive rate.

Under existing conditions increased litter sizes should not be sought but increased fertility and fecundity appear to be feasible alternatives.

ARTIFICIAL INSEMINATION

Sheep in Britain

(Contributed by Ian McDougall, BVM&S, MRCVS. For additional information write direct to Mr McDougall, 19 Church Street, Sherston, Wilts SN16 OLR, U.K.)

Ram semen can be frozen into pellets or straws on-farm. The frozen semen can be stored for over 10 years in liquid nitrogen. It is easily transportable, the only limitation being political restrictions on semen export from some countries and disease considerations.

Ewes can be inseminated on-farm. The ewes are inseminated by injecting a small volume of semen into both uterine horns. This is done by laparoscopic surgery, which is very simple and quick to perform. The procedure does not stress the ewes and good lambing percentages are obtained.

Field procedure and technical aspects. A ram ejaculate usually has a volume of about 1 ml. The semen is diluted usually with two parts diluent to one part of semen (depending on the quality of the semen), so about 3 ml of diluted semen is obtained from an average ejaculate. About

15 pellets or straws can be frozen from such an ejaculate. Most rams will produce about three ejaculates a day, about 45 pellets or straws. Each frozen pellet or straw contains enough semen to inseminate three ewes. Depending on the quantity and quality of semen produced by the individual ram, on average enough semen can be prepared from a ram each day to inseminate 135 ewes.

The frozen pellets or straws are prepared by diluting the semen with the diluent at 30°C soon after collection (after semen quality has been checked). The diluted semen is then slowly cooled over 90 minutes to 5°C. The cooled diluted semen is then either pipetted into indentations in dry ice, to produce pellets, or loaded into straws and frozen in liquid nitrogen vapour. The pellets and straw are stored carefully in labelled containers in liquid nitrogen. One pellet or straw from each ejaculate is thawed and checked for motility and percentage alive; if there has been a problem and the semen quality is not up to a suitable standard, then the semen is discarded. Semen must be frozen into straws if it is to be exported.

Ewes are synchronised with progesterone intra-vaginal sponges and given a PMSG injection at sponge withdrawal. The sponges are removed and the PMSG injection administered 12 days after sponge insertion, and the ewes inseminated 56-60 hours later. About 100 ewes are inseminated each day. For insemination the ewes are placed in a mobile insemination crate, their belly wool is shorn off, and the area washed with Hibitane. Two blebs of local anaesthetic are placed into the wall of the ewe's abdomen either side of the midline approximately 14 cm down from the udder. A trocar and cannula is inserted through the abdominal wall at each site. A laparoscopic telescope is put through one trocar, and a pipette containing the semen is passed through the other trocar. The insemination procedure is quick and safe and the ewes are not distressed by the procedure.

Results achieved. An average lamb drop of 85 per cent has been obtained from field commercial on-farm insemination performed on Merino sheep in Australia. The conception rate varies depending on the breed of sheep (Merino sheep have a lower conception rate to first service than many British breeds) and the health and nutritional status of the ewes. An average lamb drop of 85-100 per cent should be achieved with British breeds although attention to detail is required to obtain these results.

Benefits of the technique. Semen freezing should be used as a form of insurance to preserve genetic material from superior rams, in the event of the ram becoming infertile, being unable to work or dying. Semen trading can also be conducted to obtain desired genetic material. Pedigree breeders can progeny test their young rams -- the procedure enables large numbers of ewes to be inseminated with semen from different rams at the same time -- the difference in progeny are then not related to season, feed availability or how early the lambs are born. The ewes inseminated with semen from different rams can be run together as one flock and differences obtained in the progeny are then largely of genetic origin. Progeny testing of milk sheep breed rams could also take place along similar lines to those used for progeny testing bulls in the dairy cattle industry.

Costs and cost benefits of the technique. It is cheaper to collect and store semen in many instances than to pay insurance premiums on the reproductive performance of valuable rams. The progeny are usually preferred to the insurance payouts if the ram dies or becomes injured and infertile. It is cheaper to transport semen than live rams and stress induced infertility that can occur in transported rams is not a problem.

Valuable rams can be syndicated and all the owners, no matter where they are, can use the semen when they choose in the breeding season.

Goats in Southern Africa

(From a presentation at the IV International Conference on Goats by Dr R. Lawrenz -- for further information contact SRCG).

Introduction. During the past thirty years, there had been several reports on the successful use of frozen semen in artificial insemination of goats (Bonfert, 1969; Corteel et al, 1984; Fougner, 1979; Ritar & Salamon, 1983). The use of frozen goat semen in planned breeding programmes is mainly practised in France, Switzerland, Norway and Czekoslovakia (Iritani, 1984) but compared to AI in cattle still plays a relatively insignificant role.

The results achieved with frozen goat semen vary considerably. Corteel et al (1984) reported a kidding percentage of 65.1 (1093 goats) using semen containing 150-200 x 10^6 spermatozoa and a double insemination, whereas

Van der Westhuyzen et al (1980) reported a conception rate of 27 and 50 per cent when Angora does were inseminated with 0.25 and 0.5 ml frozen semen. Ritar & Salomon (1983) carried out a series of experiments whereby various insemination techniques and semen diluents were used. One of their findings was that thawed frozen semen used as an intra-uterine insemination resulted in much higher conception rates than intra-cervical semen deposition.

Due to the future importance of the goat industry, it is probable that use of superior rams as semen donors will become necessary. The successful freezing of semen and artificial insemination will ultimately be of considerable value in putting such a programme into practice.

Procedures. In 1983 a project was commenced to freeze semen of superior Angora and Boer goat rams. With the use of an artificial vagina, a double ejaculate was collected from rams twice weekly. A Tris-fructose-citric acid and glycerol-egg yolk diluent was used, the semen centrifuged once, resuspended and filled into plastic straws shortly before freezing. Different sperm concentrations were prepared i.e. 75, 100, 150 and 200 x 10^6 spermatozoa per dose (0.2 ml). Semen was subsequently stored in liquid nitrogen and thawed at 70°C for 10 seconds just prior to insemination. A non-surgical intra-uterine insemination technique was used. All does were inseminated during natural oestrus (except experiments V + VI, Table 1). Teaser rams were used to identify does in oestrus, which were inseminated approximately 12 to 14 hours after the onset of standing oestrus. In experiments V and VI, does were synchronised using FGA intravaginal sponges for 11 days and 48 hours before sponge removal 400 I.U. PMSG and 7.5 mg LUPROSTIOL were injected. These does were inseminated approximately 37 hours after sponge removal (intra-uterine). All inseminations (except in experiment I) were carried out during the normal breeding season. The actual number of does kidding as a percentage of the original number of does inseminated was taken as the actual percentage of does kidding.

Results. The results of inseminations carried out during 1984, 1985 and 1986 are summarised in Table 1. The results of experiments II, IV and V show clearly that no marked difference in conception rates occurred

Table 1 Results of artificial insemination of Angora and Boer goat using thawed frozen semen (non-surgical intra-uterine insemination)

Experiment	Does inseminated			60 days rate non-return (per cent)	60 days rate non-return (per cent)	No of does kidding	Per cent does kidding	No of kids per doe	Sperm concentration
	No	Breed	Method						
I Oct 1984	46	Boer	Natural	31	67.4	28	60.8	1.64	100×10^6
II Apr 1985	31	Boer	Natural	24	77.4	22	70.9	1.90	100×10^6
III Apr 1985	53	Angora	Natural	35	66.0	33	62.3	1.15	150×10^6
IV Apr 1985	68	Angora	Natural	44	64.7	42	61.8	1.35	75×10^6
V Apr 1985	20	Angora	Synchronised	13	65.0	12	60.0	1.58	75×10^6
VI Apr 1986	33	Angora	Synchronised	26	78.7	24	72.7	1.62	100×10^6
VII Apr 1986	126	Angora	Natural	84	66.6	79	62.7	1.20	100×10^6
VIII Apr 1986	182	Angora	Natural	101	55.5	93	51.1	1.18	100×10^6
IX Apr 1986	216	Angora	Natural	161	74.5	156	72.2	1.23	100×10^6

when using either 75 or 150 x 10^6 sperm concentrations. From experiments V and VI it is evident that more kids per doe are born when oestrus synchronisation with the earlier described method is used, as compared to AI at natural oestrus.

Conclusion. The results of experiments I to IX show clearly that satisfactory conception rates can be achieved with a single intra-uterine insemination. These results compare favourably with those described by Fougner (1979) who also, following intra-uterine insemination, achieved conception rates between 60 and 80 per cent. From experiments IV and V, it can be concluded that a single dose of frozen semen containing 75 x 10^6 spermatozoa is sufficient to obtain satisfactory conception rates.

With the use of lower sperm concentrations (75 x 10^6) compared to higher concentrations (200 x 10^6) a much more effective use of ejaculates can be made but this has the added disadvantage that intra-uterine semen deposition must be carried out, which is more time-consuming than the usual intra-cervical method, and special equipment is needed for this purpose.

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SEMINAR: MEAT PRODUCTION FROM SHEEP AND GOATS IN THE HUMID TROPICS OF WEST AFRICA

The Food and Agriculture Organization and the Ministry of Animal Production of Côte d'Ivoire have recently jointly sponsored a seminar on small ruminants in the West African humid tropics. The meeting was held at Yamoussoukro from 21 to 25 September 1987. Present at the meeting, in addition to staff of FAO and ILCA, were representatives of Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Côte d'Ivoire (official participants and many observers), Congo, Gabon, Guinea, Ghana, Liberia, Mali, Nigeria, Sierra Leone and Togo. Official representatives were required to provide position papers on small ruminant research in their country of origin: the organisers stated that some of these were very good but there was insufficient time to present and discuss these in plenary sessions or working groups and technical problems prevented their being photocopied and distributed.

In addition to the country papers, 9 plenary presentations were made, which were finally photocopied and distributed during the official closing session. The plenary papers covered: systems; production economics; health; nutrition based on fodder resources; nutrition based on crop residues and by-products; breeding and genetics; management; extension and training; and a case study of an FAO development project. The systems and production economics papers suffered from the fact that they drew only on the Ivoirian experience. The case study referred to Togo but showed what can be achieved in a traditional system if sufficient and dedicated effort is directed to improving this system.

One day was devoted to visiting a sheep station belonging to the parastatal development agency (SODEPRA -- Société pour le Développement de la Production Animale) and the National Sheep Centre (CNO -- Centre National Ovin). It appears that very considerable progress has been made in the genetic improvement of the Djallonké sheep, based mainly on selection for weight, and it is unfortunate that this work is virtually unknown outside Côte d'Ivoire.

The plenary papers will be edited and published by FAO, probably as an Animal Production and Health Paper. It is also intended to produce

four short training manuals (extension networks, management and nutriton, health, and breeding and genetics) for the use of extension workers in the African humid zones.

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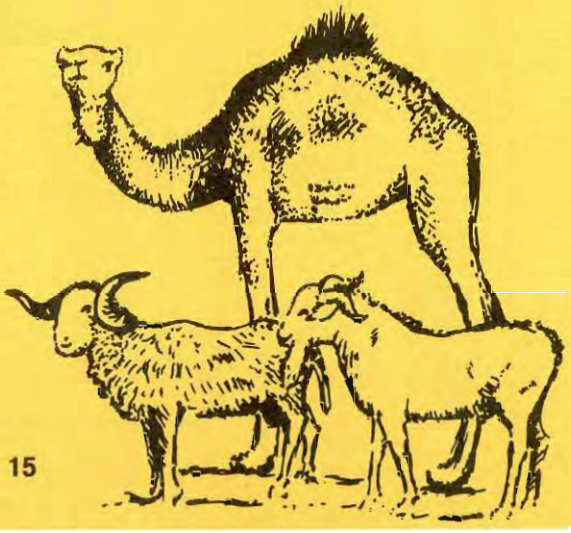

International Livestock Centre for Africa,
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No 11 DATE FEBRUARY 1988

ASSISTANCE TO TRADITIONAL SHEEP BREEDERS IN CAMEROON

(Taken from the "Tropical Animal Production and Health I.T.M. series: No 2" published by the Institute of Tropical Medicine, Department of Animal Production and Animal Health, 155 Nationalestraat, B-2000 Antwerp, Belgium).

Introduction

The project on "Assistance to Traditional Sheep Breeders" began in Cameroon in 1981 under the patronage of the Andre Ryckmans Foundation, a non-governmental organization recognized by the Belgian Government and with the material and scientific support of the Prince Leopold Institute of Tropical Medicine. The bulk of the financing was done by the Administration generale belge de la co-operation au developpement. The Institut de Recherches Zootechniques du Cameroon (IRZ) made available to the project at the Mankon Station near Bamenda in the North-Western Province, pastures, a Cameroonian laboratory technician, accommodation for the project chief and administrative facilities. It was therefore possible to verify the new technologies developed by the project before

disseminating them among the villagers. After 55 months of continuous activity, the project ended on 10 March 1986 following the mutual consent of the parties concerned.

The initial village surveys actually started in 1978 as part of an applied research project financed by the Administration generale belge de la cooperation au developpement whose aim was to identify the main constraints to the development of traditional small ruminant husbandry. Following surveys and monthly visits to various villages, Dr Belot, Officer-in-Charge of the project, concluded that productivity could be considerably increased by applying some simple measures in the area of reproductive control, the control of gastro-intestinal parasites and the improvement of feed. Some documents were published on that subject.

This preliminary appied research work had led to the implementation of the project which is now ending. The project concentrated its efforts on developing a type of pen and stockbreeding accessories from local materials that the local rural inhabitants could afford. At the same time, growth controls and periodic faecal examinations were carried out to determine the causes of and variations in parasite infestation and technical assistance and practical advice were given to various stockbreeders of the region around Mankon. Many requests for assistance with respect to goat breeding in the traditional context were made; such requests were met whenever possible although it was not possible to do any station work on goats. The two project chiefs who succeeded each other, Dr Micheline Nielsen and Dr Chantale Symeens maintained a continuity in activities which was particularly well accepted; everywhere they went they were always given a very warm and positive welcome.

At the request of Cameroonian agencies, the project carried out extension exercises; the project also trained technical and scientific staff of the Mankon Station when official requests were made in that respect.

Since 1984, the number of goats under the project has remained stable at around 60 head.

Project impacts

Before the project began, the official extension services of the Ministry of Animal Husbandry, Fisheries and Animal Industries (MINEPIA) had neglected the breeding of small ruminants in the north-western province. The National Rural Development Fund (FONADER) was interested neither in sheep nor in goats. The agency responsible for developing the province (MIDENO) did not have any small ruminant activities. At Mankon, IRZ had a core of imported pure bred sheep and locally-purchased sheep.

The inhabitants of the region immediately showed great interest in any form of assistance and advice because small ruminants, especially goats, played a social role which the authorities had failed to recognise until then. The traditional authorities supported the efforts that were initiated, particularly through the establishment of some family-type husbandry schemes and the project quickly became known in the English-speaking region as the Belgian Sheep Project.

The approach adopted by the project using materials which could be afforded by the small-scale breeders appealed to the latter. Regular visits to small livestock owners quickly made it possible to distinguish those breeders who were genuinely interested in learning more and getting ahead, from those who were just curious. During the final year of the project, a model of the entire sheep farm of the project was set up in a village complete with weight gain checks, earmarking of lambs, castration and selection of the healthiest animals. It was learned that the reason why such small-scale sheep breeding had not started earlier was out of respect for the local belief that a married couple which breeds sheep before having children will be childless; the new breeder was newly-wed! It should be noted that this taboo is not associated with goat breeding.

Other stockbreeders increased the number of animals they were raising and spontaneously requested deworming or other treatments. Regular treatment of minor wounds is part of the assistance given to the stockbreeders as is the sale of mineral supplements.

The stockbreeders also understand the important role that appropriate feeding plays even if the feed given to the project's animals is based

mainly on natural fodder or fodder improved through rotation. The fairly common local system of grazing animals by tethering them is compatible with rotational pasture. However, a fodder supplement at night is important when the system of feeding used is one of natural and extensive pastures.

Technical recommendations

Shelter is a must for the small ruminants especially in regions that are humid and sometimes as cold as Bamenda which is at an altitude of around 1 500 metres. It is perfectly possible to use local materials such as raffia both for the sheep sheds and hurdles. This was demonstrated and was perfectly understood and agreed by the local breeders.

The need to control reproduction is more difficult to accept; observations show, however, that when lambing is too close together it wears out the mothers which produce weak lambs whose chances of survival are slim. In the traditional system, all the animals, male and female, are turned loose in the morning; there is a high proportion of males to females because every owner wants to have his ram or buck even if he has only three or four ewes or she goats. Under such circumstances, the chances of premature pregnancies and of in-breeding are very high; traditional breeders very seldom purchase or exchange males.

Preliminary experiments as part of applied research had demonstrated that rams could be temporarily sterilized by raising the temperature of the scrotum as a result of wrapping them up in plastic bags. Such sterility disappeared some weeks after the bags had been removed. It was not possible to pass on this message in the villages. However, the second phase of the project showed that it was not easy to apply the method nor was it reliable, which amply justified the constant concern for verifying the actual performance of the new techniques at the station, before disseminating them.

The project also studied the sperm of various rams, such analyses were necessary properly to assess reproductive control methods whereby the behaviour of the male is altered.

Preliminary observations were made on the possibility of placing a mechanical obstacle (a small mattress-type plastic sponge) in the vagina to

neutralise the service of the males. It was not possible to verify the effectiveness of the method because of a lack of time and funds.

On the other hand, as a result of observations it is possible to identify fairly accurately the oestrus period in the normal sexual cycle of the ewe. These scientific and technical findings are described in the technical report of the project. The Cameroonian partner (IRZ) which provided facilities for the project was interested enough in the results to send an IRZ staff member to Belgium to finish off his training in scientific research leading to a master's degree in Tropical Animal Production.

Much more attention needs to be given to sheep feed than is normally done in the villages. Salt and water should be given regularly to the animals. It is quite easy to improve the feed of animals which is crucial if one wants to improve their performance.

Lambs are gradually weaned when they are about two to three months old.

Routine treatments of small flocks are simple but necessary to obtain good results; hand removal of ticks once a week, cleaning of the feet every four months, annual vaccination against contagious ecthyma, castrating surplus males at the age of two to three months, treatments for worms and coccidia, etc.

For three lambing seasons (August 1984 to February 1986) the mean results of prolificity (1.3) were good while average intervals between lambings were 10 months (1983-1984), eight months (1984-1985) and 13 months (1985-1986); it should be noted, however, that abortions were deliberately provoked for experimental reasons during the last season.

Average daily weight gains for the lambs in 1985 were respectively for females and males 127.7 g and 157.8 g for the period 0-30 days and 119.9 g and 148.7 g for the period 0-80 days.

The carcasses of seven animals between seven and four months old were cut up and studied; live weights varied between 13.0 to 29.8 kgs.

The pathology generally did not give cause for great concern. There were cases of lameness, diarrhoea, conjunctivitis, heartwater and contagious ecthyma. Rabies was diagnosed and confirmed on a project

animal; there had been an outbreak in the region. Streptothricosis, on the other hand, affected many animals but the lesions were benign and not extensive in most cases.

Conclusions

The experience acquired from 1981 to 1986 with respect to the breeding of small ruminants in Cameroon, confirmed the importance of small ruminant breeding in the economic activity of rural people.

New stockbreeding techniques affordable by small-scale stock owners can be developed only if a flock is available on which experiments can be carried out before the techniques are disseminated in the rural area. This was made possible as a result of the co-operation and support of IRZ in Cameroon; we publicly thank IRZ for its assistance.

Nothing would have been achieved without the trust of the stockbreeders who were always encouraged and attended to when they sought to make contact with the project.

At the end of the entire period, it can be justifiably concluded that the breeding of small ruminants in the villages is still not well known and that it deserves much more attention than it has received so far.

A non-governmental organization, two scientific institutions, qualified volunteers, local staff and stockbreeders all managed to establish fruitful co-operation with each other. Key foundations for self-sustaining development were thus laid.

However, nothing would have been possible without the substantial financial input of the Administration belge de la cooperation au developpement to whom sincere thanks go from the officials of the project who hope that similar initiatives will be forthcoming in other biotopes for the direct benefit of the rural people.

FODDER CONSUMPTION OF CAMELS

(Contribution of Denis Gerard, Veterinary Mission, Franch Technical Co-operation in Ethiopia. The contributions of Alemayehu Tessema and Ahmed Hassen who made the quantitative measurements of fodder, are acknowledged. The measurements were made when a new trypanocide was experimented on camels by the Rhone-Merieux Laboratories (Dr Van Gool) with the co-operation of the Veterinary Department of the Ethiopian Ministry of Agriculture (Dr Zelleke)).

Place of the experiment

Gewani Agricultural School for pastoralists (Third Livestock Development Project, Ministry of Agriculture). Country: Ethiopia; Region: Hararghe; Province: Chercher, Afar and Gara Guracha; District: Gewani. Climate: semi-arid.

Period of observation

26/01/1987 to 26/04/1987 (91 days).

Animals observed

Eleven young camels with an average weight of around 266 kg (minimum 225 kg, maximum 417 kg) of Adal (Afar) stock. The animals had an average gain of about 9 kg of live weight during the experiment (maximum: daily gain of 52 g; minimum: daily loss of 21 g). It should be noted that the animals were infested by strongyles, particularly Haemonchus. The weights were calculated using barymetric measurements. The animals were infested, for the purposes of the "Merieux" experiment, with T.evansi about 15 days prior to the experiment and were effectively treated 10 days after the beginning of the experiment.

Habitat

The 11 camels were divided into two groups (group I: 6 animals, group II: 5 animals); each group was put into an insect-free shed with natural ventilation. The camels were let out of the sheds for only about two to three hours a day and were not given access to pasture in order to conform to the requirements of the "Merieux" experiment. The animals were locked

up 26 days before the experiment; they were very nervous at the beginning of the period of adaptation because they were used to the open air.

Feeding

Morning and evening, depending on the appetite of the camels to ensure that quality hay would always be available. Throughout the entire period of the experiment, the fodder distributed was medium quality grass hay without any other food supplements. The animals were watered every day. It should be noted that before the experiment, the camels had been used to browse and herbaceous pasture feeding and that they had gone through a 26 day acclimatization period during which they had been locked up and fed on hay.

General conclusion

Consumption of 3 kg of dry hay per animal per day for 91 days to cover a little more than the maintenance requirements. The animals weighed 268 kg on the average i.e., 1.4 kg of dry matter for 100 kg of live weight per day.

NEW DEVELOPMENTS IN MAMMAL CLONING

(Abstract from La Recherche, No. 178, June 1986).

Is animal cloning possible at last? Will we some day see genetically indentical twins reproduced in series from a single parent as is routinely done for plants? The results obtained by the Englishman S.M. Willadsen in Cambridge which led to the birth of three lambs seem to prove that it is possible (Nature, 320, 63, 1986).

It will be recalled that in 1981 the American P.C. Hoppe and the Swiss K. Illmensee caused a sensation when they announced the first successful cloning of mice. The principle of cloning is simple (it has in fact been applied since 1952 to small vertebrates like frogs): it consists of taking the nucleus of an embroyo's cell and transferring it to a fertilised egg whose own nucleus has been removed beforehand. If the

operation is repeated with other nucleus of the same embryo, the individuals produced will all be similar and will have the same genetic make-up as the donor embryo. Using this process, P.C. Hoppe and K. Illmensee obtained the birth of three young mice which were, however, not identical twins because they came from different embryos. But the experiment showed for the first time that the cloning technique was feasible. However, it has never been possible to reproduce this result again in spite of many attempts and the scientific community came to doubt its validity. What is more, the work done later by other teams of scientisits resulted in their considering mammal cloning as simply impossible (J. McGrath and D. Salter, Science, 226, 1317, 1984).

Will this statement be challenged by the recent publication of S.M. Willadsen in Nature? The process he used differs slightly from the previous one. The nuclei were removed from the cells of very young embryos (8-cell stage) and fused (by a fusion agent, the sendai virus) with unfertilized and enucleated eggs. After a few days of test tube culture, the embryos "manufactured" in this manner were placed in the uterus of the "carrier" ewes. Two of the three lambs born as a result of the transfer were real twins from the same embryo.

Since the births were in 1984, it might appear surprising that S.M. Willadsen waited for two years before publishing his results. The reason seems to be that he was unable to obtain other births, proving the very low yield of the procedure. Moreover, J.P. Ozil at INRA and the Pole J.A. Modlinski were also able to clone mice by fusing embryo cells with freshly fertilized and enucleated eggs. Unfortunately, the mice that were born, died shortly afterwards. These results had not been published because, once again, it had not been possible to reproduce them. Everything is happening as if the cloning of mammals, which in principle is possible, were the outcome of a strange twist of fate. In fact, it seems today that although the techniques of nucleus transfers and embryo manipulation are well understood, the biological mechanism upon which the later development of "manufactured" embryos depends are far from understood and mastered thus virtually condemning to failure such experiments. If one day the natural biological barriers that seem to stop the species from being multiplied in series are overcome, the mastery of cloning will be possible. But is it

really desirable? Doubtless the applications expected for the breeding of domestic mammals are important. Of greater concern is the prospect of applying the technique to man as in the "best of worlds". Let us hope, then, that ethical barriers that cannot be crossed, effectively replace the biological barriers.

MINERAL COMPLEMENTATION UNDER ASSISTED SHEEP BREEDING SCHEMES IN SOUTHERN COTE D'IVOIRE

(sent in by T. Armbruster, Albrecht-Thaer-Weg 1, 3400 Gottingen, Federal Republic of Germany. T. Armbruster is a former post-doctoral fellow of the Small Ruminants and Camel Group).

Experiments carried out under the assistance project

The present experiments were undertaken under the south-eastern component of the Societe pour le Developpement des Productions Animales (SODEPRA) from 1982 to 1986.

The project used a salt lick which contained 40 per cent salt and 21 per cent bicalcium phosphate (20 per cent calcium carbonate and 19 per cent cement). The blocks are manufactured in Abidjan and sell at 260 CFA francs/kg (1 FF = 50 FCFA). The calcium carbonate was added for internal profit making purposes of the factory. In some systems of husbandry, the lick was made up of 65 per cent salt and 35 per cent bicalcium phosphate was used. At 123 FCFA/kg it is a cheaper option. The advantage of blocks is that they are easier to distribute (in 1985 salt cost 64 F/kg while bicalcium phosphate cost 230 F/kg). With an annual consumption of 5 kg/ewe and its lambs a charge of 615 FCFA is obtained for the mineral supplement.

The following were the findings of consumption experiments carried out on a traditionally raised flock of the region.

A portion of th blocks contained 1 per cent of a premix of 10 per cent Monensin (cost 120-250 FCFA/25 kg at Abidjan in 1983). Prophylaxis against coccidiosis using blocks containing monensin was satisfactory.

People were sometimes advised not to use cement in blocks because it was suspected that they contained toxic substances. A LACENA analysis on a

sample of cement yielded the following results: Pb 20.6, Cd 0.28, As 3.4, Fe 645 mg/kg. However, this did not confirm the suspicion.

Practical aspects

Salt licks are produced on a small scale using boards with incisions placed at right angles to each other. A piece of wood is placed in the middle of each square formed by the boards to fix the blocks in the pen. Salt tubs are used to distribute the powder in the pen.

Conclusions

In southern Cote d'Ivoire, it is not usual to provide salt in traditional sheep breeding. As it is easy to distribute blocks, they are recommended to sheepbreeding systems that have freshly secured assistance. On the other hand, powder is profitable.

In the sheepbreeding systems where the animals are given concentrated feedingstuffs, the distribution of pure salt appears to be adequate. If the sheep are fed only on pasture (which is often more advantageous in terms of profitability) a mixture of salt and phosphate is recommended.

HOW THE TYPE OF MANAGEMENT AFFECTS THE WEIGHT OF SHEEP

(Authors: researchers of the IDR Department of Animal Husbandry, Burkina Faso)

Introduction

In this pilot experiment using a limited number of animals (four castrated Djallonke sheep aged between six to eight months per batch) our aim was to find out how the growth of sheep was influenced by the types of management and the use of urea-treated straw. This is of special interest because in five years' time it will no longer be possible to allow small ruminants to graze freely on natural rangeland in parts of Burkina Faso. We hope to be able to gather basic data in order to advise extension workers and the peasants they are assisting on appropriate accompanying measures.

The straw was treated immediately after harvest; it contained only 45 per cent of dry matter. It was treated in a silo with a six per cent urea solution at a rate of one litre for every two kg of green matter. This experiment was conducted in June and July when the vegetation was beginning to grow again.

In the next experiment the animals were divided into three batches: batch one was taken to the natural pasture every day; batch two was kept in the stable and fed on grass cut the previous afternoon; batch three was tethered during the day. The second pilot experiment was carried out during the day. The second pilot experiment was carried out during the second half of the rainy season for six-week periods at the Gampela research station of the University of Ouagadougou.

All the animals had access to mineral licks (adequate in Ca and P) and the natural range was very rich and diversified.

Consumption of treated straw

The control batch (1) went out every day on the natural range for at least eight hours. Batch 2 received treated straw in addition to its shortened grazing time (from 8 am to 12 midday) initially; later the animals were kept permanently in their stalls and given as a supplement fresh grass which had been cut the previous afternoon. The animals in lot 3 were initially fed a supplement of cottonseed cake (150 g on the ground) after being let out daily to graze for at least eight hours: later on, they were given no supplements.

The health of the animals in batch 2 was adversely affected and this makes the data obtained in the next experiments impossible to compare. It was estimated that the animals consumed about 3.6 g of nitrogen derived from urea per day. An autopsy after the experiment showed lesions in the liver. During the experiment, the animals of batch 1 performed best.

By way of conclusion, we noticed that the sheep have difficulty in absorbing excess nitrogen and that they do not appreciate crudely chopped straw. As a result of their ability to select what to graze on in the natural rangeland, animals in free range manage to avoid losing weight during the dry season and show considerable weight gains during the rainy season.

Future research will be focused on the use of more finely chopped straw and treatment with less concentrated solutions of urea (2 to 4 per cent) before trying to determine digestibility in-vivo and in-vitro.

Types of herding

We note, first of all, that the stakes were not moved around regularly enough; it would be advisable to change the stakes daily. The ability of the sheep to choose where to browse was limited by the whims of a keeper who was the one who decided whether or not enough grass was available.

From the mean daily weight gains we can conclude that permanent stalling and tethering of sheep reduce their prospects of selecting the best parts of the fodder. In order to prevent a decline in animal production, either a wide variety of fodder in great quantities should be provided or the stakes should be moved about very regularly. Further research involving comparison with goats should show whether or not there is a need for supplementation rations.

NOTE ON T. EVANSI TRYPANOSOMIASIS IN THE NARA SECTOR (MALI) AND IN SOUTHERN MAURITANIA

(Contributed by O. Diall, A. Oumare, B. Diarra, Y. Sanogo and Z. Coulibaly, Animal Husbandry Department, Ministry of Rural Development, Mali)

Summary

Two surveys were conducted in the Nara Sector and Southern Mauritania whose main objective was to determine the incidence of trypanosomiasis among camels. A total of 195 camels were examined. The findings showed that rates of infection varied according to the season: 3 per cent in the dry season and 20 per cent in the rainy season.

Introduction

It is vital to have an up-to-date picture of the trypanosomiasis situation in Mali and Mauritania especially since there are no drugs on

which there is unanimous agreement regarding their effectiveness agains T. evansi. Towards the 1950s, Antrycide was the great favourite of therapeutists in the treatment of camel trypanosomiasis. But, following the use of the drug on a large scale, strains that were resistant to it appeared and the existence of such Antrycide-resistant strains led to the withdrawal of the drug from the market. The fresh outbreak of camel trypanosomiasis was no doubt due to the ineffectiveness of the few trypanocides available. The aim of these surveys was to obtain information on the following:

a) The seasonal frequency of T. evansi infections among camels;
b) The ability of T. evansi to cause anaemia based on the comparison of PCV from infected and healthy camels;
c) The possible incidence of T. evansi among other animal species living in the same region, in this case cattle and donkeys.

Equipment and methods

Animals. The dry-season survey involved 100 camels examined at markets at Nara (Mali), Adel-Bagrou and Nema (Mauritania). Fourteen donkeys were also examined to see whether they were infected by T. evansi.

Methodology of the survey. Blood samples were taken from all the camels examined. The blood taken from the jugular vein was collected in tubes which had been treated with an anticoagulant i.e. ethylenediaminetetratic acid (EDTA). The blood was treated using the haematocrit centrifugation method (woo method); it was then examined under a microscope with a magnifying power of 40. The volumetric percentage of red blood corpuscles or PCV was worked out for each animal.

Results

Parasitological findings. There is a very high incidence of the disease in Nara and Abel-Bagrou in the rainy season. On no occasion was T. evansi detected among the other species. Nearly 90 per cent of the positive cases (rainy season) are camels between 0 and 5 years old.

Blood findings. The analysis of blood findings was restricted to those camels which had been found to have trypanosomiasis.

Discussion

The greatest frequency of T. evansi infections in the rainy season no doubt corresponds to the rapid multiplication during that season of horse flies, the main carriers of the disease.

Although the negative findings at Nema do not constitute conclusive evidence that there are none of the parasistes in that zone, they do, however, indicate that it is rare there when compared to zones further north such as Nara and Abel-Bagrou.

A statistically significant difference was recorded between the averages of hematocrits from camels with parasites and camels without parasites. This confirms that T. evansi causes disease among camels.

The findings from the surveys of cattle and donkeys are not conclusive evidence that those species do not have T. evansi.

Conclusions and recommendations

As a result of the frequency of trypanosomiasis infections and their importance pathologically, trypanosomiasis can be put on the list of the major causes of camel diseases in this part of Africa. The announcement that Antrycide will be marketed again should probably make it possible to combat trypanosomiasis. When the drug becomes available, research should be made on how to utilize it rationally in order to reduce both the incidence of the disease and the chances of developing chemical resistance to the drug.

The epizootic data available indicate that veterinary officers need to provide more assistance to combat trypanosomiasis among camels especially young ones during the rainy season.

Additional surveys need to be carried out so as to detect the incidence of T. evansi among other species.

BIBLIOGRAPHICAL REVIEW

Lhoste, P. 1987 The association of agriculture with stockbreeding. Development of the agro-pastoral system in the Sine Saloum, Senegal. Maisons Alfort, Colection Etudes et Syntheses de l'IEMVT No 21 (This paper was the subject of a doctoral thesis - Docteur Ingenieur en Sciences Agronomiques - which was defended in 1986 at the Institut National Agronomique de Paris/Grignon.

In this publication the author tackles in succession the historical and methodological aspects of the approach used by stockbreeding systems in West Africa and the development of stockbreeding in the agro-pastoral system of Sine Saloum. According to Philippe Lhoste, agriculture and stockbreeding are two activities whose relationships are seen differently by agents of development and researchers in Africa. Some authors feel that such relationships do not exist or are contradictory while others feel that they should be associated and be seen as a solution. If one tries to go beyond the all too frequent sectoral approaches, animal and plant production actually seem to be associated in the traditional African production systems. Animals seem to be key elements in maintaining the balance in tropical agricultural ecosystems. The role of animals in the African production systems is growing and becoming crucial in many ways: the economics of the production unit, farm work and transport, organic manure etc... Animal husbandry is henceforth a crucial aspect of the agrarian system which cannot be completely divorced from other elements when making a sectoral study of animal productivity. The use of animal energy appears to be a crucial factor in the development of agricultural production systems. In West Africa in particular, animal traction appears to be a technical innovation of capital importance. The author focuses particularly on animal traction because cultivation using draught animals has often played an influential role in the process of integrating stockbreeding into farming and brought about other major changes in the stockbreeding systems. The author drew on his experience in the experimental units of Sine Saloum to tackle these problems. In the first part of the publication, the author deals with the historical and

methodological aspects of the approach to stockbreeding systems in tropical Africa. He justifies this historical review by the fact that today's realities are the fruits not only of a historical process but also because the institutions, methods and design elements available today are influenced by recent history. Part two is a review of the study's objective: stockbreeding in the tropical environment and the consequences in terms of methodology stemming from the specific nature of stockbreeding. Finally, it develops a theory on the design background, the system's overall outline approach and the methods used and makes comparisons with other disciplines particularly agronomy. Part two, which is the most important part of the publication, studies the development of stockbreeding systems in Southern Sine Saloum. The publications and files on the experimental units of Sine Saloum are compared and enriched through the study of regional statistics and findings of surveys carried out by the author during his stay in Senegal. The main thrust of the presentation remains the association of agriculture with animal husbandry; considerable passages are devoted to the use of space and complementarities with agriculture and to the use and breeding of fraught animals. A number of chapters deal with other animal species especially donkeys and small ruminants. In part three, the author briefly takes a look at a more comprehensive approach to the agro-pastoral system. The author carried out surveys on the agricultural production units which resulted in the classification of farms and the development of animal traction. The cattle herds move about on the same land and the author identifies a number of functions that they carry out and indicates how complementary such functions are with the agricultural production system. Cultivated land is a special framework which tries to find a coherence between farming and animal husbandry. The overall feed balance sheet may be evaluated at this level. It is also the basis of a review of the operation of the agro-pastoral system demonstrated by the actual situations studied. This leads Philippe Lhoste to consider various problems such as the expansion of cropped land and erosion and maintaining a balance between cultivated land and extensive herds and makes suggestions as to how to improve the agropastoral system. Philippe Lhoste concludes that logically, the productivity of the agro-pastoral system should be intensified and

improved. Such a solution would include animals in the ecological and economic balance of inter-tropical Africa and call for a series of actions in respect of erosion control, reforestation, development of agricultural residues, maintenance of soil fertility, improvement of organic manure and management of domestic animals. It also assumes a comprehensive approach to spatial development problems and considerable participation of the rural communities that are becoming increasingly aware of the need to adopt a specific strategy in the use and management of rural land resources. Using a bibliography of more than 240 titles, the author demonstrates a considerable wealth of professional field experience in this publication.

Landais, E. 1987 Research on stockbreeding systems: management and prospects, Versaille, INRA, Departement de Recherche sur les systemes agraires et le developpement (Department for Research on Land Systems and Development).

This paper by Etienne Landais proposes a general review of stockbreeding systems and analyses how they operate. Just like agronomy some fifteen years ago, zootechnics is looking for a new lease of life. Indeed, today, zootechnics looks like a set of increasingly sophisticated different sectoral analytical approaches. The balance between zootechnical research and upstream research which might be associated (physiology, genetics, biochemistry, micro-biology, molecular biology...) appears to be increasingly threatened. Cannot the study of the animal as a whole, the herd, the animal husbandry system based on a method similar to that of modern agronomy, restore and then maintain the balance and thus meet even better than in the past the needs of stockbreeders who are managers of their own herds and their farms. The researchers of INRA, systems particularly those of the Department of research on land systems in the group to which Etienne Landais belongs, have tried to define the outlines of a new zootechnical discipline which C. Beranjais defines as "the study of relationships that are established between a herd of domestic animals and its environment, considered as a whole controlled by man in order to

establish laws on how the herd operates (...). Zootechnics is a scientific discipline, animal husbandry is its area of application". This awareness of the need to go back to a more synthetic approach to zootechnics so as to better reflect the interactions which give the phenomena studied their functional unity, strongly invites zootechnicians, like the agronomists, to draw closer to the systemic trend. This leads to the definition of the system of animal husbandry as a specific subject of study. This text is designed as a synthesis document on the current status of this new approach, as a very open platform for discussion and as an educational document. The author's conclusion: "As it can be seen, this work raises more questions than it gives answers. It would have achieved its aim if it contributed directly or indirectly through the reactions it provokes to stating the challenges and problems of zootechnical research applied to the analysis of stockbreeding as a human activity whose fundamental concepts are the practice of animal husbandry and the system of animal husbandry".

From this attempt to provide an epistemological and methodological explanation, we can draw two main conclusions:

a) the method proposed should be put to the test, the only way of improving it;

b) there is a clear confirmation of the initial idea: the scope of the questions to be treated, the vital importance of co-operation between various scientific disciplines leave no doubt as to the path to be followed.

"Such a scientific project can only be the fruit of team work programmed over a long period...". This paper of the tropical zootechnician, Etienne Landais, proposes methodological concepts and seems to be an important paper especially in the system of CGIAR centres which have clearly opted for a systemic approach to their research problems.

APOLOGY

The Editors apologise to the readers of the English version of SRCG Newsletter 11 for the delay in publication. This is due to the problems encountered in having the original text (which for this issue was in French) translated.

NOTE

If your address is incorrect or if a colleague would appreciate receiving a copy of this Newsletter, please fill in the form below:

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THE SMALL RUMINANT RESEARCH NETWORK

NEWSLETTER

International Livestock Centre for Africa,
P.O. Box 5689, Addis Ababa, Ethiopia. Telephone: 18 32 15

No 12 June 1988

PREAMBLE

The astute observer will have noted the change in the masthead of this Newsletter. Following the implementation of the new ILCA strategy (SRCG Newsletter 10: 1-5) the camel and the arid zones are no longer priority targets for ILCA research. The former Small Ruminant and Camel Group has been quietly transformed into the Small Ruminant Network. It forms part of the Animal Nutrition and Management Section of ILCA within the Research Department. Operationally it works within the Small Ruminant Meat and Milk Thrust, the Coordinator of which is Dr Kurt J. Peters, who is also ILCA's Deputy Director-General (Research).

In order that readers of this Newsletter may be familiar with the work of the Thrust and be aware of the possibilities for future areas of collaborative research, much of this first issue under the new banner is devoted to presenting the work and responsibilities of the various sections and units which work within the Thrust framework.

SMALL RUMINANT MEAT AND MILK THRUST ACTIVITIES

ANIMAL REPRODUCTION AND HEALTH SECTION

Effect of dietary supplementation and endoparasitic control on the reproductive and productive performance of Menz-type sheep. (Zere Ezaz, O.B. Kasali, D. Little, E. Mukasa-Mugerwa, R. Brokken and Negussie Akalework: Debre Berhan ILCA Research Station, ILCA Ethiopia).

The highlands of Africa, conventionally defined as areas of more than 1500 m above sea level, comprise about 1 x 10^6 km^2. About half of this area is within Ethiopia and supports a population of about 35 million people and 34 million sheep and goats (ILCA 1985/86). The Debre Berhan area forms part of the central Ethiopian highlands, where ILCA also maintains a research station (120 km NE of Addis Ababa, 2830 m). Farmers in this part of the highlands raise Menz-type sheep, a member of the East-African fat-tailed family. ILCA also maintains this breed at its station at Debre Berhan.

Information on the reproductive and productive performance of Menz-type sheep under both traditional and improved management systems is very limited. Generally, it is not considered to be high (Allthan, 1971; Wilson, 1975; Agyemang et al., 1985). This is not untypical of non-intensively managed hill flocks throughout the world but it must be undoubtedly limited by nutritional and health, especially endo-parasitic, factors. It thus remains an open question as to what the performance of the Menz-type sheep might be under conditions of better nutrition and lower endo-parasitic challenge.

Given better nutrition and freedom from endo-parasitic infection, it seems possible that the reproductive performance of Menz-type ewes might be raised through increased twinning and/or breeding more frequently than once a year. The higher health status of the ewes might also improve lamb birth weights and viability, milk yield and hence lamb growth rate to weaning, with possible carry-over effects after weaning as well as wool production.

A research project is currently underway at Debre Berhan ILCA station to study the effect of dietary supplementation and/or endo-parasitic

control on the reproductive and productive performance of Menz-type sheep. The experimental design followed is a 2 x 2 factorial in two blocks, with 50 ewes per treatment in each block. The factors are +/- feed supplementation and +/- endo-parasitic control.

The control group is managed in the traditional fashion, thus depending on natural grazing for maintenance and production. The group will also not be drenched for endo-parasitic control. The nutritionally advantaged group of ewes are, besides grazing, supplemented with wheat bran, noug cake and hay at the rate of 300, 150 and 500 g per ewe per day respectively. The aim of the supplementation is, on the average, to increase and maintain the live weight of the supplemented group by about 4 kg or one body condition score unit over the nonsupplemented control group. The group will not be drenched for endo-parasite control. The endo-parasite controlled group will receive strategic drenching against gastro-intestinal nematodes and trematodes. They have already been drenched with Rafoxamide (Ranide) against trematodes and with Phenbendazole (Panacur) against gastro-intestinal nematodes in mid-March. Drenching will be repeated in mid-June and mid-September. This group will not receive dietary supplementation. The last group will be both nutritionally advantaged and drenched against endo-parasitic infection.

A study of the effect of these two treatments and their interactions with age of ewes, season and each other is currently underway through monitoring:

- liveweight and body condition changes of ewes;
- ovulation, lambing and weaning rates of ewes;
- oestrus, pregnancy and steroid pregnancy hormone values of ewes;
- birth weights, viability and weaning weights of lambs;
- milk and wool production of ewes;
- pasture dry-matter intake of ewes; and
- the relationship between body condition and estimated body fat of ewes.

At the completion of the project all inputs and outputs will be evaluated to allow cost benefit analysis. The project, which commenced in December 1987, is expected to be completed in December 1989.

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Monitoring endoparasite status in sheep (Dr Tekelye Bekele: ILCA, Ethiopia)

Fascioliasis is a serious endoparasite contributing to low productivity of sheep in highland areas. Rapid and reliable diagnosis is lacking although it would facilitate treatment of prepatent infections before enormous destruction of livers occur and also juveniles mature and oviposit. Engyme-linked immunosorbent assays (ELISA) using fluke metabolic antigens prepared in a simplified manner have been developed to meet this demand. Efforts are underway to test this method in the field.

Purpose of the study: Small ruminant production is an important component of livestock production in Africa. There are 103 865 000 sheep and 125 287 000 goats (Jahnke, 1982), the former of which are mainly distributed in the highlands and the latter in the lowlands. They provide mainly meat and fibre and to a lesser extent milk.

Gastrointestinal parasites are the chief constraints of sheep production which result in anaemia, diarrhoea, reduced weight gain, increased mortality rates and increased cost of production (Barger, 1982). Such production losses are the outcome of both clinical and subclinical infections (Sykes, 1978; Oakely et al, 1979). There are few reliable estimates of the economic significance of gastrointestinal helminths in African countries (Akerejola et al, 1979; Bahru and Ephraim, 1979).

The prevalence of gastrointestinal parasites varies depending on the rainfall pattern, temperature, and other ecological factors of the environment. In addition it differs according to the animal species and the species of parasites concerned. The fecundity of gastrointestinal parasites varies seasonally. The egg laying capacity of Haemonchus contortus is retarded during the dry season due to arrested development whereas it is increased in the wet season. Cattle develop resistance against repeated infections of fascioliasis. Likewise, breed and individual differences have been observed in sheep against certain nematodes (Preston and Allonby, 1978). Hence it is highly valuable to monitor the status of endoparasites in small ruminants to determine their fecundity at different seasons, degree of infection in the host and the level of resistance of the host. Besides, the regular monitoring of the status of endoparasites in small ruminants also give an indication of the number of ova passed in the faeces and the level of infestation of pasture (Tekelye et al, 1987).

Design of the study: The first part of the study will concentrate on monitoring endoparasites and productivity of Menz, Horro, Blackhead Somali and other breeds of highland sheep in their own habitat. This is expected to be implemented on 400-800 farmers sheep at Debre Berhan, Deneba (vertisol site), Degen (vertisol site), Tulu Meku (Chelia district-Ambo) and Melkawerer (IAR-station). At first, about 200-300 farmers' sheep will

be tagged in each site which will be used for data and sample collection. The participant farmers can be allowed to dispose their animals as they like even though they would be encouraged to keep them upto the end. Since the study starts with a big number of sheep, not all would be withdrawn before the end and an average of 100 sheep are expected to be available for sampling every month at each site.

In addition one sheep shall be sacrificed in each site every month to identify the type of gastrointestinal parasites. The sheep for slaughter will come from ILCA station at Debre Berhan, IAR station at Melkawerer and locally purchased from farmers.

The second phase of the study shall compare the parasite burden and productivity performance of these breeds of sheep in the same habitat and determine if there are breed differences. This will be done at Debre Berhan by assembling the different breeds together. Comparison shall be made with reference to the result of their respective habitats.

The most important parameters to be looked at during the study periods include: packed cell volume (PCV); blood and buffy coat smear; faecal egg per gram (epg) count; faecal culture and identification; worm count and identification; body weight changes; body condition score; heart girth measurement; lambing rate; twinning rate; mortality rate; abortion rate; and perinatal loss. Samples shall be analysed both at the field and in the laboratory. They will be dispatched to reference laboratories for further confirmation and identification when necessary.

Data collection sheet: A data collection sheet is attached as page 7 and 8.

References

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THRUST: SMALL RUMINANT MEAT AND MILK
ADMINISTRATION UNIT: ANIMAL REPRODUCTION AND HEALTH SECTION
PROJECT TITLE: IMPROVED HIGHLAND SHEEP PRODUCTIVITY: MONITORING OF ENDOPARASITE STATUS

DATA COLLECTION SHEET

1. Month

2. Date reported

3. Site:
   1) Deneba
   2) Degen
   3) D B
   4) Ambo/Shambu

4. Field-tag Number

5. Animal Number

6. Breed:
   1) Menz
   2) Highland
   3) Horro
   4) Black head Somalia
   5) Others

7. Sex
   1) Male
   2) Female
   3) Castrate

8. Age in months

9. Live weight in kg.

10. Body condition score
    1) 0
    2) 1
    3) 2
    4) 3
    5) 4
    6) 5

11. Heart girth in cms.

12. Pregnancy status
    1) Yes
    2) No

13. Date of lambing

14. Lambing status
    1) Single birth
    2) Twin birth
    3) Other multiple birth
    4) Abortion
    5) Still birth

15. Lambs survival
    1) survival upto 1 month
    2) survival upto 2 months
    3) survival upto 3 months
    4) survival upto 4 months
    5) survival upto 5 months
    6) survival upto 6 months
    7) survival after 6 months

16. Disposal of the experimental animal
    1) Still part of the experiment
    2) Slaughtered by the owner

3) Slaughtered for the research purpose
4) Sold by the owner
5) Dead
6) Others

17. Faecal egg count
a) Nematode, epg
b) Trematode, epg

18. Presence of distinguishable parasitic ova and larva in the faeces
1) Trichuris
2) Strongyloides
3) Nematodirus
4) Dictyocaulus
5) Moniezia
6) Dicrocoelium
7) Avitellina
8) Coccidium

19. Worm count

20. Worm identification
a) _____
b) _____
c) _____
d) _____
e) _____
f) _____
g) _____
h) _____
i) _____
j) _____
k) _____
l) _____
m) _____
n) _____
o) _____
p) _____
q) _____
r) _____
s) _____
t) _____

21. Faecal culture identification
a) _____
b) _____
c) _____
d) _____
e) _____
f) _____
g) _____
h) _____
i) _____
j) _____
k) _____
l) _____
m) _____
n) _____
o) _____
p) _____
q) _____
r) _____
s) _____
t) _____

22. Liver fluke count

23. Packed cell volume

24. Blood smear result
a) _____
b) _____
c) _____
d) _____
e) _____
f) _____
g) _____
h) _____
i) _____
j) _____

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SMALL RUMINANT NETWORK

(R.T.Wilson & D. Bourzat: ILCA, Ethiopia)

As explained in the preamble the Small Ruminant Network was formarly the Small Ruminant and Camel Group. Within the Thrust area it now has the responsibilities listed below.

Information exchange

A Network Newsletter is published every four months (February, June and October) in both English and French. The letter is sent to over 1000 addresses (of which about 30 per cent are francophone) in 48 African

countries and in more than 20 non-African ones. The major objectives of the Newsletter are to provide a link between scientists and other interested persons and to provide an outlet for exchange of views and publication of preliminary results.

Training

A 2-week course entitled "Small Ruminant Production Techniques" is held in alternate years in French and English. The second annual course (first in the English language) was held in May 1988.

Data Analysis

Assistance is given to National Agricultural Research Systems with analysis and publication of existing data sets. This can be looked upon as an interim measure to maintain the interest of some established or potential partners pending the establishment of full collaborative research. A Research Report has been published in collaboration with the Institut des Sciences Agronomiques du Rwanda, one is being finalised for review in collaboration with the Animal Production Institute/Mozambique, data is currently being analysed in collaboration with APRA/Sudan, and discussions with Projet Petits Ruminants/Togo are at an advanced stage.

NUTRITION SECTION

The nutritive value and use of feeds for fattening small ruminants in African highlands: A perspective of ILCA's research (Jess Reed, Cyprian Ebong, John Tanner, Getachew Gebru and Negussie Akalework).

Introduction

Meat from sheep and goats accounts for almost 30 per cent of the meat consumption in Africa. Major gains in small ruminant production could be achieved in highland Africa by overcoming constraints related to nutrition and disease management on smallholder farms.

In most highland regions, smallholder farmers fatten rams or castrates for sale at Christian and Muslim festivals. In addition to

grazing and crop residues, sheep are occasionally supplemented with grains and with by-products of local beer During the finishing period, animals are confined and fed a diet mainly of grain. In view of national food deficits, the use of grain for increasing livestock output should be avoided. Alternative, non-food nitrogen sources should be used for such purposes.

Figure 1 shows a classification of potential feed resources available on small farms in highland regions (McDowell, 1977). Vegetation available on non-arable land and crop residues from cereals and grain legumes are the most important. Feed grains are not produced on smallholder farms and livestock receive grain only under exceptional situations. Small holders seldom cultivate forages. Agro-industrial by-products are not available because distribution is inadequate and smallholders lack capital to purchase feeds.

Grazing on non-arable land is seasonal. Herbaceous legumes and other dicotyledons are important during the growing season but grasses usually dominate. In the dry season, only senescent grasses remain in the herb layer and in many areas they are completely grazed before the beginning of the next growing season.

Browse from woody legumes is an important component of dry season feed. Species such as Acacia albida and A. tortilis produce fruits in the middle of the dry season which are consumed by livestock as they fall or collected and brought to calves and small ruminants for feeding. The leaves of shrubs are browsed and branches from trees are lopped. Although many Acacia species tolerate lopping, this may lead to deforestation.

Communal ownership of grazing land limits the introduction of better management and improved species of forages, although it is incorecct to assume that smallholders do not attempt some management. A portion of the grazing land may be set aside for the dry season. Suitable species of forage legumes and muli-purpose trees could increase quantity and quality of forage produced in these areas.

At present cultivated forages are unimportant on smallholder farms. However, there is great potential for increasing soil fertility, subsequent crop yields and livestock productivity by introducing forage legumes into the cropping system (Haque and Jutzi, 1984; Tothill, 1986). The major

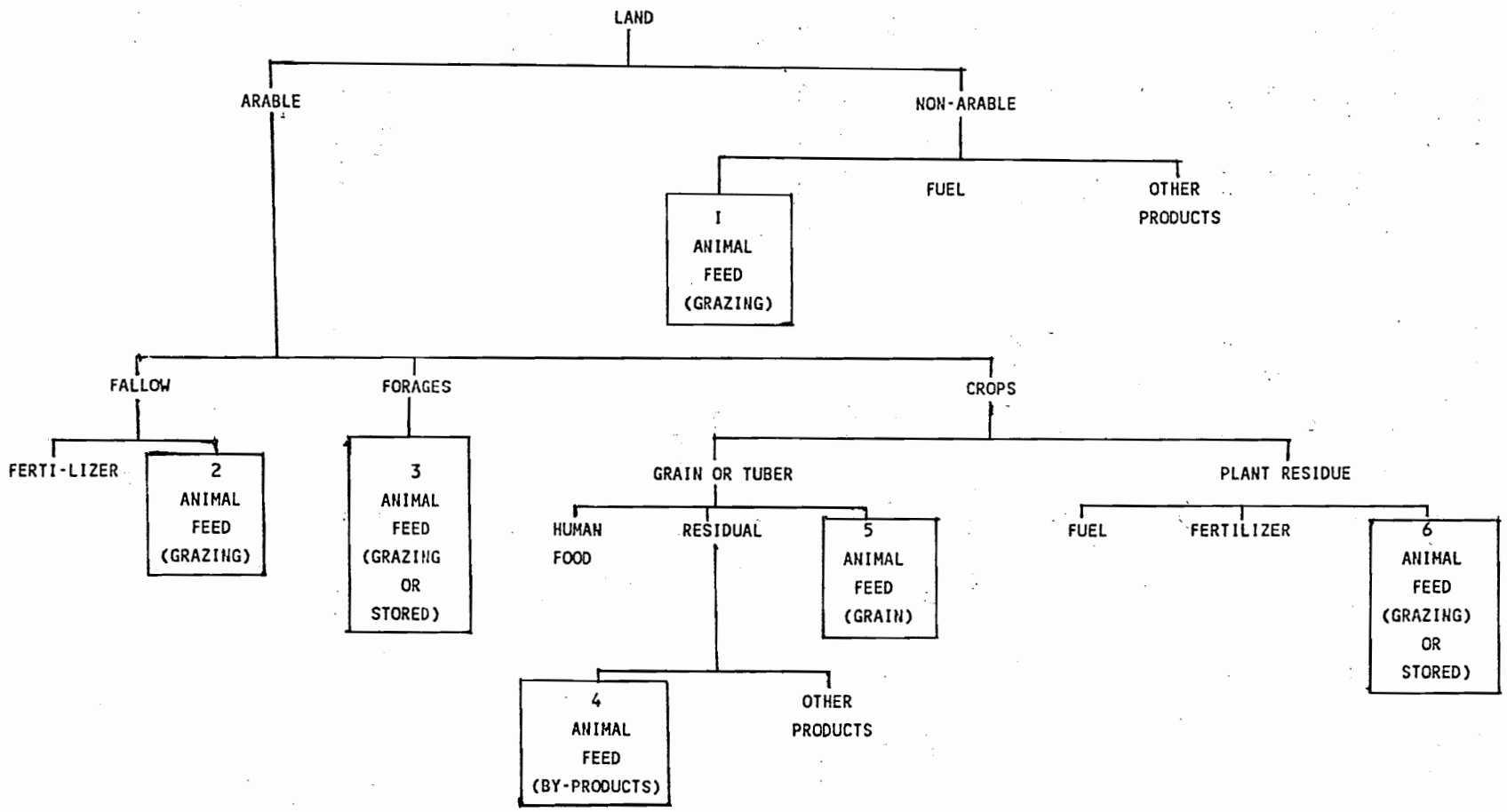

Figure 1 A classification of feed resources in relationship to land use in smallholder farming systems.

constraints to their introduction are: scarcity of land and competition with food crops; labour shortages; inadequate supply of seeds; and lack of adapted species.

Some of these constraints can be overcome by the introduction of multi-purpose fodder trees in alley cropping systems and near households in "browse gardens" (Sumberg, 1984). Leucaena leucocephala and Gliricidia sepium are successful species in humid and sub-humid zones and in arid zones under irrigation. Sesbania sesban has been successfully used at higher elevations in East Africa. Species for the more arid zones are lacking but native and introduced leguminosae, such as African and Australian acacias, are promising (Le Houerou, 1980).

Agro-industrial by-products are variable in their potential use as feeds. Oil seed cakes and cereal by-products are not available because they are exported or used in feed compounding enterprises which supply para-statal and commercial livestock industries. Village scale oil extraction and milling could improve the availability of these by-products to smallholders. Molasses is an important by-product in many African countries but may be too expensive for livestock because of its use in alcohol production. Molasses is underutilized in Ethiopia and the greatest potential is for feeding cattle in beef and dairy enterprises near sugar factories. Village manufacturing of urea/molasses blocks could be an effective means of introducing non-protein nitrogen and mineral supplementation.

Crop residues are important in smallholder farming systems. In Ethiopia, farmers efficiently utilize crop residues from teff, barley and wheat. These cereals are harvested by sickle at a height of less than 10 cm and the entire crop is threshed by trampling with oxen and donkeys. After threshing the straw is tightly stacked and protected from rain by covering with long straw or grass (Goe, 1987).

Maize and sorghum are also important food crops in the highlands. The residue from these cereals is usually grazed in the field with large losses of 40 to 50 per cent of the dry matter from trampling and spoilage (Chandler, 1983; Tessema, 1983). More efficient use of cereal crop residues could increase livestock productivity.

ILCA's Research Approach

Research on the development of sustainable feeding systems for increasing small ruminant production on smallholder farms consists of three levels of interrelated research activities:

- strategic research on evaluating the potential of existing and introduced feeds for use in small ruminant production;
- commodity research on the use of these feeds in production trials on-station; and
- on-farm development and testing of appropriate feeding systems for small ruminants.

Results from this research will lead to the development of appropriate feed packages for small ruminant production on small farms which can be recommended to extension agencies in NARS.

Strategic Research. Strategic research centres on crop residues, multi-purpose trees and agro-industrial by-products. It is estimated that at least 50 per cent of annual ME intake by ruminants in developing countries is derived from fibrous crop residues (McDowell, 1977). In highland Africa this is largely contributed by maize, sorghum, barley, and wheat. In Ethiopia teff is also important. Low digestibility and limited voluntary intake are the major constraints to extensive utilization of crop residues.

Tropical cereals, like other species of grasses with the C4 photosynthetic pathway, have rapid rates of cell elongation and accumulation of cell wall carbohydrates during vegetative growth (Volence et al, 1986). The digestibility of the cell wall carbohydrates as determined by their association with lignin and related phenolic compounds has a large influence on nutritive value.

In sorghum, high levels of phenolic pigmentation are associated with higher levels of lignin and lower digestibility of cell wall carbohydrates as measured by *in vitro* digestibility of NDF (Reed et al, 1987; Reed et al, 1988). Both variety and site have significant effects on lignin, pigmentation and digestibility of NDF. The effects of variety and site were greatest in the leaf sheath fraction from highly pigmented bird-

resistant varieties (Reed et al, 1988). Pigmentation may also affect intake of sorghum residue (Reed et al, 1988). A highly pigmented dwarf variety had very low intake compared to other varieties although it had the highest proportion of leaf and was the only variety with a significant amount of leaf fraction in the feed refusals.

Low molecular weight phenolic acids are also important in limiting the digestibility of cell wall carbohydrates (Akin, 1982; Akin and Rigsby, 1985). The major acids associated with the cell walls of grasses are ferulic and p-coumaric (Hartley and Jones, 1977). These compounds are estarified to xylans (Mueller-Harvey et al, 1986). The brown midrib mutants of maize and sorghum have higher digestibility of cell wall carbohydrates as compared to their normal counterparts and commercial varieties and a lower concentration of lignin and p-coumaric acid in the cell wall (Porter et al, 1978; Barnes et al, 1971; Muller et al, 1971; Akin et al, 1986; Cherney et al, 1986). There has been some interest in incorporating the brown midrib mutation into commercial varieties.

Residues from cowpea and maize are also important feed resources. Maize is the most important cereal in terms of production in Africa. Experiments at the ILCA Debre Zeit Experiment Station on the effects of intercropping maize with cowpea on soil fertility and crop responses indicate that this combination can be very successful. The residues could form the basis of improved feeding systems for sheep fattening. However, before these systems can be developed, more information is required on the effects of maturity of cowpeas on their ability to serve as a source of protein in diets based on maize. The best level of maize stover on offer in order to maximize response to supplementation with cowpea also needs to be determined.

The objectives of strategic research on the utilisation of crop residues for feeding small ruminants are:

- determine the relationship between level of feed offered and intake, growth and digestibility;
- determine the effect of pigmentation and bird resistance in sorghum on intake, growth and digestibility;
- determine the effects of phenolics on rumen function;

- determine the best combination of maize residues and supplements in sheep fattening systems.

Expected outputs from this research are:

- guidelines for improved utilisation of crop residues through methods that do not utilise chemical treatments;
- strategies for using crop residues in relation to on-farm feed budgets;
- influence of variety, environment and agronomic practices on nutritive value of crop residues.

Research activities consist of:

- growth and intake trials;
- digestion balance trials;
- metabolism trials with fistulated animals.

Improved animal agroforestry Multi-Purpose Trees (MPTs) could improve livestock production in developing countries through increasing forage production (Torres, 1983). However, quantitative information of livestock performance on diets containing forage from trees is lacking for the highland zones. In these zones, cereal residues are an important feed resource which is deficient in protein and moderate to low in content of digestible energy. Forage from trees could improve livestock performance when fed in combination with cereal residues. This research will determine the intake, growth and digestibility by small ruminants fed forage produced from African MPTs in combination with cereal crop residues.

There are large differences in the nutritive value of African fodder trees when fed in combination with straw (Reed and Soller, 1987). Much of the difference may be explained by the presence of high levels of polyphenolic compounds. However, sheep can adapt to consuming leaves from species such as A. seyal and grow at expected rates although these leaves contain high levels of phenolics. The selection of multi-purpose trees for

use in forage systems on smallholder farms must consider that: there are large differences in nutritive value among species; nutritive value is not easily predicted by content of nutrients (Wilson, 1977; Wilson and Harrington, 1980), or analysis of secondary plant compounds such as phenolics; and some species may be agronomically successful but unsuitable for feeding livestock.

The genus Sesbania is found throughout subsaharan African and other tropical regions. Of the 33 species known in Africa, 18 occur in East Africa and others are spread over the continent. Many Sesbania spp. tolerate a wide range of rainfall, altitude, temperature and soil conditions and the genus ranges from the semi-arid (400 mm annual rainfall) to the humid zones (2 000 mm) and from below 500 m to 2 500 m at temperatures from 17°C to greater than 26°C.

The feeding value of leaves from a local accession of Sesbania sesban was high due to high concentration of crude protein (25-30 per cent DM) and low content of tannin and other polyphenolics. However, preliminary investigations of a wide range of accessions indicates that there is large variation in the content of tannins and related polyphenols.

The occurence of secondary plant compounds in Sesbania spp. needs to be determined in relation to environmental conditions. The variation in nutritive value and content of polyphenolics among species (accessions) and individual trees within species and variety needs to be investigated.

Farmers in Africa are aware of the value of Acacia fruits for feeding their livestock. Acacia fruits contain high levels of crude protein and moderate levels of digestible energy. However, little research has been conducted on the utilization of these fruits in diets for ruminants. The nutritive value of the fruit from four species (A. albida, A. nilotica, A. sieberiana, and A. tortilis) has been determined when used as supplements to maize stover. These fruits were compared to noug cake, an oil seed cake widely used as a protein supplement in Ethiopia. There were large differences in the growth rate of sheep fed fruits from different acacias. These differences are related to their content of polyphenolics which alter the digestibility of N and carbohydrates. Levels of polyphenols were highest in A. sieberiana and A. nilotica. Although fruits from A. tortilis gave the best response, data from the appearance of whole seeds in the

faeces indicated that these fruits would be better utilised if treated to destroy the seed coat and alow better digestion.

Polyphenolic compounds in browse affect intake, digestibility and animal performance by reducing degradation of fibre and protein by rumen microorganisms when fed in combination with cereal crop residues. Acacia seyal, A. nilotica and Sesbania sesban have been identified as successful multi-purpose trees for the highland areas with potential for use in agroforestry systems for forage production. The effects of polyphenolics in these MPTs on growth and N utilization when used as supplements to teff straw in diets for sheep and goats needs to be determined.

Leaves from A. seyal and A. nilotica had twice the content of soluble polyphenolic compounds as compared to leaves from S. sesban. A. seyal had the highest content of insoluble proanthocyanidins. Sheep had a higher growth rate than goats when fed these MPTs in combination with teff straw and this difference was related to the much lower intake of straw by goats. There were no significant differences between browse supplements in growth rates of sheep or goats. However the effect of the polyphenolics in A. seyal are apparent in the results of the nitrogen balance study. Apparent and true nitrogen digestibility were significantly lower in the diets containing A. seyal which was a result of a higher faecal excretion of nitrogen. Both the neutral-detergent soluble and neutral detergent insoluble nitrogen were higher in sheep and goats fed A. seyal. There were no significant differences between MPTs in nitrogen balance because the nitrogen loss in the urine of animals fed A. seyal was lower than for animals fed S. sesban and A. nilotica.

These results suggest that polyphenolics in A. seyal are affecting protein utilization by decreasing urinary nitrogen loss and increasing faecal nitrogen loss. The higher excretion of detergent insoluble nitrogen in the faeces indicates that the proanthocyanidins in A. seyal are forming indigestible complexes with protein. However the higher excretion of detergent soluble nitrogen in the faeces indicates that the polyphenols are also increasing the excretion of microbial nitrogen which may have its origin from endogenous sources.

The objectives of strategic research on multi-purpose trees are:

- investigate the effect of tannins and related compounds on the nutritive value of MPTs;
- identify promising species with a high fodder potential;
- determine the variation in nutritive value and content of polyphenolics in the genus Sesbania as influenced by accession, environment and individual tree within an accession; and
- determine optimal levels for combining cereal crop residues and MPTs in diets for small ruminants.

Expected outputs from this research are:

- methodology for sampling and analysing (statistical, biological and chemical) browse species;
- determination of promising Sesbania and other MPT species with high nutritive value.

Research activities consist of:

- laboratory determination of nutritive value;
- analysis of tannins, related polyphenols and other secondary plant compounds;
- feeding trials with diets that combine MPTs with cereal crop residues;
- metabolism trials to determine the effects of MPT supplements on protein and energy utilisation.

The most important agro-industrial by-products for feeding small ruminants in Africa are oil seed cakes and by-products of the cereal milling industries. Other by-products, such as brewery wastes, coffee pulp and hulls from decortication plants require greater research before they can be incorporated into diets for ruminants.

Cotton seed cake is the most important oil seed cake for ruminant feeding in Africa. In many countries the cake is not decorticated before

the oil is extracted (both lint and hulls remain in the by-product). Undecorticated cottonseed cake has a very high content of fibre (60 per cent or more) which is also highly lignified and of low digestibility. The content of crude protein (20 to 25 per cent) is low for an oil seed cake.

Oil extraction of decorticated cotton seed is more efficient and more modern plants usually decorticate before extraction. However, some of the lint and hulls commonly are added back to the cake to facilitate handling. Decorticated cotton seed cake has higher nutritive value for ruminants due to a lower content of fibre and higher content of crude protein.

Older oil extraction plants remove the oil by expelling in presses. This process yields a by-product with a variable amount of residual oil (usually between 6 to 10 per cent). Solvent extraction in more modern plants lowers the residual oil content to below 4 per cent. The residual amount of oil in cotton seed cake could have a substantial effect on nutritive value.

Bird damage is a major constraint to sorghum production in Africa and crop breeders are selecting for bird resistance which depends on the presence of tannins in the grain. The tannin is located in the pericarp which should be removed to improve food value for human consumption. Appropriate equipment for dehulling sorghum in the village is being developed and bran from bird resistant varieties will become available for use as feed on smallholder farms. The value of bran as a by-product is important to the economics of the commercial milling of sorghum.

Bran from a bird resistant variety (MW5020) and a non-bird-resistant variety (Melkamash) were compared as supplements in hay diets for sheep and goats. Sheep had a greater rate of gain than goats and the difference between varieties at the low level of supplementation (150 g/day) was not significant. However, rate of gain was over 20 g/day greater for animals receiving Melkamash at the high level of supplementation (300 g/day). The high level of supplementation with MW5020 gave similar rates of gain to supplementation with both varieties at the low level. Sheep fed the high level of MW5020 also had low intake of hay.

Apparent nitrogen digestibility and true nitrogen digestibility and nitrogen retention were lower in sheep fed bran from MW5020. The

digestibility of acid-detergent fibre, lignin and fibre bound nitrogen was also lower in sheep fed bran from MW5020. These results indicate that tannin in bran from MW5020 forms complexes with protein in the digestive tract and inhibits the digestion of both protein and cell wall carbohydrates. The negative effects of tannin on fibre digestion may also explain the low intake of hay by sheep fed the high level of bran from MW5020.

The bran from non-bird-resistant varieties appears to have no inhibitory effects and should have an economic value equivalent to brans from other cereals. Bran from bird resistant varieties may have an adverse effect on animal performance at high levels of supplementation but at low to moderate levels may be useful for feeding ruminants. More research is required to determine the level at which bran from bird-resistant varieties can be included in diets for sheep.

The effect of level of supplementation with dry processed coffee pulp (0, 60, 120 and 150 grams per day) on intake, digestibility and N retention in sheep fed hay was determined in a collaborative project with Alemaya University. There was no effect of level of supplementation on intake and digestibility of dry matter, organic matter and NDF. However, N balance was significantly depressed at the 120 and 150 gram levels. Both urinary and faecal N loss were increased at these levels. Total urine excretion was also higher at the 120 and 150 gram levels. Faecal N loss may have increased because coffee pulp contains condensed tannins which form indigestible protein complexes. Urine excretion and N loss may have increased due to effects of caffeine on renal function. The nutritive value and usefulness of coffee pulp as a feed resource is limited by the presence of the secondary plant compounds, condensed tannins and caffeine.

The objectives of strategic research on agro-industrial by-products are:

- to determine the effects of decortication and solvent extraction of oil seed cake on intake and growth in sheep;
- to determine the effects of bran from bird-resistant sorghum grain on intake, digestibility, growth and protein utilization; and

- determine factors that limit the nutritive value of agro-industrial by-products that are not normally incorporated in rations for ruminants (i.e. coffee pulp, groundnut hulls, citrus pulp, etc.).

Expected outputs from this research are:

- recommendations on the use of oil seed cakes for supplementing crop residue based diets;
- recommendations on the level of inclusion of bran from bird resistant sorghums; and
- recommendations on the nutritive value of unconventional by-products;

Research activities consist of:

- laboratory determination of nutritive value;
- analysis of taninns, related polyphenols and other secondary plant compounds in agro-industrial by-products;
- feeding trials with diets that combine agro-industrial by-products with crop residues; and
- metabolism trials to determine the effects of agro-industrial by-products on protein and energy utilisation.

Commodity Research On-Station. Apropriate management strategies for fattening small ruminants in smallholder crop/livestock farming systems need to be developed. Information on the most economical combination of diet, age and feeding duration need to be determined. These factors are closely related and the best combinations will also depend on the control of internal and external parasites and other diseases on-farm.

The feeds described in the preceeding section need to be combined into productive rations. The evaluation of these rations can best be conducted in on-station research under feedlot management. This management system allows the measurement of individual growth rate and group intake. Age and ration can be replicated across pens while duration of fattening

can be replicated individual animals. Parameters of economic returns and consumer acceptability can be made on large numbers of animals.

The objectives of the on-station commodity research are:

- to determine the best combination of age, diet and duration of feeding in small ruminant fattening systems for smallholders; and
- develop appropriate rations for testing in on-farm research.

Expected outputs from this research will be the development of small ruminant fattening systems using feed resources that are available to smallholders.

On-Farm Research. On farm research will consist of surveys of feed resources available and their nutritive value, introduction of legume forages and multipurpose trees for feeding small ruminants, and on farm verification of successful results from the on station research.

Collaborating farmers are selected to represent the different major agro-ecological zones of the African highlands. Initial measurements of small ruminant productivity and management practices are made. Other aspects of the farming system are studied by a multi-disciplinary team.

Available feed resources are quantified by:

- estimating the amount of straw and hay available at the selected farms (measure volume of straw and hay stacks, determine density of roughage, calculate mass);
- determine the amount of oil seed cake and other by-products available for purchase;
- determine the yield of forage crops and multipurpose trees on farms in collaboration with forage agronomists;
- study differences among farmers in management of hay fields and pastures; and
- determine constraints to optimal management of grazing lands.

The nutritive values of available feed resources are determined by:

- collecting samples of feed from the farms;
- determining digestibility by in vitro and nylon bag techniques;
- nitrogen (crude protein) is determined by Kjeldahl technique;
- neutral-detergent fibre, acid-detergent fibre, lignin and silica are determined by the methods of Goering and Van Soest (1970); and
- Na, K, Ca, P, Cu and Zn are determined by atomic absorption spectrophotometry.

Forage production systems for small ruminants are introduced through collaboration with other ILCA programmes and NARS. Practical feeding systems for fattening small ruminants on farm will be introduced by:

- supplementation of barley and teff straw and meadow hay with vetch/oat hay and noug cake on-farm;
- measuring the effects on growth rate and mortality;
- determining the interaction between control of internal and external parasites and nutrition in small ruminant fattening.

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AN OVERVIEW OF THE SHEEP RESEARCH ACTIVITIES IN THE HIGHLANDS

(Negussie Akalework and Ephraim Kabaija: Debre Berhan station)

I. Monitoring work
II. Performance of highland sheep
III. Mineral supplementation

I. MONITORING WORK

The lack of sufficient information on the traditional sheep production system is a major constraints for research and development works aimed at improving the output of the sheep industry in the Ethiopian Highlands. Estimations and/or assumptions of biological or socio-economic data from researchers and individuals involved in development were the major sources for the existing state of knowledge. To provide a background for future interventions, in depth monitoring of a sample population on a period covering a full agroclimatological cycle and the biological cycle of the existing highland sheep breeds is imperative. The aims of this diagnostic study are to:

- evaluate traditional management practices;
- evaluate productive and reproductive performances; and
- collect and analyse socio-economic data to evaluate the importance of sheep in the mixed agricultural production system of the highlands.

Activities

These will comprise:

- a survey of management practices;
- productive and reproductive performance analysis; and
- collection and analysis of socio-economic data

This research is a sub-project of the Vertisol management project. The introduction of a new technology has increased not only the grain yield on dark clay soils but also the crop residue yield. It is with a view to matching livestock production to available resources that this research has been incorporated in the research to improve the management of dark clay soils.

II. PERFORMANCE OF THREE ETHIOPIAN HIGHLAND SHEEP BREEDS MAINTAINED ON LOW AND HIGH PLANES OF NUTRITION

The various breeds and types of sheep indigenous to Ethiopia have a low productivity which may be improved through better management and nutrition. To be able to recommend a change in management procedure, information is necessary on the potential of the various breeds, under varying conditions and systems of production. A study is being conducted to assess the response in terms of growth and carcass characteristics by three indigenous sheep breeds when maintained on low and high planes of nutrition. The three breeds taken from the Wello, Arsi and Shewa regions of Ethiopia have been subjected to restricted (100 g day of supplementary concentrate) and unrestricted (concentrate ad lib) feeding regimes (low and high planes respectively) for about 9 months. Average daily weight gain has been high (100-120 g) in animals on the high plane of nutrition and low (28-40 g) in animals on the low plane. Animals on the high plane of nutrition have a higher dressing percentage (45-52) than those on the low plane (30-35). The study continues.

III. MINERAL SUPPLEMENTATION

Past studies in Ethiopia have indicated deficiencies of Na, P, Mn, Zn and Cu in various areas. Information is however scant on the status of Se and Co in ruminants, although cases of white muscle disease have been

diagnosed in highland sheep. The impact of various trace elements on productivity of sheep in Ethiopia has never been assessed, neither has the economic importance of an element such as phosphorus which is deficient in feeds. A 12-month study involving
female sheep of the Ethiopian highland Menz type has thus been undertaken in which intra-ruminal preparations of Se, Co and Cu and P in the form of bone meal are being administered. Growth and reproductive performance of the female lambs is being monitored. Data obtained will give an indication of the beneficial effects of supplementary micronutrients and P to sheep. The results will also indicate the suitability of intra-ruminal micro-element preparations as supplements to livestock in African animal production systems.

TRAINING COURSE - SMALL RUMINANT PRODUCTION TECHNIQUES

Our first English language training course was held in Addis Ababa from 2 May to 13 May 1987. Altogether 20 participants from 12 African countries and one participant (providing his own funding!) from Yemen attended. The course comprised 26 formal training sessions of 1 1/2 to 2 hours each and two days of field visits.

In general the course appears to have been successful and largely satisfied the aspirations of the participants. Some sessions were less successful than others, either because they were too restricted geographically or covered a very narrow field. An additional criticism was that some lectures lacked adequate visual aids materials and those formal lectures which could have been linked to the field visits (e.g. carcass evaluation) were not done so adequately. We are happy to accept these suggestions and will ensure, in future courses (in both English and French), that improvements are made.

We were very impressed by the spirit of the group of participants both during the training sessions and particularly on the social side. The presence of four lady participants (a very large proportion for an ILCA

course and an indication perhaps of the importance of goats and sheep to the African family) also added to the interest of the course. We scored another first by having a participant from the Yemen and we are delighted that he look the trouble to write to us with his impressions. These are printed below.

Letter from the Yemen

I had the privilege to attend the Small Ruminant Production Techniques short course from 2 to 13 May 1988 at ILCA Headquarters in Addis Ababa. I am most grateful to ILCA for accepting me on this course, the first participant from Asia to attend such a course at ILCA. The course was most informative and exciting. In addition to the wealth of information about Small Ruminant Production Techniques the course covered during its relatively short period, I also had the chance to learn about the strategy and priorities of ILCA regarding Small Ruminant production in Sub-Saharan countries, and get to know many ILCA scientists who are involved in different disciplines of Small Ruminant production. I had the chance to see and use several facilities at ILCA, especially the excellent library and documentation centre. But the most exciting and informative part is that I spent more than two weeks with a fine group of participants from twelve African countries and I was able to learn about their experiences as well.

Although, I feel that the course was very useful for me, I would like the following suggestions to be considered to make the course even more useful. The first suggestion is to plan a more focused disciplinary approach to deal in more depth with important subjects such as feeds and feeding and breeding and reproduction, possibly even arranging separate courses for these. This is because I felt that the course tried to cover too much material in too short a period to be able to achieve sufficient depth in some of the most important subjects. The second suggestion deals with increasing the participant involvement in discussions and exchange of ideas. This I think can be achieved in two ways: the first one is to ask each participant in advance (that is before he or she comes to ILCA) to prepare a short presentation about Small Ruminants in his or her country [noted and agreed - Editor]; the second way is by giving each participant

the printed material of each lecture a day or two beforehand so he/she could read it and prepare his/her notes or questions to bring to the lecture [as the course develops we will be able to do this - Editor].

Finally, I would like to extend my thanks to ILCA training staff for their assistance to the Small Ruminant Network with organising this course and to my friends the participants who made it all so good.

Abdul-Rahman Al-Iryani
Research Scientist
Agricultural Research Authority
Y.A.R.

INCIDENCE OF MALFORMATIONS AND PATHOLOGICAL CONDITIONS IN THE FEMALE GENITALIA OF THE YANKASA SHEEP IN NIGERIA

(N. Pathiraja and E.O. Oyedipe, Department of Animal Reproduction and Artificial Insemination, National Animal Production Research Institute, P.M.B. 1096, Shika-Zaria, Nigeria. (*Present Address: University of Zimbabwe, Department of Animal Science, P.O.Box MP 167, Mount Pleasant, Harare, Zimbabwe)).*

Introduction

Hair sheep are a well-adapted genetic resource contributing to the nutrition and income of producers in the tropics (Fitzhugh & Bradford, 1983). In Nigeria, 95 per cent of hair sheep are farmed on range land (Nuru, 1984) and they account for about 10 per cent of the total meat supply (Adu & Ngere, 1979). However, under range conditions the data on the factors affecting their reproductive performance are scanty.

This paper reports on the incidence of malformations and pathological conditions that could affect the reproductive performance of Yankasa sheep.

Materials and methods

For a period of one year, 453 complete female genital tracts of Yankasa sheep were collected from two abattoirs in Zaria, and examined for malformations and pathological conditions as described by Emady, Noakes & Arthur (1975), within two hours of slaughter.

Results

Of the 453 genital tracts collected 54 (11.9 per cent) were found to have either malformations or pathological conditions (Table 1).

Table 1 The incidence of malformations and pathological conditions in female genitalia of Yankasa sheep

Condition	Number observed	Incidence %
Paraovarian cyst	7	1.54
Ovarian hypoplasia	1	0.22
Hermaphroditism	1	0.22
Segmental aplasia (oviduct)	1	0.22
Abnormal cervix	2	0.44
Cystic ovaries	3	0.66
Hydrosalpinx	1	0.22
Clinical endometritis	2	0.44
Pyometra	3	0.66
Mucometra or Hydrops uteri	1	0.22
Adhesions	4	0.88
Foetal deaths (28 deaths out of 206 foetuses)	28	6.18
Total	54	12.10

Discussion

The incidence of malformations observed in the female genitalia of Yankasa sheep is quite low and agrees with the findings in wool sheep breeds (Emady et al, 1975). However, the incidence of foetal deaths observed in this study is higher than would be expected under normal conditions (Hanly, 1966). Most foetal deaths occurred in the dry season suggesting a possible seasonal effect. More work is needed to elucidate the reasons for the high incidence of foetal deaths in Yankasa ewes.

Acknowledgements

The authors wish to thank Mr A. Obasi and Dr T.K. Adenowo for assistance in specimen collection.

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Faye-Grandjean, Isabelle 1987. Parasitoses gastro-intestinales du mouton et de la chevre en Republique Islamique de Mauritanie. (Thesis for Doctor in Veterinary Medicine at the University of Berne, Switzerland).

This thesis relates to a study of parasites of the digestive system of Mauritanian goats and sheep. The study period was 21 months,

effectively covering one and a half parasite cycles. A total of 850 sheep and 665 goats was examined, coming from the whole country but predominantly from the south where there are more animals and where the climate is more favourable to parasite development. Two complementary analytical methods were undertaken: faecal egg output and collection of mature worms from the viscera.

The proportion of infested animals was much more than expected and approached 100 per cent. Twelve species of Coccidia were identified, 12 genera of roundworms (of which Oesophagostomum, Haemonchus and Trichostrongylus were the most important) and three species of flatworms. The most pathogenie species were the commonest and present in up to 90 per cent of animals.

Infestation was heaviest in the rainy season. A control strategy of one prophylactic treatment at the end of the dry season possibly followed by one at the end of the rains for young, pregnant and old females is advocated [from the author's summary].

Djibrillou Oumara, Aboubacar 1986 Croissance et viabilite de la chevre rousse de Maradi au Centre d'Elevage caprin de Maradi (Niger). (Thesis for Doctor in Veterinary Medicine at the University of Dakar, Senegal).

The goat research centre at Maradi was established in 1964 in order to produce improved bucks for distribution to the local small scale producer. Over a period of time this objective has been partially fulfilled but in recent years, in the official view, the station has been in decline. This thesis appears to be the first serious attempt to carry out a complete analysis of some aspects of the productivity of the Maradi goat at the station.

The thesis is presented in four parts comprising: an introductory section on Niger, the Maradi region and goats in the Republic; a review of relevant literature; materials and methods; and results, discussion and recommendations.

Analyses were carried out mainly by least-squares. Birth weight was 2.05 ± 0.10 kg and this was affected by the sex of the kid and by the dam's age but not by month, year or type (single or twin) of birth. Weight at 30

days (3.94 ± 0.17 kg) was affected by the same variables but at 90 days (9.05 ± 0.37 kg) month and year of birth also influenced the weight. Daily gains from 0-30 days (61.1 ±5.34 g) were influenced only by sex and from 30-90 days (55.2 ± 4.07 g) only by month and year of birth.

Mortality to 5 days (3.3 ± 0.01 per cent) was influenced by the month of birth, from 5 days to weaning at 90 days (26.2 ± 0.02 per cent) by month and type of birth, by the sex of the kid and by the age of the doe, and from 90-180 days (12.7 ± 0.01 per cent) again only by month of birth.

Recommendations are made which include manipulating the age of the breeding flock and controlling reproduction so that kids are born in November.

Smith, O.B. & Bosman, H.G. (1988) Goat production in the humid tropics. Proceedings of a workshop at the University of Ife, Ile-Ife, Nigeria, 20-24 July 1987. Centre for Agricultural Publishing and Documentation, Wageningen.

As the title states this book comprises the Prodeedings of a Workshop which related mainly to the West African Dwarf Goat. An account of the Workshop has already appeared in this Newsletter. The 23 chapters cover all of the papers presented. Although the Workshop was reportedly bilingual only four of the papers are in French (the remainder being in English) and 13 to 16 papers - depending on how you calculate it - were from Nigeria. It is doubtful if this distribution represents the anglophone/francophone and Nigerian/non Nigerian concentration of research effort on goats in the humid tropics. One of the English language non-Nigerian papers was from Indonesia and three (or two) were presented by adademics from British universities. Three of the French language papers were from Togo - less than 200 km from Ife as the crow flies - and one from Benin, which is even closer. The Small Ruminant and Camel Group was involved in the organization of this meeting and did, in fact, send out three prepaid tickets but only one of these was actually used. This reviewer knows the efforts that the staff of the "Management of the West African Dwarf goat in the Humid Tropics" project expended in trying to get

people to life from other countries and it is most unfortunate that they were not more successful.

It is particularly unfortunate because, if one assumes that the papers as presented in the book reflect what happened at the Conference, then it was a very useful meeting. There are seven chapters on management in its widest sense, six on production, seven on nutrition and, surprisingly, only two on health. The twenty-third paper is concerned with the relevance of research and concludes that "the cessation of much small ruminant research would be sound economy particularly if the savings so made could be re-directed towards extension and inter farmer communication so as to identify, and if appropriate, to overcome the real constraints". Would someone like to write a contradiction for a future Newsletter?

The book is produced by direct photolitho from a word-processed text and is easy to read. It is bound in hard covers and the organisers are, above all, to be congratulated on the rapidity with which they have brought it to publication - less than six months is indeed commendable. There are far to many conference proceedings which are irelevant (even if the research they report might once have been!) when they finally appear in print 4, 6 or even more years after the event.

REPRODUCTIVE PARAMETERS OF DJALLONKE SHEEP AT KOLOKOPE, TOGO

(Y.N. Hadzi, Chef du Centre d'Appui de Kolokope, Projet Petits Ruminants, B.P. 65, Atakpame, Togo)

Djallonke sheep were bought in local markets during 1981 to form the foundation stock of the station. The objective of the station is to improve the productivity of Djallonke sheep by selection within the type and to make breeding females and males available to local farmers.

Three reproductive systems were adopted between 1982 and 1986, these being: (i) rams in the flock all year round; (ii) rams in the flock for 45 days every 8 months; (iii) rams in the flock for 45 days every 6 months. Since 1986 only system (ii) has been practised. Detailed analyses relating to differences between the different reproductive groups will be carried

out shortly (as will analyses of weight, mortality and total productivity) in collaboration with the ILCA Small Ruminant Network.

The annual fertility rate (= number of females giving birth divided by number of females in the flock) varied from 136 per cent to 178 per cent for the years 1982/1983 to 1985/1986. Litter size was fairly constant at about 1.15 young per birth but appeard to be slightly higher at 1.17 in 1984/1985. Fecundity (= number of lambs born in the year divided by number of ewes joined) varied from 157 per cent to 203 per cent. The abortion rate (= ewes aborting divided by ewes pregnant) was between 1.5 per cent (1983/1984) and 4.1 per cent (1982/1983, the first year of full operations when all ewes were foundation stock). Pre-weaning mortality (to 120 days) was between 7.5 per cent and 17.0 per cent over the 4-year period for which results are so far available.

A NOTE ON THE EFFECTS OF CONCENTRATE SUPPLEMENTATION ON WATER INTAKE OF MALAWI LOCAL GOATS

(J. A. Ayoade and P.A.J. Tambala Department of Animal Science, University of Malawi, P.O.Box 219, Lilongwe, Malawi. *Present address: University of Agriculture, Department of Animal Production, PMB 2373, Makurdi, Benue State, Nigeria)*

Factors that influence the intake of drinking water by goats include the amount of dry matter eaten, the nature of the feed, individual variation, physiological condition, temperature of the drinking water, ambient temperature and frequency of drinking (Devendra & Burns, 1970; Morand-Fehr, 1981). There is little information on the water intake of Malawi local goats (Ayoade, 1982). This paper reports on the effects of concentrate supplementation on water intake of Malawi local goats fed chopped groundnut haulms.

Three male goats weighing about 15 kg were used in five digestibility trials. The animals were fed chopped groundnut haulms (crude protein 10.6 per cent) ad libitum as a basal ration supplemented with a concentrate mixture (groundnut meal 10.0 per cent, poultry manure 5 per cent, maize bran 83.0 per cent, salt 2.0 per cent; crude protein 19 per cent) at 0, 1,

2, 3 and 4 per cent, body weight. Consumption of the concentrate began at about 08:00 hr daily and that of the haulms 3 hours later. Clean water was made available each day and intakes of free water and feed water including losses of water in faeces and urine were recorded for each animal during the last 5 days of each 14-day digestibility trial.

The results of the water balance trial are presented in Table 1.

Increasing the amount of concentrate mixture offered significantly ($P < 0.001$) increased free water intake, total water intake and water balance of the animals; faecal output and urine output were not significantly affected. The ratio of water intake to dry matter intake ranged from 1.8 - 2.3 for free water and 1.9 - 2.4 for total water. These figures are comparable to those reported for other tropical breeds (Devendra & Burns, 1970; Aganga et al, 1986). Part of the increased water intake with

Table 1 Water balance in Malawi local goat feed chopped groudnut haulms

Variable	Concentrate Supplement (per cent of body weight)					
	0	1	2	3	4	Significance
Dry matter intake (kg/day)	0.30a	0.47ab	0.53bc	0.59c	0.61c	*
Free water intake (kg/day)	0.62a	0.83ab	1.12bc	1.30c	1.38c	**
Free water intake (% BW)	4.50a	6.27b	7.80bc	8.87c	7.63b	***
Total water intake (kg/day)	0.65a	0.87ab	1.16bc	1.33c	1.41c	**
Total water intake (% BW)	4.60a	6.57b	8.03bc	9.07c	7.83b	***
Free water intake (kg/kg DMI)	2.08a	1.79b	2.13a	2.33a	2.27a	*
Total water intake (kg/kg DMI)	2.17a	1.85b	2.22a	2.38	2.33	NS
Faecal water excretion (kg/day)	0.13	0.15	0.16	0.17	0.22	NS
Water balance (kg/day)	0.41a	0.58b	0.81c	1.05c	0.96c	**

Total water = Feed water + free water BW = Body weight

Water balance = (Feed water + free water) - (urine + faecal water)

Figures followed by different letters in the same row differ significantly ($P < 0.05$)

increased concentrate supplementation may be due to increased ($P < 0.01$) crude protein intake (from 32.1 to 104.4 g/head/day) with increased concentrate supplementation.

The financial support of University of Malawi through the Research and Publications Committee is gratefully acknowledged.

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NOTE

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THE SMALL RUMINANT RESEARCH NETWORK

NEWSLETTER

International Livestock Centre for Africa,
P.O. Box 5689, Addis Ababa, Ethiopia. Telephone: 18 32 15

No.13 October 1988

CONFERENCE AND RESEARCH NETWORK PLANNING MEETING

Plans for the Conference and Planning Meeting to be held in Bamenda, Cameroon, from 18-26 January 1988 are now well advanced. The Conference is jointly hosted and sponsored by ILCA, the International Foundation for Science (IFS) and the Institute of Animal Production of Cameroon. There will be a total of about 60 participants and observers. Some papers for presentation have already arrived at the Small Ruminant Research Network secretariat. Accepted papers will be published in a Proceedings for which editing work is already in progress. Subject to adequate cooperation among authors, reviewers and editors, it is hoped that the Proceedings will be available for distribution within two months of the Conference itself (end of March or early April 1989).

A CONDITION SCORING SCHEME FOR SMALL EAST AFRICAN GOATS IN ZIMBABWE

(Honhold N., Petit H. & Halliwell R.W., Department of Clinical Veterinary Studies, University of Zimbabwe, P.O.Box MP 167, Mount Pleasant, Harare, Zimbabwe. (*French Embassy Goat Project, Embassy of France, Box 1374, Harare)).*

Summary

A body condition scoring scheme for Small East African goats in Zimbabwe is described. This measure is less affected by confounding variables than is weight as an estimate of an animal's condition and

nutritional state and requires no special equipment. Condition score is correlated with a parametric measure of condition ($r = 0.5$, $P < 0.01$) in adult females and changes in condition score are significantly correlated to percentage changes in body weight ($r = 0.5$, $P < 0.01$) for all ages. A score change of 1 represents a 12 per cent change in body weight.

Introduction

Increasing the productivity of goats in Zimbabwe will require the development of simple management tools, including methods of assessing their well-being. One such method is to assess body condition. This is often done indirectly by recording weight but this is a less than satisfactory procedure. Working with the same group of identified animals on different occasions, factors such as growth, gut fill, pregnancy, parturition, lactation, time since last suckling, dry matter content of food and possibly hydration will all affect weight. For different groups of animals, body conformation and sex also have a strong influence on weight. Other workers have described techniques requiring less sophisticated equipment using body measurements in goats (Githae et al, 1975) but these still use some equipment, require quite complex computation to yield a result and give a measure of weight rather than condition.

As part of a long term productivity study a more easily applied system of scoring directed specifically to assessing body condition has been developed. This is an established technique for other domestic animals. The UK has such a system for both cattle (Lowman et al, 1976) and sheep (Hughes, 1981). Under Zimbabwean conditions, the UK cattle scheme works well (M. Honhold, pers.comm.) and there is also a specific system for *Bos indicus* cattle (Nicholson and Butterworth, 1986).

Methods

Both sheep and cattle deposit subcutaneous fat as their condition improves and it is this as much as muscle mass that is used to assess condition. Goats store fat in the abdomen and any simple scheme must take this into consideration. The present scheme is based on palpation of the same body region as for cattle and sheep but using differing degrees of muscle cover. The data presented are from Small East African goats on a

commercial farm, 39 km south of Harare, and from 3 flocks in Seke Communal Area, 45 km south of Harare, all of the Small East African type.

Features used in assessing the condition score

Condition score is estimated by feeling the backbone in the area between the back of the ribs and the front of the pelvic bones (Figure 1). This scheme emphasises the coverage of anatomical landmarks rather than the amount of muscle present. The points to note are:

the prominence of the intervertebral articulations in thinner goats, which can be felt as hard round protruberances at the angle between the vertical and horizontal processes;

the amount of muscle cover on the vertebrae, in particular how far up the vertical and along the horizontal processes the muscle extends;

the prominence of the ends of the horizontal processes and the shape of the space between them;

the shape of the muscle on the backbone (concave or convex).

These are combined to produce a set of scores ranging from 1 to 4 in the manner described below and illustrated in Figure 2.

The condition scores

Score 1. The intervertebral articulations are prominent, having only a thin covering of muscle, which extends for very little distance along the horizontal or up the vertical process.

Score 1½. The articulations can still be felt but the muscle mass extends about halfway along and halfway up the two processes. The ends of the horizontal processes are sharp and there is an obvious space between them.

Score 2. The articulations can be felt but not easily. The muscle mass extends two thirds of the way along the horizontal and up the vertical process. The muscle surface is noticeably dished.

Score 2½. The muscle mass extends to the end of the horizontal process but not to the top of the vertical. The surface of the muscle mass is straight or slightly concave. The ends of the horizontal processes can still be felt clearly with noticeable dishing between them.

Score 3. The muscle mass is rounded but the tip of the vertical process can still be felt. The articulations cannot be felt and the tips of the horizontal processes are rounded with little or no dishing between them.

Score 3½. The muscle mass reaches the tip of the vertical process although this can still be felt. The end of the horizontal process is well covered and difficult to feel. The edges cannot be easily felt and the muscle extends somewhat beyond them with a straight edge.

Score 4. Both the vertical and horizontal processes are completely covered and cannot be felt. There is some subcutaneous fat.

Practical Results

Analysis of results was by correlation where data justified the use of parametric methods and by Spearman's rank co-efficient (r) where some of the data were percentages.

Two studies were undertaken to determine if this scheme gives a valid measure of body condition for the Small East African goat in Zimbabwe. In the first the simple and "subjective" condition score was compared to a more objective measure of body condition in adult females. This involved weighing the animal and measuring the length of the foreleg from the point of the elbow to the fetlock joint (Figure 1) with the latter taken as a measure of the size of the animal. By dividing the weight by this length, it was hoped to eliminate some variation due to the "subjective" measure. There is a correlation coefficient of 0.5 ($P < 0.01$, $n = 43$) between these two measures (Figure 3).

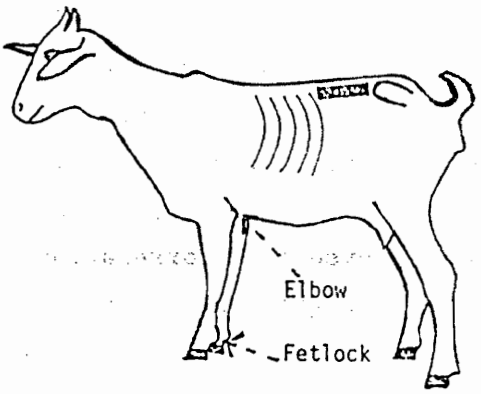

Figure 1 Region of palpation to assess condition score and elbow to fetlock joint measurement

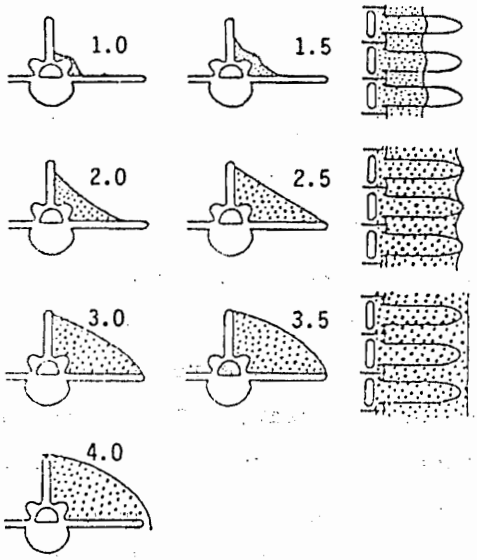

Figure 2 Muscle mass on lumbar vertebrae at 0.5 score intervals. Left and center columns are vertebrae end on; right column is dorsal view (stippling is muscle)

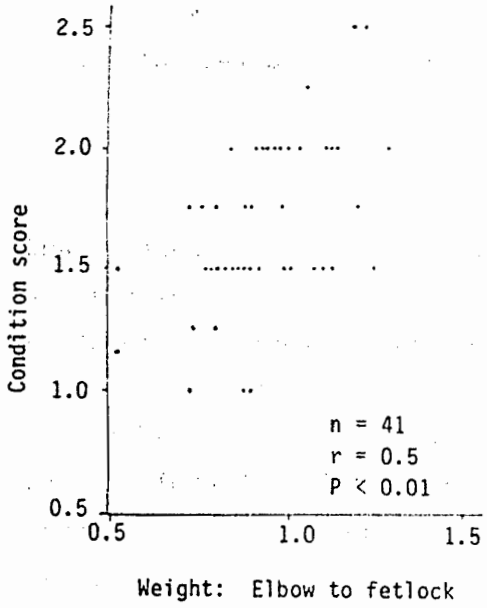

Figure 3 Condition score vs weight divided by elbow to fetlock length for female adult goats

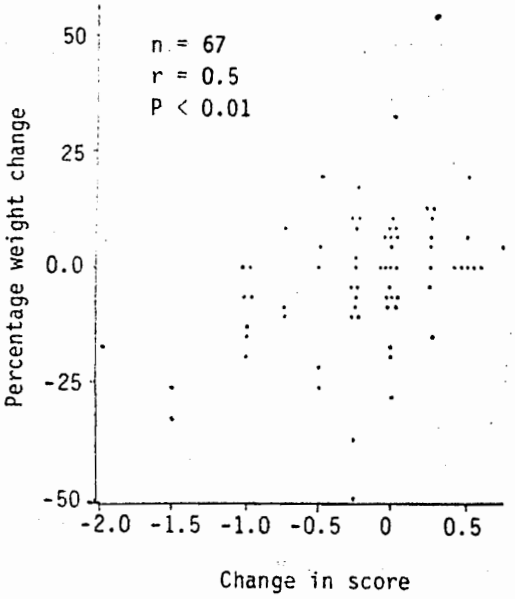

Figure 4 Change in condition score v percentage change in weight for goats of all ages

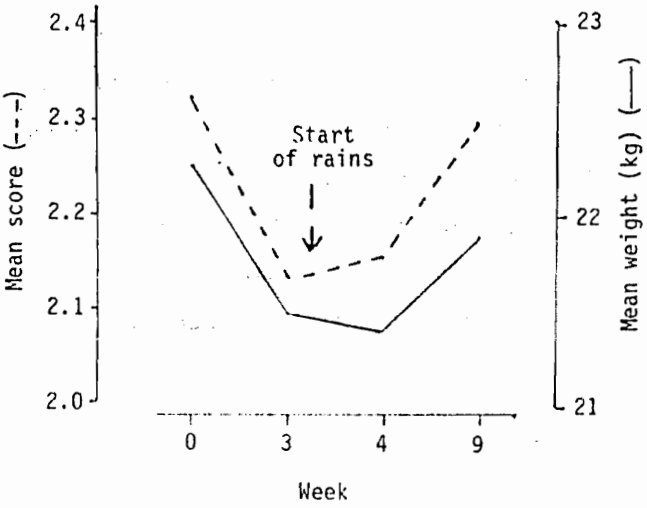

Figure 5 Mean weight and condition score for adult female goats in 3 herds on 4 consecutive visits at 3 week intervals

The second test involved comparing percentage changes in weight (to eliminate variations due to size) with changes in condition score for different ages of goat from small kid (3 kg) to adult (30 kg). The correlation was 0.5 (Spearman's rank coefficient, $P < 0.01$, $n = 71$) (Figure 4). Neither log nor squaring transformations improved the correlation, suggesting that the relationship between changes in weight and condition score are linear. The regression equation was $Y = 0.4 + 11.7X$ where Y represents the percentage weight change and X the change in condition score and suggesting that a change in condition score of 1 represents a 12 per cent change in body weight. This figure is little altered if the data are analysed by age category (adult v non-adult).

Over a period of time there was a clear relationship between weight and score (Figure 5) which perhaps demonstrates that, as with other condition scoring schemes, herd or flock averages are more reliable than individual scores.

Discussion

There are positive correlations between weight, its changes and condition score. Although the correlations are not very high, they are for condition scores versus measures which include weight in their calculation and this latter is subject to all the variables already mentioned. Given this, it is perhaps surprising that the correlations are as strong as they are. They are not dissimilar from others for cattle (Nicholson and Sayers, 1987). Experience has shown that different members of a team, once they have learnt the scheme, produce very similar results. With practice, it is possible to judge the condition score to the level of quarter scores.

The advantages of such a scheme are that farmers, extension workers and scientists have a method of evaluating nutritional status and/or disease effects that requires no equipment and is not affected by factors which cause weight variation. Disease and nutrition are likely to be important determinants of fertility and ability to rear young so that condition scoring can be used to assist in increasing productivity. In Zimbabwe, a formal market for goat meat on a live weight basis is being established. Condition scoring will enable farmers to maximise returns by selling goats at peak condition. It may also encourage the breeding of

goats with better meat producing qualities and be used by purchasers to grade and select goats before slaughter, leading to improved meat quality on the market.

Feedback from other workers on its use in other situations and for other breeds will be very welcome.

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EFFECT OF NUTRITIONAL CONDITION ON GLUCOSE LEVEL IN DIFFERENT BLOOD VESSELS IN SHEEP AND GOATS

(Tag Mirgani, Siham M.A. Bakit and Omer F. Idris, Department of Physiology and Biochemistry, Faculty of Veterinary Science, P.O.Box 32, Khartoum North, Sudan and Soba Central Veterinary Research Laboratory, Khartoum, Sudan)

Summary

Six each male sheep and goats were subjected to three nutritional conditions (grains plus lucerne, lucerne alone, or fasted for 48 h). At the end of each experimental period, blood was taken from different arteries and veins for the determination of glucose and amino acid

concentrations. Glucose was absorbed from the rumen of both sheep and goats. During grain feeding a considerable amount of glucose was absorbed readily from the rumen. Renal veins have higher glucose concentrations than renal arteries indicating release of glucose by the kidneys. The hepatic vein had a higher glucose concentration than the portal vein indicating release of glucose by the liver. In contrast to monogastric animals, the release of glucose was greater in the fed than in the fasted state.

Introduction

Early studies of glucose absorption in ruminants showed that little glucose was absorbed from the digestive tract (Armstrong, 1965; Leng, 1970; Bergman, 1975). Considerable controversy exists concerning the amount of glucose absorbed although it seems to be affected by the type of food and the amount of starch present in the diet. In lactating cows on high concentrate diets, 10 per cent of the glucose requirement was absorbed (Armstrong and Smithard, 1979). Wright et al (1966), reported that on a high starch diet, the total carbohydrate concentration in the abomasum of sheep reached 55 per cent of the carbohydrate concentration in the diet. Increasing dietary starch significantly ($P < 0.05$) increased the amount of starch present in the small intestine (Tucker et al, 1968). The amount of starch passing to the intestine increased from an average of 34.5 g to 155.0 g in sheep fed rations containing 20 and 80 per cent ground corn (Tucker et al, 1968). Armstrong and Smithard (1979) have suggested that with diets containing ground corn much of the glucose requirement of the lactating cow might be met by glucose absorption.

It is established that most of the dietary carbohydrates are fermented by rumen microorganisms to volatile fatty acids (acetic, propionic and butyric). Consequently, ruminants depend on gluconeogenesis for most of their glucose requirement. The main sites of gluconeogenesis are the liver and kidneys (Krebs and Yoshida, 1963).

In monogastric animals, gluconeogenesis is high in fasting and low in fed animals. In ruminants, large amounts of gluconeogenic substrates (propionate and glicogenic amino acids) are made available during feeding (Bergman, 1973). Consequently, the effect of the nutritional status on gluconeogenesis is expected to be different in ruminants.

The present studies were undertaken to examine the extent of glucose absorption from the digestive tract of sheep and goats. The amount of glucose provided by the kidneys and the liver was estimated by determining glucose concentration in the veins draining these organs.

Materials and Methods

Animals and their feed. Six each male adult sheep and goats were used. Animals were housed in a barn and three different nutritional conditions were applied; lucerne plus grains, lucerne alone and 48 h fasting. Water was offered *ad libitum* during the three experiments.

Experimental procedures. Nine days of adaptation period were followed by seven days of experimental period in both experiments I and II. During the experimental periods, blood samples were obtained daily from the jugular vein 2 h after feeds were offered. At the end of the experimental period, two animals were sacrificed, and blood samples were taken from veins and arteries (mesentric, ruminal, portal, hepatic, and renal veins, and carotid and renal arteries).

In experiment III, animals were fasted for 48 h and two animals were sacrificed. Blood samples were taken as in experiments I and II.

Analytical methods. Blood glucose concentration was determined immediatly in whole blood using the method described by Varley (1967). Amino acid nitrogen was determined in plasma using B-naphthoquinone 4-sulphonate as described by Varley (1967).

Results

Glucose concentration in arteries and veins is shown in Table 1. Blood glucose concentration in lucerne feeding plus grains feeding was higher in all arteries and veins than for lucerne alone or 48 h fasting in all the animals. Blood glucose in the renal veins was higher than in the renal arteries in both sheep and goats.

Table 2 shows amino acid nitrogen concentration in veins and arteries under different nutritional conditions. In sheep, hepatic vein amino acid was lower than in the portal vein under the three conditions. Renal vein amino acid was lower than that of the renal artery in licerne-fed sheep and in fasted sheep. In goats, the amino acid in the renal vein was lower than in the renal artery only in the fasted state.

Table 1 Glucose concentration (mmole/dm^3) in sheep and goat arteries and veins (Mean of 2 animals)

Site	Feed		
	Lucerne	Lucerne plus grains	Fasting (48 h)
Sheep			
Portal vein	4.8	5.2	3.2
Hepatic vein	7.3	8.7	6.7
Renal artery	3.4	4.1	2.4
Renal vein	5.6	7.2	4.0
Carotid artery	3.0	3.4	1.9
Jugular vein	2.3	2.8	1.7
Ruminal vein	4.5	5.2	2.4
Goat			
Portal vein	4.9	5.5	1.8
Hepatic vein	5.7	7.1	2.7
Renal artery	2.3	3.9	1.5
Renal vein	4.6	6.9	2.6
Carotid artery	2.3	2.5	1.7
Jugular vein	1.7	1.8	1.2
Ruminal vein	2.2	4.6	2.0

Table 2 Arterial and venous amino acid nitrogen concentration (mmole/dm^3) in sheep and goats under three nutritional conditions (Mean of 2 animals)

Feed	Feed		
	Lucerne	Lucerne plus grains	Fasting (48 h)
Sheep			
Portal vein	2.5	2.4	2.3
Hepatic vein	1.8	1.7	1.0
Renal artery	1.5	1.1	1.9
Renal vein	1.4	1.2	1.1
Goat			
Portal vein	2.7	2.7	2.2
Hepatic vein	2.7	2.5	2.0
Renal artery	2.1	2.1	2.1
Renal vein	1.80	2.2	1.5

Discussion

The ruminant pattern of metabolism differs in some respects from that of monogastric animals. Much of the dietary carbohydrate is fermented to short chain fatty acids rather than being digested to yield hexoses. Consequently, blood glucose in ruminants is low and does not rise much after meals.

Results from the present studies show that blood glucose is not much affected by the different nutritional treatments. During fasting animals show the lowest concentration of blood glucose (Table 1). Blood glucose concentration in the ruminal vein is always higher than that in the jugular vein indicating absorption of glucose from the rumen. The concentration of glucose in the ruminal vein reaches 5.2 and 4.6 mmole/dm^3 in sheep and goat, respectively, when these animals are fed lucerne plus grains. The increased ruminal vein glucose during grains feeding is due to the increasing amounts of glucose escaping fermentation and being absorbed from the rumen. Previous work emphasized the passage of starch from the rumen and its digestion and absorption from the small intestine (Wright et al, 1966; Clary et al, 1967; Tucker et al, 1968; Armstrong and Smithard, 1979). After fasting for 48 h, ruminal glucose concentration was low, but still higher than that of the jugular vein, indicating some absorption.

Glucose concentrations in the portal and hepatic veins indicate that there is less glucose concentration in these veins after fasting. It is apparent that during both feeding and fasting, the liver released glucose into the blood but this was greater in the fed than in the fasted animal.

These results are similar to those reported for the quoka, a marsupial with a nutritional status similar to ruminants. In the quoka, the liver released more glucose into the hepatic vein when the animal was fed than when it was fasted (Ballard et al, 1969). These results imply that in fed ruminants much of the gluconeogenic substrate absorbed from the digestive tract is converted into glucose in the liver and released into the blood. In contrast to this, in monogastric animals glucose was taken up by the liver when the animals were fed and released by the liver when they were fasted (Ballard et al, 1969).

The occurrence of renal gluconeogenesis is well established (Krebs and Yoshida, 1963). In the present work, blood glucose concentration in renal

arteries and renal veins indicates the apparent release of glucose from the kidneys into the blood. The amount of glucose released was also affected by the nutritional treatment. The amount of glucose entering the kidneys through the renal artery was much less than the amount released in the renal veins implying renal gluconeogenesis.

The concentrations of amino acid nitrogen in renal arteries and veins showed that much amino acid reaching the kidney disappeared (Table 2). More amino acid was extracted by the kidneys during fasting. In the fasted sheep more than 50 per cent of the amino acid reaching the kidneys was extracted compared to only 28 per cent in the fed sheep. Lower amounts of amino acid reached the kidneys during fasting. Conversion of amino acids into glucose by liver and kidneys has been established by many workers (Krebs and Yoshida, 1963; Bergman, 1973). It is believed, however, that hepatic gluconeogenesis is of greater significance to the animal because of the larger mass of the liver relative to the kidneys.

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[Editors' note: full references for Bergman (1973) and Krebs and Yoshida (1963) will appear in the next issue].

A NOTE ON THE EFFECTS OF CONCENTRATE SUPPLEMENTATION ON WATER INTAKE OF MALAWI LOCAL GOATS

(Ayoade J.A., and Tambala, P.A.J. Department of Animal Science, University of Malawi, P.O.Box 219, Lilongwe, Malawi. University of Agriculture, Department of Animal Production, PMB 2373, Makurdi, Benue State, Nigeria).

Factors that influence the intake of drinking water by goats include the amount of dry matter eaten, the nature of the feed, individual variation, physiological condition, temperature of the drinking water, ambient temperature and frequency of drinking (Devendra and Burns, 1970; Morand-Fehr, 1981). There is little information on the water intake of Malawi local goats (Ayoade, 1982). This paper reports the effects of concentrate supplementation on water intake of Malawi local goats fed chopped groundnut haulms.

Three male goats weighing about 15 kg were used in five digestibility trials. The animals were fed chopped groundnut haulms (crude rotein 10.6 per cent) ad libitum as a basal ration supplemented with a concentrate

Table 1 Water balance in Malawi local goats fed chopped groundnut haulms

Variable	Concentrate Supplement (per cent of body weight)					Significance
	0	1	2	3	4	
Dry matter intake (kg/day)	0.30a	0.47ab	0.53bc	0.59c	0.61c	*
Free water intake (kg/day)	0.62a	0.83ab	1.12bc	1.30c	1.38c	**
Free water intake (% BW)	4.50a	6.27b	7.80bc	8.87c	7.63b	***
Total water intake (kg/day)	0.65a	0.87ab	1.16bc	1.33c	1.41c	**
Total water intake (% BW)	4.60a	6.57b	8.03bc	9.07c	7.83b	***
Free water intake (kg/kg DMI)	2.08a	1.79b	2.13a	2.33a	2.27a	*
Total water intake (kg/kg DMI)	2.17	1.85	2.22	2.38	2.33	NS
Faecal water excretion (kg/day)	0.13	0.15	0.16	0.17	0.22	NS
Water balance (kg/day)	0.41a	0.58b	0.81c	1.05c	0.96c	**

Total water = Feed water + free water BW = Body weight

Water balance = (feed water + free water) - (urine + faecal water)

Figures followed by different letters in the same row differ significantly ($P < 0.05$)

mixture (groundnut meal 10.0 per cent, poultry manure 5 per cent, maize bran 83.0 per cent, salt 2.0 per cent, crude protein 19 per cent) at 0, 1, 2, 3 and 4 per cent of body weight. Consumption of the concentrate began at about 08:00 hr daily and that of the haulms 3 hr later. Clean water was available each day and intakes of free water and feed water including losses of water in faeces and urine were recorded for each animal during the last 5 d of each 14-d digestibility trial.

Increasing the amount of concentrate mixture offered significantly ($P < 0.001$) increased free water intake, total water intake and water balance of the animals; faecal output and urine output were not significantly affected (Table 1). The ratio of water intake to dry matter intake ranged from 1.8 to 2.3 for free water and 1.9 to 2.4 for total water. These figures are comparable to those reported for other tropical breeds (Devendra and Burns, 1970; Aganga et al, 1986). Part of the increased water intake with increased concentrate supplementation may be due to increased ($P < 0,01$) crude protein intake (from 32.1 to 104.4 g/head/d) with increased concentrate supplementation.

The financial support of University of Malawi through the Research and Publications Committee is gratefully acknowledged.

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A NEW JOURNAL -- GOAT HEALTH AND PRODUCTION

"Goat Health and Production" is the title of a new bulletin being issued by the New Zealand Ministry of Agriculture and Fisheries. The need for this new bulletin is considered to be because "goat farming has emerged as a viable diversification option and has created many problems for new goat farmers and their veterinarians. Lack of knowledge, coupled with the temptation to treat goats like sheep or cattle, has meant that many valuable goats have died from diseases which could have been prevented". It is said that the bulletin "contains reliable, up-to-date information on goat diseases, management and production under pastoral farming conditions and aims to fill the gap that currently exists in this area".

The complementary copy (Volume 2 No 2, July 1988) received by the Small Ruminant Network is printed on nice glossy paper and is produced in a racy journalistic style. Most information is on diseases and it is probable that some of the information in some issues may be of relevance to Africa.

Anyone interested in obtaining copies or having further information should send enquiries to the Editor, Palmerston North Animal Health Laboratory, Ministry of Agriculture and Fisheries, P.O.Box 1654, Palmerston North, New Zealand.

A SECOND GOAT CONFERENCE IN NIORT

The "first" International Colloquium on Goat Diseases was held at Niort (France) from 9-11 October 1984. The proceedings of that meeting were published by the French Institut National de la Recherche Agronomique and comprised 89 papers in a 750 page document which has rapidly become an indispensable reference on goats. There was no indication in 1984 that the Niort meeting would become a serial event: that it is apparently about to do so is further indication of the success of the first meeting.

The "IInd International Colloquium in Niort. Goat Diseases and Productions" [sic!] will take place from 26-29 June 1989. The timing has been arranged so that participants will be able to continue, if they so wish, their visit to France and participate in the International Sheep and Goat Show at Montmorillon-Vienne (France) which will take place on 30 June-

2 July 1989. The coupling of two meetings is becoming increasingly common and is a trend to be encouraged in cutting down the expenses involved in travelling.

For Niort II seven main themes have been proposed, these being:

Diseases and new techniques of reproduction;
Diseases and international trade;
Diseases, production and milk technology;
Diseases and developing systems;
Slow viruses;
Diseases, meat and fibre production;
Diseases and human health.

The deadline for paper abstracts was 30 September 1988 but for those who still wish to try their luck in having a paper accepted for presentation the address for contact is "Colloquium Secretariat, IIe Colloque International de Niort, "Pathologie caprine et productions", B.P. 3081, 79012 Niort Cedex, France.

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In addition to the 20 or so pages devoted to the usual opening speeches these Proceedings comprise about 350 pages of text devoted to the presentations made at the meeting and 9 and 10 pages in English and French respectively of the results of the deliberations carried out by Technical Groups after the Workshop.

The Proceedings are in sections covering Genetic Resources (8 papers), Feed Resources (5 papers), Production Systems (4 papers) and Marketing and Health (3 papers). There is also a long section of Country Papers from 15

countries in the region including some often neglected ones such as the Comores and Mauritius.

There is little that is new in the technical sections although there is plenty of useful information crammed into a relatively small volume. As might be expected the country reports vary in quality and value and it is not always the countries with large populations of small ruminants which have produced the best papers. In the country section there is also a wealth of information, much of it not always easily available elsewhere.

One of the purposes of publishing a Proceedings such as this would certainly seem to be making such information readily available. One wonders, however, how well the organisers have succeeded in doing this. This reviewer has a paper in the Proceedings but did not receive a copy and he is aware of several other contributors who also have not received copies. The imprint appears to state it was published in 1986 but this seems doubtful and 1988 is more likely. The contents are nicely printed and bound but the document would have been even more useful if the Editors had had more time to spend on the format of the papers. Even within a paper the sequence of headings in sometimes difficult to follow and one is never sure from the content whether a leap from section 3.1.2 to 5.1.4, for example, is a printer's error or a real omission. Similarly more attention could have been paid to standardizing references and ensuring that citations were complete: at least three references in the text of the first paper are not in the bibliography and laying a hand on some papers that are listed would not be easy from the often cursory information provided.

In spite of these comments the Proceedings will be a useful addition to the literature on African small ruminants and should find a place in every private and public library.

Smith, O.B and Bosman, H.G. 1988. GOAT PRODUCTION IN THE HUMID TROPICS Proceedings of a workshop at the University of Ife, Ile-Ife, Nigeria, 20-24 July 1987. Centre for Agricultural Publishing and Documentation: Wageningen.

As the title states this look comprises the Proceedings of a Workshop which related mainly to the West African Dwarf Goat. An account of the

Workshop has already appeared in a previous Newsletter (9:7-9). The 23 chapters cover all of the papers presented. Although the Workshop was reputedly bilingual only four of the papers are in French (the remainder being in English) and 13 to 16 papers - depending on how you calculate it - were from Nigeria. It is doubtful if this distribution represents the anglophone/francophone and Nigerian/non-Nigerian concentration of research effort in goats in the humid tropics. One of the English language non-Nigerian papers was from Indonesia and three (or two) were presented by academics from British universities. Three of the French language papers were from Togo - less than 200 km from Ife as the crow flies - and one from Benin, which is even closer. The ILCA Small Ruminant and Camel Group (now the Small Ruminant Research Network) was involved in the organization of this meeting and did, in fact, send out three prepaid tickets but only one of these was actually used. This reviewer knows the efforts that the staff of the "Management of the West African Dwarf goat in the Humid Tropics" project expended in trying to get people to Ife from other countries and it is most unfortunate that they were not more sucessful.

It is particularly unfortunate because, if one assumes that the papers as presented in the book reflect what happened at the Conference, then it was a very useful meeting. There are seven chapters on management in its widest sense, six on production, seven on nutrition and, surprisingly, only two on health. The twenty-third paper is concerned with the relevance of research and concludes that "the cessation of much ruminant research would be sound economy particularly if the savings so made could be re-directed towards extension and inter-farmer communication so as to identify, and if appropriate, to overcome the real constraints". Would someone like to write a contradiction for a future Newsletter?

The book is produced by direct photolitho from a word-processed text and is easy to read. It is bound in hard covers and the organisers are, above all, to be congratulated in the rapidity with which they have brought it to publication - less than six months is indeed commendable. There are far too many conference proceedings which are irrelevant (even if the research they report might once have been!) when they finally appear in print 4, 6 or even more years after the event.

REPRODUCTIVE PARAMETERS OF DJALLONKE SHEEP AT KOLOKOPE, TOGO

(Y.N. Hadzi, Chef du Centre d'Appui de Kolokope, Projet Petits Ruminants, B.P. 65, Atakpame, Togo)

Djallonke sheep were bought in local markets during 1981 to form the foundation stock of the station. The objective of the station is to improve the productivity of Djallonke sheep by selection within the type and to make breeding females and males available to local farmers.

Three reproductive systems were adopted between 1982 and 1986, these being: (i) rams in the flock all year round; (ii) rams in the flock for 45 days every 8 months; (iii) rams in the flock for 45 days every 6 months. Since 1986 only system (ii) has been practised. Detailed analyses relating to differences between the different reproductive groups will be carried out shortly (as will analyses of weight, mortality and total productivity) in collaboration with the ILCA Small Ruminant Research Network.

The annual fertility rate (= number of females giving birth divided by number of females in the flock) varied from 136 per cent to 178 per cent for the years 1982/1983 to 1985/1986. Litter size was fairly constant at about 1.15 young per birth but appeared to be slightly higher at 1.17 in 1984/1985. Fecundity (= number of lambs born in the year divided by number of ewes joined) varied from 157 per cent to 203 per cent. The abortion rate (= ewes aborting divided by ewes pregnant) was between 1.5 per cent (1983/1984) and 4.1 per cent (1982/1983), the first year of full operations when all ewes were foundation stock). Pre-weaning mortality (to 120 days) was between 7.5 per cent and 17.0 per cent over the 4-yr period for which results are so far available.

NOTE

If your address is incorrect or if a colleague would appreciate receiving a copy of this Newsletter, please fill in the form below.

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THE SMALL RUMINANT RESEARCH NETWORK

NEWSLETTER

International Livestock Centre for Africa,
P.O. Box 5689, Addis Ababa, Ethiopia. Telephone: 61-32-15

N°14 February 1989

BIRTH OF AN AFRICAN SMALL RUMINANT COLLABORATIVE RESEARCH NETWORK

A meeting on Small Ruminants was held at Mankon Station, Bamenda, Cameroon, during the period 17-25 January 1989. It was sponsored by ILCA, IFS and the Cameroonian Institute of Animal Research (Institut des Recherches Zootechniques). There were more than 75 fully registered participants and offical government representatives from 21 African countries (Cameroon, Cote d'Ivoire, Congo, Ethiopia, Kenya, Malawi, Mali, Morocco, Mozambique, Niger, Nigeria, Rwanda, Somalia, Sudan, Swaziland, Tanzania, Tchad, Togo, Tunisia, Zambia and Zimbabwe). There were also participants, representatives and observers from Belgium, Columbia, the Federal Republic of Germany, France and Sweden as well as the ILCA participants and secretariat.

The objectives of the meeting were to:

hold a scientific conference on the principal aspects of small ruminant productivity in the major topic areas of systems analysis and economics, nutrition and feeding systems, reproductive performance, health problems and hygiene management, and breeds and breed improvement;

decide on the requirements and role of an African Small Ruminant Research Network;

define modes of collaboration among the International Livestock Centre for Africa, National Agricultural Research Systems and bilateral and multilateral donors; and

elect (if the need for a Network had been established) an interim steering committee to establish the network.

The meeting was opened by His Excellency the Minister for Higher Education, Computer Services and Scientific Research of the Cameroon Government who was accompanied by His Excellency the Governor of North-West Province.

Following the official opening, there were five scientific sessions in the major theme areas already outlined. These sessions, including the discussion periods allocated to each, lasted about 2½ days during which a total of 42 papers was presented in the areas of production systems and economics (10), feeds and feeding systems (8), reproduction (6), health and hygiene management (8), and breeds and breed improvement (10). The Proceedings of the Conference will contain 44 full papers and 2 summaries and an Introduction by the newly-elected Chairman of the Interim Steering Committee of the African Small Ruminant Collaborative Research Network.

The 6th session comprised a presentation by the Coordinator of ILCA's Small Ruminant Meat and Milk Thrust on the objectives of the Thrust and the

major research themes identified. That presentation was followed by one by the Coordinator of the existing ILCA Small Ruminant Research Network on the role and function of networks and on ILCA's experience and achievements in its small ruminant network over the preceding 4 years. There followed a very active participatory discussion: on the pros and cons of networks; on whether participation in the network could or should be confined to countries in the ILCA mandate area (sub-Saharan Africa); on the relationships among ILCA, the National Agricultural Research Systems and potential donors; and on the roles and functions of a steering committee. It was eventually agreed that a collaborative network was in the best interests of all parties. A decision was then taken to divide into working groups, based on themes rather than regions, the groups to reconvene after the weekend.

The 2 weekend days were devoted to field trips, one to the Mankon station of the Institute of Animal Research and the other to study local farming systems.

The working group sessions (Session 7) were preceded by an extraordinary plenary meeting at the demand of the participants, chaired by a representative of the host country. The aim of this plenary meeting was to clarify some inconsistencies and misunderstandings resulting from Session 6 and from small and informal group discussions over the 2 days of the weekend. The salient points discussed were: the name of the network ("Pan-African Small Ruminant Collaborative Research Network"); the objectives of the network and its structure; the location of the coordinating body; and the possible roles of regional and national networks. Following further active debate, the decision to form a network was taken with 42 of the meeting participants present voting for, none voting against, and 2 abstaining.

Participants split into 4 working groups for Session 7. The working groups were: Systems and Economics; Feeds and Feeding Systems; Reproductive Wastage and Health; and Animal Genetic Resources and Breeding. The groups were asked to structure their discussions in order to identify the major problems within geographical regions and research themes, to identify active small ruminant research and development programmes, to list

resources (human, animal and infrastructural) available for small ruminant research by country, to make a preliminary list of possible research projects, and to recommend on how collaborative research might best be carried out ("what, where and when?"). The groups should also consider the formation of an interim steering committee based on regional representation.

Following completion of the working group talks and distribution of their session notes to participants, Session 8 considered their reports. Suggestions from the floor (from participants of other groups) were taken and incorporated into the various working group reports. This session of synthesis was followed immediately by the election of an interim steering committee. Members elected to the committee were:

Professor S.H.B. Lebbie (Chairman)	University of Swaziland	Southern Africa
Mr Ronny Sibanda	Zimbabwe Research and Specialist Services Department	Southern Africa
Dr R. Shavulimo	Kenya Veterinary Research Department	Eastern Africa
Professor Beyene Chichaibelu	Alemaya University of Agriculture (Ethiopia)	Eastern Africa
Mr C. Sibomana	Institut des Sciences Agronomiques du Rwanda	Central Africa
Dr R.M. Njwe	Dschang University Centre, Cameroon	Central Africa
Dr Y. Pessinaba	Projet Petits Ruminants, Togo	West Africa
Professor M.O. Akusu	University of Ibadan, Nigeria	West Africa
Professor A. Lahlou-Kassi	Institut Agronomique et Vétérinaire Hassan II, Maroc	Sahelian and North Africa

Professor A. Yenikoye	Université de Niamey,	Sahelian and North Africa
Dr R.T. Wilson	International Livestock Centre for Africa	Secretary/ Coordinator

The interim steering committee met immediately following the closing of Session 8. The final assembly, Session 9, was a presentation of the deliberations of the first meeting of the interim steering committee, followed by a decision to hold the first full and formal meeting of the Committee in Addis Ababa as soon as possible (if possible in early March 1989), with the following agenda items:

a. Role and functions of the Interim Committee.
b. Relationship among the Committee (acting on behalf of the Network), the Coordinating Body and the Donor Community.
c. Relationships between African Network and Regional and National Networks and decision on two priority regions where Regional Networks will be established, preferably during 1989.
d. Preparation of preliminary protocols, based on discussed research priorities, for donor scrutiny and reaction.
e. Any other business.

The meeting was officially closed late in the afternoon of Tuesday 25 January by His Excellency the Governor of the North-West Province of Cameroon.

This issue of the Newsletter provides summaries of selected papers presented at the Scientific Conference in Bamenda in order to make information available to as wide readership as possible. Full texts of the presentations (in the original language only) will appear in the Proceedings of the Conference which, it is hoped, will be published during March 1989.

CONSTRAINT IDENTIFICATION AND ANALYSIS IN AFRICAN SMALL RUMINANT SYSTEMS

P.K. Ngategize
International Livestock Centre for Africa
P.O.Box 5689 Addis Ababa Ethiopia

SUMMARY

A review of the economic role of small ruminants and their production constraints is presented. Approaches to small ruminant constraint identification and analysis are identified. Levels of production economics analysis are suggested and examples of economic or statistical models given. Simulation analysis is identified as a powerful tool in constraint identification and analysis due to its robustness.

[*Text in English*]

SOME PERFORMANCE INDICATORS OF MALAWI INDIGENOUS GOATS UNDER VILLAGE AND RANCH CONDITIONS

S.K. Karua
Department of Animal Science
Bunda College of Agriculture
P.O.Box 219 Lilongwe Malawi

SUMMARY

Goat performance in 6 villages around Bunda College and at Lifidzi ranch in Salima was monitored during 1985 and 1986. In the villages age at first kidding was 15.0 ± 1.9 mo: season of the doe's own birth affected her age at first kidding but her type of birth did not. No environmental variables affected age at first kidding on the ranch. Kidding percentage was 107 under village conditions and 175 on the ranch. Kidding interval was 44.9 ± 11.3 wk in the villages and 35.2 ± 6.8 wk on the ranch. Season had a significant effect on kidding interval in the villages but not on the ranch. Village goat litter size was 1.35 ± 0.5; on the ranch it was 1.38 ± 0.5. In both systems litters were largest during the cool dry season (May-Aug) and smallest in the hot dry season (Sep-Nov). Birth weight of single born kids was 1.75 ± 0.4 kg in the villages and 1.77 ± 0.5 kg at the ranch. Birth weight was positively correlated to dam postpartum weight ($r = 0.58$). Dams kidding multiples were heavier than those kidding singles. Kid mortality was different in different seasons in the villages but not on the ranch. Mortality was 11% in the villages and 20.1% on the ranch while abortion was 5.6% in the villages and 9.5% on the ranch.

[*Text in English*]

SMALL RUMINANT PRODUCTION IN CAMEROON

R.M. Njwe
Department of Animal Science
Dschang University Centre
P.O.Box 110 Dschang Cameroon

SUMMARY

The potential for small ruminant production in Cameroon is high. Numbers are estimated at 5.3 million and they account for about 14% of domestic meat production. Development objectives are to increase meat production from both species and encourage milk production from improved goats. Constraints to small ruminant production include diseases and parasites, malnutrition, lack of improved breeding stock for distribution to farmers and inadequate marketing facilities. Recommendations for the future include: improved nutrition by increased use of crop residues; alley cropping and tree crop production (rubber and oil palm); educating farmers in grass conservation; development of decentralised and flexible veterinary services to reduce mortality; improving the efficiency of the extension services; establishing breeding centres for improved stock; increasing investment in research; improving marketing; and providing direct assistance to farmers rather than projects that are too costly and do not produce significant production improvements.

[*Summary only in Proceedings*]

THE PRODUCTIVITY OF INDIGENOUS GOATS UNDER TRADITIONAL MANAGEMENT IN SWAZILAND

S.H.B. Lebbie and A.T. Manzini
Animal Production and Health Department
University of Swaziland
P.O. Luyengo Swaziland

SUMMARY

Results of a 24 mo study of traditional goat production in Swaziland are reported. Females greatly outnumbered males in the flocks. Females kidded first at 301 ± 55 d, kidding interval was 268 ± 100 d, litter size was 1.18 ± 0.29 and kids born per doe per year was 1.61. Birth weight was 1.9 ± 0.14 kg and growth to 3 mo averaged 68.2 g/d. Mortalty was 30% over the study period and offtake was 17%: home consumption was the largest component of offtake and deaths were much higher in kids than in adults.

[*Text in English*]

SMALL RUMINANTS IN THE TRADITIONAL AGROFORESTRY SYSTEM OF MAYOMBE, CONGO

A. Batalou Mbetani
Direction Générale
de la Recherche Scientifique et Technique
B.P. 2499 Brazzaville Congo

and

D. Bourzat
Centre International pour l'Elevage en Afrique
B.P. 5689 Addis Abéba Ethiopie

SUMMARY

This systems study looks at the human, nutritional and animal resources in the Mayombe primary forest zone of Congo with a view to promoting small ruminant production. In spite of excellent agricultural prospects, the labour force is not very active. Small ruminants are in competition with commercial agriculture but complementary to subsistence production. This explains why the majority of livestock owners are older people attempting to improve their income and overcome social problems through herding livestock. The integration of small ruminants into the existing system is suggested as a way by which the forest can be more rationally used and the quality of life of the populace improved.

[*Text in French*]

SMALL RUMINANTS IN THE HOUSEHOLD ECONOMY OF LESOTHO: TOWARDS A DYNAMIC FUNCTIONAL PERSPECTIVE

J.P. Hunter
Ministry of Agriculture and Marketing
P.O.Box 333 Maseru 100 Lesotho

SUMMARY

Basotho stockkeepers have raised Merino sheep and Angora goats for wool and mohair since their introduction in the 19th century. When grain production for export became increasingly unprofitable and labour migration to South Africa became more attractive, wool and mohair became the principal sources of domestically generated rural cash. Small ruminant keeping was ideally suited to this function as it had the advantage of being complementary in labour requirements to migration. Small ruminants also provide households with meat and serve as a store of savings from migrant incomes and as insurance against retirement. Using data from a nationwide socio-economic survey and from measurements of a sample of sheep and goats, this paper analyses these roles for different classes of livestock holders. In a

country in which landlessness is increasing, small ruminant ownership tends to be associated with access to land, and owners tend to be well-situated in the income distribution. Small ruminant ownership is thus a key element in a rural household's pursuit of economic security and prosperity.

[*Text in English*]

TRADITIONAL WEANING PRACTICES IN THE SEMI-ARID ZONE OF MALI

A.T. Ngwa
Institute of Animal Research
P.O.Box 1457 Yaounde Cameroon

and

J. Hardouin
Institute of Tropical Medicine
Nationalestraat 155 B-2000 Antwerp Belgium

SUMMARY

In central Mali small ruminants are mainly owned by low-income families who rarely provide good management to their stock. During the day animals roam in single or composite flocks and at night they are tethered or enclosed, irrespective of sex or age groups, in locally made pens. This results in malnutrition, in a rapid spread of disease, in cases of missing animals and above all in indiscriminate mating. To overcome some of these problems various traditional methods of weaning are used including application of dung on the dam's mammary glands, immobilizing the tongue of the nursing kid/lamb and using thorns to produce pain to the dam during suckling. Though crude, these methods are efficient in weaning and, if improved, could lead to productivity increases.

[*Text in English*]

INTER-FLOCK DIFFERENCES IN SMALL RUMINANT PRODUCTIVITY IN THE CENTRAL MALI AGROPASTORAL SYSTEM

S. Killanga
Institut des Recherches Zootechniques
B.P. 125 Mankon-Bamenda Cameroun

A. Traoré
Centre International pour l'Elevage en Afrique
B.P. 60 Bamako Mali

and

J. Hardouin
Institut de Médecine Tropicale
Nationalestraat 155 B-2000 Anvers Belgique

SUMMARY

This study identifies the causes of the observed differences in flock productivity in a central Malian village, in a rainfed millet agropastoral subsystem. Small ruminant productivity, management factors and socio-economic characteristics are analysed. The causes leading to the observed differences in small ruminant productivity are related to the owner's socio-economic characteristics, to his management strategies or to preferences for one or the other small ruminant species.

[*Text in French*]

SCIENTIFIC TRAINING THROUGH TRIPARTITE COLLABORATION

J. Hardouin
Institut de Médecine Tropicale
Nationalestraat 155 B-2000 Anvers Belgique

SUMMARY

In spite of the existence of specialised institutions with responsibility for national livestock research, few developing countries have the necessary documentation and experience for starting research and for training young scientists. There is a risk that research will therefore be undertaken to solve problems to which the solutions are already known. Another method of training young scientists is therefore required. One possible solution has just been demonstrated by collaboration among an African national research organisation, a European university and an international research centre. This tripartite form of collaboration deserves to be recognised and further developed, in addition to already

established procedures, to assist national research efforts. Publication and distribution of research results is an important aspect of any collaborative effort.

[*Text in French*]

PARASITES AND NUTRITION AS CONSTRAINTS TO GOAT PRODUCTION IN THE LATIN AMERICAN HUMID TROPICS

J.I. Restrepo and *T.R. Preston*
Convenio Interinstitucional para la Produccion
Pecuaria en el Valle del Rio Causa
Apartado Aéreo 7482 Cali Columbia

SUMMARY

A first priority in any production programme for goats in the humid tropics is parasite control. Avoidance of reinfestation is more cost effective and biologically sustainable than use of anthelmintics. The features of this strategy are: complete confinement; uncontaminated forages; dry lying (slatted floors or non-edible litter that is changed frequently); and use of locally available feed resources according to the principles of balanced nutrients both for the rumen and for the animal.

[*Text in English*]

THE CREATION OF A DUAL PURPOSE GOAT IN MALAYSIA AS A MODEL CASE FOR COLLABORATIVE RESEARCH AND DEVELOPMENT

P. Horst
Institut für Tierproduktion
Lentzeallée 75 D-1000 Berlin 33 West Germany

SUMMARY

In an analysis of a collaborative research and development project, the factors necessary to its success, such as mutual confidence in personal relations, a common conceptual approach, common interest at the individual and institutional level and a multidisciplinary approach to cover all aspects of production and allow close collaboration with development aspects are presented. The successful creation of a dual-purpose goat in Malaysia is used as a model to illustrate these points.

[*Text in English*]

TRADITIONAL SHEEP AND GOAT PRODUCTION IN NORTH WEST PROVINCE, CAMEROON

K.J.N. Ndamukong
Mankon Station
Institute of Animal Research
P.O.Box 125 Bamenda Cameroon

M.M.H. Sewell
Centre for Tropical Veterinary Medicine
University of Edinburgh United Kingdom

and

M.F. Asanji
Annexe Bambili
Advanced Teachers' College
University of Yaounde Cameroon

SUMMARY

Sheep and goat productivity under traditional management was assessed in 115 flocks by questionnaire survey. Goats were reared by 92% of farmers but only 21% reared sheep. Flock sizes were small (3-48, median 7) with larger numbers in mixed flocks. Females greatly outnumbered males. The commonest of 4 management systems included night housing and day tethering in the cropping season with tethering or free range grazing during the day in the non-cropping season. Most farmers provided salt. About 43% of farmers provided water. Breeding was generally uncontrolled. Offtake rates were 20% for sheep and 24% for goats. Mortality was higher in sheep than in goats and in young stock than in adults. Treatment of sick animals was practised on a very small scale.

[*Text in English*]

EFFECT ON SOMALI-ARABIAN GOAT DOE BODY WEIGHT, BIRTH WEIGHT AND HAY INTAKE OF RATIONS OF VARYING DIGESTIBLE ENERGY FED IN PREGNANCY

H.M. Hassan
Animal Production Department
Faculty of Veterinary Medicine and Animal Husbandry
P.O.Box 2080 Mogadishu Somalia

SUMMARY

Productivity of Somali goats is generally low due to poor husbandry practices. The effects of nutrition on birth weight, body weight and hay intake of does fed diets varying in digestible energy during the last 4 mo of pregnancy were studied on 24 Somali-Arabian goats. Body weight of

pregnant goats and kid birth weight increased with the level of digestible energy. Hay and total feed intake tended to decrease as digestible energy in the concentrate increased and also as goats approached parturition. None of these increases were significant. A low digestible energy level (29.3 Mcal/kg) in the concentrate is adequate for daily digestible energy requirements of Somali-Arabian goats during the last 6 wk of pregnancy.

[*Text in English*]

THE USE OF *Acacia albida* AND *Calotropis procera* FOR IMPROVING SMALL RUMINANT DIETS IN SENEGAL

S.T. Fall
Laboratoire National de l'Elevage
et des Recherches Vétérinaires
Institut Sénégalais des Recherches Agricoles
B.P. 2057 Dakar Sénégal

SUMMARY

Proximate analyses, *in vitro* and *in vivo* digestibilities and intraruminal degradability of dry matter and protein were established for leaves and pods of *Acacia albida* and leaves of *Calotropis procera* in order to establish their nutritive value and test their suitability for improving the energy and protein contents of basal diets of low quality. Feeding trials were also conducted on young sheep in order to study effects on growth rate. Organic matter digestibility was 48% and 62% for *A. albida* leaves and pods and 71% for *C. procera* leaves. Total protein was 11% for both leaves and pods of *A. albida* and intraruminal degradability of the 2 components was 55% and 63%. The results show that *A. albida* and *C. procera* can be useful supplementary feeds for small ruminants.

[*Text in French*]

THE VALUE OF COFFEE PULP ALONE AND IN COMBINATION WITH OTHER FEEDS IN SHEEP NUTRITION IN ETHIOPIA

Solomon Demeke
Department of Animal Science
Jimma Junior College of Agriculture
P.O.Box 347 Jimma Ethiopia

SUMMARY

Two experiments were conducted with yearling rams to evaluate the nutritive value of coffee pulp ensiled on its own and ensiled in combination with either sugarcane stem, sugarcane top or elephant grass (*Pennisetum*

purpureum). Quality and percentage nutrient composition of the silage, and voluntary feed intake, weight gain and protein digestibility by sheep were used as parameters of nutritive value. Good quality silage was produced from coffee pulp alone and in combination with the forages. Percentage composition of lignin, lignified protein and caffeine were highest in pure pulp silage and decreased, as a result of dilution by forages, in the others. Feed intake was low and all animals lost weight on all silages. In Experiment 1 the sheep regained initial body weight after 15 days of grazing at the end of the trial. In Experiment 2 initial body weight was regained at the ninth week of feeding, when gains were 75 g/d to 154 g/d.

[*Text in English*]

COMPOSITION AND *in vivo* DIGESTIBILITY OF COFFEE PULP IN ETHIOPIA

Getachew Gebru and *Beyene Chichaibelu*
Department of Animal Science
Alemaya University of Agriculture
P.O.Box 138 Dire Dawa Ethiopia

and

J.D. Reed
International Livestock Centre for Africa
P.O.Box 5689 Addis Ababa Ethiopia

SUMMARY

Effects of the method of processing of coffee cherries on pulp composition and digestibility *in vivo* were studied. The effects of wet and dry processing on chemical composition were analysed in Experiment 1. The effects of dry processed pulp (Dcop) and wet processed pulp (Wcop) (0 g/d, 60 g/d, 120 g/d and 150 g/d) on intake, digestibility and nitrogen retention in sheep fed hay were determined in Experiment 2. Processing method affected the contents of neutral-detergent fibre (NDF), acid-detergent fibre (ADF), lignin soluble phenolics and insoluble proanthocyanidins (condensed tannins). Dry processed pulp had higher NDF, ADF, lignin and phenolic compounds. There was no effect of pulp level on feed intake or digestibility but N-balance was significantly depressed at the 120 g and 150 g levels of Dcop, at which both urinary and faecal N losses and total urine excretion increased. No pronounced effects were observed for Wcop. Condensed tannins and caffeine in coffee pulp appear to limit its nutritive value.

[*Text in English*]

EFFECTS OF FEEDING GRADED LEVELS OF GROUNDNUT HAY ON THE UTILIZATION OF VELD HAY BY GOATS IN ZIMBABWE

L.R. Ndlovu and *L. Hove*
Department of Animal Science
University of Zimbabwe
P.O.Box MP 167 Mount Pleasant
Harare Zimbabwe

SUMMARY

Five rumen-cannulated mature does were used to measure intake and rumen parameters in a trial to investigate the potential of groundnut hay as a supplement for goats fed on mature veld hay. Another 5 does were used to measure intake and digestibility. Groundnut hay was offered at 135 g/hd/d, 270 g/hd/d, 405 g/hd/d or 900 g/hd/d in addition to a 75/25 mixture of veld hay/dried poultry manure at 900 g/hd/d (control) for all treatments. Groundnut hay increased total dry matter intake ($P < 0.05$) but reduced intake of basal diet. Apparent digestibilities increased ($P < 0.05$) with increased levels of groundnut hay. Rumen pH and NH_3-N increased to the 405 g treatment. The reasons for the drop at the higher level are unclear but could be related to volatile fatty acid production. A level of groundnut hay of 400 g/hd/d is recommended as optimal.

[*Text in English*]

COMPARATIVE RUMEN DEGRADABILITY OF FORAGES, BROWSE, CROP RESIDUES AND AGRICULTURAL BY-PRODUCTS

O.B. Smith, O.A. Idowu, V.O. Asaolu
and
O. Odunlami

Department of Animal Science
Obafemi Awolowo University
Ile Ife Nigeria

SUMMARY

In situ degradability experiments of forages, browse, crop residues and by-products in cattle, sheep and goats were carried out to assess nutritional value and potential use as feed. The 48 hr dry matter degradability obtained suggests that many items available in large amounts in humid tropical Africa could be used as supplements to poor quality dry season forages. Degradability ranged from medium for *Leucaena* and *Gliricidia* (68%), winged bean forage (65%) and green corn stover (68%) to high for cassava leaves (84%), cowpea husk (74%), foofoo residue (78%), plantain peels (74%), maize bran (81%), cassava peels (83%), yam peels (86%) and

sweet potato peels (95%). Values for browse, crop residues and by-products were higher than those for 5 dry season forages (mean of 56%) and underline their potential nutritive value.

[*Text in English*]

MINERAL AND ANTINUTRITIONAL CONTENTS OF FORAGE LEGUMES CONSUMED BY GOATS IN NIGERIA

A.D. Ologhobo
Department of Animal Science
University of Ibadan
Ibadan Nigeria

SUMMARY

Experiments were conducted to evaluate the nutritive value of 25 forage legumes collected from 5 locations in Nigeria. Analyses carried out for macro- and micro-mineral contents of these plants showed high percentages of Mg (0.31), P (0.28), Ca (1.25), Na (0.02) and K (2.44). Overall mean levels were 23.64 ppm for Zn, 315.66 for Fe, 86.42 for Mn, 9.43 for Cu and 108.90 for Se. In all forages the concentrations of phytic-acid (28.55-316.22 mg/g), phytic-phosphorus (20.17-92.50 mg/g), oxalates (0.54-0.82%) and nitrates (0.13-0.66%) were moderate to high. Saponin and hydrogen cyanide contents were inherently low or low due to a high drying temperature of the samples. Tannic acid differed considerably among the different species, being absent or low in some forages and extremely high in others. These differences may be genetic or due to cultural practices and soil composition. The nutritional implications of the results are discussed.

[*Text in English*]

USE OF COTTON HULLS AS A DRY SEASON FEED FOR PEUL SHEEP IN NORTH CAMEROON

A.Cl. Ngo Tama
Antenne de Garoua
Institut des Recherches Zootechniques
B.P. 1073 Garoua Cameroun

and

G. Rippstein
Station de Nkolbisson
Institut des Recherches Zootechniques
B.P. 1457 Yaounde Cameroun

SUMMARY

In a dry season feeding trial in the Sudan zone of north Cameroon, 15 rams 2.5 years old and weighing 28 kg were fed cotton hulls *ad libitum*. In addition 1 lot received 300 g/hd/d cotton seed cake and 1 lot received the same amount of cotton seed cake and 150 g/hd/d of maize bran. Weight gain over 80 d on cotton seed cake was 149 g/d and on cotton seed cake plus maize bran was 162 g/d, the difference not being significant. Cotton hulls are well liked but an energy supplement of maize bran does not increase growth performance and also reduces economic returns.

[*Text in French*]

EFFECTS OF BROWSE SUPPLEMENTATION ON THE PRODUCTIVITY OF WEST AFRICAN DWARF GOATS

L. Reynolds
Humid Zone Programme
International Livestock Centre for Africa
P.O.Box 5320 Ibadan Nigeria

SUMMARY

A trial involving 28 West African Dwarf (WAD) goats fed 4 levels of supplement of *Leucaena leucocephala* and *Gliricidia sepium* over a basal diet of *Panicum maximum* and dried cassava peels was conducted over 2 reproductive cycles. The provision of supplementary browse to pregnant and lactating goats and to their offspring from weaning to 24 wk improved growth and survival rates of the offspring. Productivity, calculated as weight of kid weaned/doe/yr increased by 0.64 kg for each 100 g of browse DM consumed by the does daily. Intake of DM increased as the level of supplementation rose, reaching 180 $g/kg^{0.75}/d$ for lactating adults. Growth rates of kids and productivity of dams was about half that recorded in earlier trials with WAD sheep which had a similar food intake.

[*Text in English*]

PERFORMANCE OF DJALLONKE SHEEP SUPPLEMENTED WITH RATIONS CONTAINING DIFFERENT LEVELS OF RUBBER-TREE SEED

R.F. Bikoi Ntep
Station de Nkolbisson
Institut des Recherches Zootechniques
B.P. 1457 Yaoundé Cameroun

and

R.M. Njwe
Département de Zootechnie
Centre Universitaire de Dschang
B.P. 110 Dschang Cameroun

SUMMARY

The performance of Djallonké sheep fed concentrates containing graded levels of rubber seeds for 3 mo was studied at Nkolbisson-Yaoundé. Dry matter and crude protein intake in sheep fed concentrates containing 10% and 20% rubber seed was similar to that of the control group but intakes were lower ($P < 0.05$) in those fed concentrates with 30% and 50% rubber seed. Digestibility of dry matter, organic matter, cellulose, ether extract and nitrogen free extract was lower ($P < 0.05$) in sheep fed 30% and 50% rubber seed than in those fed 10% and 20%. Animals kept on the 10% and 20% concentrates gained 17 g/d and 10 g/d while those on the 30% and 50% concentrates lost 26 g/d and 51 g/d. A maximum of 20% rubber seed can be used as a ration supplement in Djallonke sheep.

[*Text in French*]

EFFECTS OF SEXUAL CONDITION AND DIETARY PROTEIN LEVEL ON FEEDLOT PERFORMANCE OF LAMBS IN ZIMBABWE

S. Sibanda, V.B. Kiwanuka and *T. Smith*
Grasslands Research Station
Department of Research and Specialist Services
Private Bag 3701 Marondera Zimbabwe

SUMMARY

Effects of 3 sexual conditions (entire, cryptorchid and castrate) and 4 dietary protein levels (120 g/kg, 140 g/kg, 160 g/kg and 180 g/kg) on the feedlot performance of lambs were studied in a 3 x 4 factorial experiment. Merino and Dorper x Merino x Suffolk lambs (average weight 30 kg) were fed a high energy diet *ad libitum* for 70 d, slaughtered, and physical and chemical carcass measurements made. Level of protein in the diet had no

effect (P > 0.05) on any variable. There was, however, a significant (P < 0.05) interaction between protein level and sexual condition. Weight gain and eye-muscle area, water content and protein content in the carcass increased with protein level while carcass fat and feed conversion ratio decreased in both entire and cryptorchid lambs: the opposite was the case in castrates. Neither protein level nor sexual condition affected carcass mass. The results suggest that carcass composition can be manipulated through higher dietary protein levels for entire and cryptorchid lambs. There seems to be no justification for increasing the protein level above 120 g/kg for castrates.

[*Text in English*]

REPRODUCTIVE WASTAGE IN SMALL RUMINANTS IN TROPICAL AFRICA

O.B. Kasali, E. Mukasa-Mugerwa, Tekelye Bekele
and
B.C. Njau
Animal Reproduction and Health Section
International Livestock Centre for Africa
P.O.Box 5689 Addis Ababa Ethiopia

SUMMARY

Causes of reproductive wastage in small ruminants in tropical Africa are highlighted. Pre- and post-natal deaths account for most of the loss. The role of the International Livestock Centre for Africa in collaboration with the National Agri-cultural Research Systems in overcoming the multiple factors involved in reproductive wastage in small ruminants is outlined.

[*Text in English*]

SEASONAL VARIATIONS IN PLASMATIC PRL, FSH AND LH AND IN FSH AND LH FEEDBACK IN PEUL SHEEP IN NIGER

A. Yenikoye
Université de Niamey
B.P. 237 Niamey Niger

SUMMARY

Seasonal changes in the levels and patterns of the gonadotropins PRL, FSH and LH were studied in Peul sheep in the Sahel zone in Niger. Highest concentrations (> 200 ng/ml) of prolactin were observed in Apr-May (long days and high temperatures) and lowest (< 100 ng/ml) in Dec/Jan (short days and low temperatures). Photoperiod is the principal environmental factor influencing prolactin secretion. Circannual changes in LH level show a

reduction of the concentration in Feb-Mar, Jun-Jul, Sep-Oct and in December, caused by a reduced frequency of LH secretion (1 peak/1.6 hr against 1 peak/4.0 hr) and not by a change in the sensitivity of the hypothalamo-hypophysary complex to ovarian steroids. There are no significant seasonal variations in autonomous pituitary activity for releasing FSH or in feed-back by ovarian steroids. The results suggest that seasonal variations in sexual activity in Peul sheep are controlled by the frequency of LH peaks.

[*Text in French*]

EFFECTS OF ZINC INJECTION ON THE REPRODUCTIVE PERFORMANCE OF SUDAN DESERT EWES GRAZING ZINC-DEFICIENT PASTURE

O.M. Mahmoud and *L.K. Jaja*
Department of Veterinary Pathology
University of Khartoum
P.O.Box 32 Khartoum North Sudan

SUMMARY

Subcutaneous injection of 250 mg of zinc to desert ewes grazing zinc-deficient pasture increased both conception and lambing rates. Lambs born from ewes injected with zinc were heavier than those born from the undosed ones.

[*Text in English*]

EVALUATION OF THE REPRODUCTIVE PERFORMANCE OF DRA GOATS IN MOROCCO

R. Boukhliq and *A. Lahlou-Kassi*
Département de Reproduction Animale
et d'Insémination Artificielle
Institut Agronomique et Vétérinaire Hassan II
B.P. 6202 Rabat-Instituts Maroc

SUMMARY

Preliminary surveys of the goat population in the Drâ valley of south-east Morocco have indicated the presence of a type with useful performance characteristics. Results from goats under station conditions indicate a prolificacy of 158% with 7% of triplet births, good fertility (89%), early puberty (5-10 mo) and an ability to produce 2 kid crops per year (33% of goats having an interval between successive parturitions of less than 8 mo). A programme is proposed to evaluate the genetic potential of reproductive, growth and milk production characteristics of the Drâ goats

and to study the effects of environmental variables. Field studies will be undertaken in the area where the goat is found to characterize the traditional production systems.

[*Text in French*]

PERIPHERAL PLASMA LEVELS OF PROGESTERONE AND OESTRADIOL-17ß DURING THE REPRODUCTIVE CYCLE OF WEST AFRICAN DWARF GOATS

M.O. Akusu, E. Nduka and *G.N. Egbunike*
University of Ibadan
Ibadan Nigeria

SUMMARY

West African Dwarf goats of different parities were bled through jugular puncture and the plasma assayed for progesterone and oestradiol-17ß by radioimmunassay. Samples were obtained during oestrus and pregnancy, at parturition and post-partum. Progesterone levels were minimal (0.18 ± 0.04 ng/ml) on the day of oestrus, followed by a steady rise, although the mean value 4 d later was less than 1 ng/ml: during pregnancy the mean level was 3.45 ± 0.12 ng/ml: at parturition it was 0.74 ng/ml: post-partum levels were generally lower than 1 ng/ml. Oestradiol levels did not follow a definite pattern. Progesterone levels are more suitable than oestradiol for the assessment of ovarian function and for pregnancy diagnosis in the West African Dwarf goat.

[*Text in English*]

MANIPULATION OF THE BREEDING SEASON IN SHEEP

A. Lahlou-Kassi and *R. Boukhliq*
Département de Reproduction Animale
et d'Insémination Artificielle
Institut Agronomique et Vétérinaire Hassan II
B.P. 6202 Rabat-Instituts Maroc

SUMMARY

Seasonal variation in reproductive activity of sheep is related to variations in daylength. Overt oestral activity may be depressed by long days. Active spermatogenesis can be maintained by using short duration light cycles. Melatonin appears to be necessary for the perception of daylength and its variations. Use of melatonin on anoestrus ewes results in an earlier breeding season but its injection in the middle of the season does not prolong it, nor does it affect the subsequent season. Melatonin injected into rams during the long day period stimulates testicular growth

in the same way as it does when injected during short days but, if used when scrotal circumference is at a maximum, does not prevent regression when daylength increases. Among the environmental factors not related to daylength, the "ram effect" is the simplest and most economic method for advancing the breeding season and for synchronizing mating without having recourse to hormonal treatment.

[*Text in French*]

EPIDEMIOLOGY AND ECOPATHOLOGY OF RESPIRATORY DISEASES OF SMALL RUMINANTS IN SEMI-ARID WEST AFRICA

A. Traoré
Programme des Zones Semi-aride et Subhumide
Centre International pour l'Elevage en Afrique
B.P. 60 Bamako Mali

and

R.T. Wilson
Réseau de Recherche sur les Petits Ruminants
Centre International pour l'Elevage en Afrique
B.P. 5689 Addis Abéba Ethiopie

SUMMARY

A short literature review and the personal experiences of the authors in the Sahelian zone of Mali are used as a basis for describing the epidemiology and ecopathology of small ruminants respiratory diseases. Prospects for control and future research priorities are outlined. Respiratory diseases often cause more than 50% of deaths in the West African semi-arid zone and are the major disease problem in small ruminants. A number of surveys has proved the presence of the principal respiratory viruses and bacteria. Attempts to overcome the problem by vaccination have had only limited success in controlling outbreaks. The necessity of using management techniques in any campaign to control the complex of respiratory diseases is emphasized.

[*Text in French*]

DISEASE AS A MAJOR CONSTRAINT TO SMALL RUMINANT PRODUCTION IN CAMEROON: THE EXAMPLE OF PESTE DES PETITS RUMINANTS

J.T. Saliki, F.N. Ekue, V.N. Tanya
and
M.D. Achu-Kwi
Institute of Animal Research
P.O.Box 65 Ngaoundere Cameroon

SUMMARY

The presence of peste des petits ruminants in 3 regions of Cameroon was confirmed through clinical signs, post-mortem findings, mortality patterns and the microneutralisation/ELISA test. Consistently higher homologous serum antibody titres were detected against PPR virus as compared to rinderpest virus, indicating that PPR virus was responsible for the outbreaks investigated. Forest goats succumbed faster than grassland ones, while sheep generally registered a lower mortality rate than goats. The use of tissue culture rinderpest vaccine to control the disease is recommended. The problems associated with this approach are highlighted with regard to cost-effectiveness.

[*Summary only in Proceedings*]

THE SUSCEPTIBILITY OF CHADIAN SHEEP AND GOATS TO PESTE DES PETITS RUMINANTS

O.A. Idriss, K. Bidjeh, K. Ganda, C. Diguimbaye
and
Y. Maurice
Laboratoire de Farcha
B.P. 433 N'Djaména Tchad

SUMMARY

Although peste des petits ruminants is widespread in Africa, its identification has never been confirmed in Chad. This study, carried out on young local goats and sheep, shows that Kirdimi goats are more susceptible to the disease than Sahel goats. Sahel sheep, however, are more affected by PPR than Sahel goats.

[*Text in French*]

ENDOPARASITES AS A CONSTRAINT TO GOAT IMPROVEMENT IN KENYA

R. Shavulimo
Regional Veterinary Laboratory
P.O.Box 450 Eldoret Kenya

SUMMARY

An 8 mo study was carried out on-farm in Kenya on dual-purpose (meat and milk) goats to assess the rate of worm reinfestation. Differential monthly egg counts indicated high concentrations of strongyles (460 epg) and strongyloides but low concentrations of tapeworms. Percentage composition of nematodes assessed by faecal culture was: *Haemonchus*, 51; *Trychostrongylus*, 40; *Oesophagostomum*, 8; and *Strongyloides*, 1. To compare the susceptibility of goat breeds to haemonchosis and to seek indications of genetic resistance, an experiment was conducted on 12 Small East African (SEA), 9 Galla and 13 Toggenberg x SEA goats. All animals were given a heavy dose of infective larvae. Mortality rates were 67% for Galla, 46% for Toggenberg x SEA and 25% for SEA goats. Deaths occurred earlier in Galla than in the other 2 breeds. SEA goats were able to survive a heavy worm infestation. No significant difference was seen in weight change, heamatocrit or faecal egg count in surviving infected animals.

[*Text in English*]

STRONGYLE INFECTIONS OF GOATS ON COMMERCIAL FARMS IN ZAMBIA

R. Muimo
Samora Machel School of Veterinary Medicine
University of Zambia
P.O.Box 32379 Lusaka Zambia

SUMMARY

Seasonal fluctuations of trichostrongylid infections in 30 adult female and 30 kid Boer goats were studied on 2 commercial farms from January 1988. Observations included faecal egg counts every 14 d and larval culture and differentiation and haematological indices every month. Eggs per gram in adults and kids peaked in February (rainy season) and in March and began to fall at the start of the dry season in May. Larval differentiation from faecal cultures showed that *Strongyloides papillosus*, *Haemonchus contortus* and *Oesophagostomum columbianum* were the most prevalent species. Anthelmintics were used during the rainy season on 1 farm but egg counts did not differ greatly from the farm where none were used.

[*Text in English*]

A 4-LAYER SANDWICH ELISA FOR DETECTION OF *Clostridium perfringens* EPSILON TOXIN

A.H. El Idrissi
Department of Microbiology
Hassan II Agricultural and Veterinary Institute
P.O.Box 6202 Rabat-Instituts Morocco

SUMMARY

A 4-layer sandwich ELISA was developed for the detection of *Clostridium perfringens* type D epsilon toxin. This method was sensitive to 6,25 ng/ml of purified toxin preparations. Similar sensitivity was obtained when ELISA was used to measure epsilon toxin in gut content preparations. The ELISA values correlated well with the mouse protection test when both assays were applied on intestinal content samples from animals suspected of pulpy kidney disease.

[*Text in English*]

THE PATHOGENICITY OF *Dictyocaulus filaria* IN ETHIOPIAN HIGHLAND AND HAMPSHIRE CROSS SHEEP

Getachew Tilahun
Institute of Pathobiology
University of Addis Ababa
P.O.Box 1176 Addis Ababa Ethiopia

SUMMARY

The pathogenicity of varying levels of single graded infections of *Dictyocaulus filaria* in Ethiopian highland and Hampshire cross lambs is described. Mortality, increased respiration rates, increased larval outputs, increased adult lungworms and loss of weight were observed in the infected groups. Symptoms were more severe in lambs receiving higher infective doses and Ethiopian highland sheep were more sensitive to infection than the Hampshire cross lambs. Uninfected control animals of both breeds performed well and gained weight.

[*Text in English*]

HEARTWATER IN GOATS

G. Uilenberg
Institut d'Elevage et de Médecine Vétérinaire
des Pays Tropicaux
10 Rue Pierre-Curie
94704 Maisons-Alfort France

SUMMARY

Heartwater ("la cowdriose") is caused by the rickettsia *Cowdria ruminantium* and transmitted by ticks of the genus *Amblyomma*. It causes heavy losses in exotic goats but its effects on indigenous goats are not well known. A preliminary study on genetic resistance in Guadeloupe indicated some influence of natural selection which could result from a recessive sex-linked gene. There is therefore the possibility of some selection against the disease. Immunity against natural infection, after inoculation and treatment, is not very strong but immunity to the same infection in the laboratory is total for at least 1-2 yr, the difference probably being due to antigenic differences among different strains.

[*Text in French*]

TRENDS IN ON-FARM PERFORMANCE TESTING OF SMALL RUMINANTS IN SUB-SAHARAN AFRICA

K.J. Peters
International Livestock Centre For Africa
P.O.Box 5689 Addis Ababa Ethiopia

SUMMARY

About 75% of Africa's livestock are associated with smallholder and agropastoral farming systems. Livestock performance can be greatly increased through improved management. Production problems, possible interventions and animal performance need to be identified within the prevailing system. On-farm testing has expanded considerably although on-station testing has been more reported. Most on-farm tests are short term, do not allow full assessment of the whole production process, and rarely match health and management data to performance. On-farm work can be complemented by on-station tests for comparative breed evaluation, assessment of specific performance ability and technology development. On-station comparisons are valuable but their application is limited by high costs and genotype-environment interactions. On-farm testing is impaired by constraints which increase the number of covariates, decrease accessibility to flocks and limit estimation of breeding values. On-farm recording therefore requires a large number of flocks, monitored coninuously, within a system oriented scheme. Efficient on-farm testing

needs standard methods, rapid data handling and results feedback, and can best be achieved through collaborative networks which could also organise complementary on-farm and on-station genetic improvement programmes.

[*Text in English*]

THE NATIONAL SHEEP IMPROVEMENT PROGRAMME IN COTE D'IVOIRE, 1984-1988

A. Oya
Programme National de Sélection Ovine
Ministère de la Production Animale
B.P. 1366 Bouaké 01 Côte d'Ivoire

SUMMARY

The National Sheep Improvement Programme aims to improve body conformation and weight of Djallonké sheep in Côte d'Ivoire by selecting and distributing Djallonké rams to supervised farms. From 1984 to 1988, 1750 young rams with an average 80 d weight of 14.3 kg were selected as foundation stock from 76 farms with 9613 ewes. Rams are selected for further service into 2 categories based on minimum 365 d weights of 37.0 kg and 31.1 kg. Following the establishment period, the Programme intends to consolidate the progress already achieved and to intensify selection pressure based on a better use of the data already obtained and to be collected in future.

[*Text in French*]

WEIGHT AND WEIGHT GAIN OF EAST AFRICAN LONG-FAT-TAILED SHEEP ON RWANDA RESEARCH STATIONS

G. Sibomana and *Th. Murayi*
Institut des Sciences Agronomiques du Rwanda
B.P. 138 Butaré Rwanda

and

A.R. Sayers and *R.T. Wilson*
Centre International pour l'Elevage en Afrique
B.P. 5689 Addis Abéba Ethiopie

SUMMARY

Data on weight and weight gain of East African long-fat-tailed sheep, starting in 1974, are analysed. Birth weights averaged 2.59 kg, were 11.6 kg at 90 d, 28.0 kg at 12 mo, 29.3 kg at 18 mo and 35.4 kg at 5 yr. Preweaning daily gains varied from 94 g to 157 g in the period 1974 to 1984

and were affected by sex and birth type. Correlations between weights and repeatabilities of weights at different ages were established and are discussed in relation to breeding plans.

[*Text in French*]

FACTORS AFFECTING MORTALITY AND GROWTH OF DJALLONKE LAMBS AT KOLOKOPE EXTENSION CENTRE IN TOGO

Y.N. Hadzi
Centre d'Appui Technique de Kolokopé
B.P. 65 Atakpamé Togo

SUMMARY

Data on mortality and growth of Djallonke lambs were collected from 1983 to 1985. Environmental factors influencing mortality were month and year of lambing and dam age at birth; birth type and birth weight from 0-5 d and year of lambing, dam age and birth weight from 5-120 d. Weight at birth was influenced by birth type, sex and dam age; at the age of 30 d and 120 d, weights were significantly influenced by month and birth type and dam age but sex was significant only at 30 d. The factors that affected growth rates from 0-30 d were month and type of birth, sex of lamb and dam age and from 30-120 d were month and type of birth.

[*Text in French*]

PRODUCTIVITY OF PUREBRED ADAL AND QUARTERBRED SAANEN X ADAL GOATS IN ETHIOPIA

Kassahun Awgichew, Yibrah Yacob and *I. Fletcher*
Institute of Agricultural Research
P.O.Box 2003 Addis Ababa Ethiopia

SUMMARY

The productivity of Ethiopian Adal and quarterbred Saanen x Adal goats was compared over 5 yr. Annual percentages of does kidding and of multiple births were 79 and 39. Kids born and kids weaned per doe joined were 1.12 and 0.95. Birth weights were 2.2 kg. Mortality rates from birth to weaning (3 mo), between 3 mo and 6 mo and between 6 mo and 12 mo were 14%, 6% and 4%. No differ-ences ($P > 0.05$) between the genotypes were noted in any of the foregoing parameters. Quarterbred Saanen x Adal does produced more ($P < 0.001$) milk (31 kg) during a 12 wk lactation than Adal does (24 kg). Progeny of the quarterbreds were heavier ($P < 0.01$) at 3 mo (9.7 kg) and at 6 mo (13.6 kg) than those of the Adal at the same ages (8.9 kg and 12.8 kg). Mature weight did not differ between the two genotypes (P >

0.05). Crossing Adal goats with Saanens to the quartebred level could increase milk production in the existing pastoral system without reducing other aspects of productivity and with no requirement for improved management or increased feed resources.

[*Text in English*]

FACTORS AFFECTING WEIGHT-FOR-AGE OF RED MARADI (SOKOTO) GOATS AT A NIGER RESEARCH STATION

A. Djibrillou Oumara
Centre de Multiplication du Bétail de Fako
B.P. 107 Maradi Niger

SUMMARY

Mean weights of 130 Red Maradi (Sokoto) goats at a research station in Niger were 2.05 kg at birth, 3.94 kg at 30 d and 9.05 kg at 90 d. Growth is affected by several environmental factors including sex of the kid, the month and year of its birth and the age of its dam.

[*Text in French*]

PRELIMINARY RESULTS ON EVALUATION AND BREEDING OF BLENDED DAIRY GOATS IN TANZANIA

S.M. Das
Livestock Production Research Institute
Private Bag Mpwapwa Tanzania

SUMMARY

A 1 yr study to evaluate blended dairy goats was conducted in the semi-arid areas of Tanzania at Kongwa and Malya stations. For 83 blended does bred at Kongwa apparent fertility was 59.0%, fecundity 83.1% and prolificacy 140.8%: these figures were 68.3%, 89.9% and 131.6% for 139 does at Malya. Breeding weights were 29.4 ± 0.96 kg at Kongwa and 32.1± 0.55 kg at Malya. Birth weights were 2.53 ± 0.07 kg at Kongwa and 2.44 ± 0.04 kg at Malya and weaning weights 8.7 ± 0.29 kg and 10.0 ± 0.18 kg at the 2 stations. Birth type and sex influenced weaning weight ($P < 0.01$) at both sites. Lactation yield at Kongwa was 120.3 ± 8.72 kg and lactation length 266.0 ± 2.66 d, butter fat content being 2.7%. Age at kidding and birth type did not influence lactation yield.

[*Text in English*]

THE CHROMOSOMES OF TWO TUNISIAN SHEEP TYPES

I. Bahri
Ecole Supérieure d'Agriculture de Mograne
9 rue du 1er juin
2050 Hammam-Lif Tunisie

and

E.P. Cribiu
Laboratoire de Cytogénétique
Institut National de la Recherche Agronomique
Jouy-en-Josas 78350 France

SUMMARY

Both fat and thin-tailed Tunisian sheep have the same karyotype (2n = 54). The 26 pairs of autosomes comprise 3 metacentric and 23 acrocentric pairs. The heterosome pair has an acrocentric "X" and a metacentric "Y" chromosome.

[*Text in French*]

PRODUCTIVITY OF THREE SUB-TYPES OF SUDAN DESERT SHEEP AT EL HUDA RESEARCH STATION, SUDAN

A.H. Sulieman
El Huda National Sheep Research Station
El Managil Gezira Sudan

and

R.T. Wilson
Small Ruminant Research Network
International Livestock Centre for Africa
P.O.Box 5689 Addis Ababa Ethiopia

SUMMARY

Shugor, Dubasi and Watish sub-types of Sudan Desert sheep were evaluated on the basis of 3 productivity indices (weight of lamb weaned, per kg ewe per year and per $kg^{0.75}$ per ewe per year). Components used to construct the indices were litter weight at 120 d, parturition interval, survival to 120 d and ewe post-partum weight. There were differences among sub-types in all components but, because of interactions among them, there were no differences in the indices. The indices were 16.8 kg, 419 g and 1.14 kg and were lower than those found in other studies. Suggestions for improving productivity are made.

[*Text in English*]

NOTE

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THE SMALL RUMINANT RESEARCH NETWORK

NEWSLETTER

International Livestock Centre for Africa,
P.O. Box 5689, Addis Ababa, Ethiopia. Telephone: 61-32-15

N°15 JUNE 1989

SMALL RUMINANT PRODUCTION TECHNIQUES -- TRAINING COURSE IN NIAMEY, 8-19 MAY 1989

A small ruminant production techniques training course, the second of the Small Ruminant Network French language training courses, was held in Niamey in Niger from 8-19 May 1989. In spite of the heat (temperatures were in excess of 40°C for most of time) and the lack of an ideal venue (the ICRISAT training facilities which should have been used were not in fact ready) the participants considered that the course had been very useful to them and was generally voted a success.

The course comprised formal lectures over an 8-day working period, preceded by 1½ days of presentations by participants on their own research programmes or on small ruminant research in their own countries. The lectures were divided into five groups which covered: systems of production and methodology of data collection and analysis; livestock performance; nutrition and feeding; health; and genetics and selection. On a scale of 1 to 5 participants scored most of these groups of subjects in the region of 4, which is an improvement in percentage terms over the score achieved by the same course in the French language held in Addis Ababa in 1987.

The 24 participants from 13 francophone countries had the benefit of the experience of Professor Alhassane Yenikoye, Vice-Rector of the University of Niamey, who gave a course of lectures on the physiology of

reproduction. Health aspects were covered by Dr Adama Traoré of the ILCA Semi-arid and Subhumid Zones Programme in Mali, while nutrition and feeding lectures were given by Dr Jim Lambourne, formerly Director of Research of ILCA and currently in charge of the ILCA Semi-arid Zones Programme in Niger. The other series of lectures were given by Trevor Wilson, Coordinator of the Small Ruminant Network, and Daniel Bourzat formerly of the Small Ruminant Network but now returned to his substantive post at the Institut d'Elevage et de Médecine Vétérinaire des Pays Tropicaux.

The lecture materials are being updated, edited and revised and will be issued in due course as an ILCA training manual.

WATER BALANCE OF MARADI GOATS AND YANSAKA SHEEP IN NIGERIA

(A.A. Aganga, N.N. Umunna, E.O. Oyedipe and P.N. Okoh**)*

*[*Department of animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria; **Department of Biochemistry, Bendel State University, Ekpoma]*

SUMMARY

A metabolism study comprising 21 days pre-collection and adjustment period and 14 days collection period was undertaken using 10 Maradi bucks and 10 Yankasa rams. During the collection period, feed intake, water intake, faeces voided and uring output were measured.

Results show that Maradi goats produced drier faeces than Yankasa sheep. At high environmental temperatures, evaporative water loss plays an important role in regulating body temperature. Evaporative water loss of Yankasa sheep was 162.4 ml/kg$^{0.73}$/day and 120.4 ml/kg$^{0.73}$/day for Maradi goats. Faecal water content was in the range 50-60% for Yankasa sheep and 40-45% for Maradi goats.

INTRODUCTION

Water is lost from an animal by three main routes: in the urine, in the faeces and by evaporation. Degen and Young (1981) reported that high

temperatures increase the requirements for water needed for evaporative cooling and high feed intakes necessitate more water intake for digestion and excretion of waste products. To maintain a constant body water volume, water lost from the body must be balanced by an equivalent water intake. Water intake originates from water in the food, free drinking water and the water derived from metabolic reactions.

Environmental conditions (Clark and Quin, 1949) and total feed intake (Degen and Young, 1980) influence the water intake of sheep. Water balance is the equation between the sum of water drunk, water taken in with food and metabolic water formed by oxidation of food on the one hand, and urine water, faecal water and water lost by evaporation via skin and lungs on the other.

Water balance data on indigenous Nigerian sheep and goat breeds were not available prior to this study.

MATERIALS AND METHODS

Ten Maradi bucks weighing on average 20 kg and 10 Yankasa rams averaging 25 kg were used in the study. Animals were put in metal metabolism cages for a pre-collection and adjustment period of 21 days during which time they were given free access to drinking water and feed made up of *Andropogon gayanus* hay and concentrate mixture. The concentrate mixture comprised 73.5% whole maize, 24.5% cottonseed cake, 1.5% bone meal, 0.25% common salt and 0.25% of a vitamin-mineral premix. Proximate analyses of hay and concentrate were: CP, 4.1 and 16.8%; ash, 9.0 and 5.0%; either extract, 2.0 and 4.8%; CF, 39.1 and 6.5%; and NFE, 45.8 and 66.9%. The animals were fed hay and concentrate at a ratio of 60:40. The adjustment period was immediately followed by a 14 days' collection period during which feed intake, water intake, faeces voided and urine output were measured. The animals were fitted with bags for collection of faeces. Urine was collected in plastic pails placed under the metabolism cages. The plastic pails contained 25 ml of toluence to prevent the evaporation of the urine and 25 ml of 50% H_2SO_4 to trap the nitrogen in the urine. The animals were weighed once every two weeks. The moisture content of the feed and faeces were determined (AOAC, 1980). A sample of fresh faeces was

collected daily, and faecal moisture content determined by drying the fresh material at 105°C to constant weight. Total daily faecal water loss was calculated from the total daily faecal output. Preformed water in feed was determined after calculating the water content of samples of feed dried at 105°C to constant weight. Metabolic water gained was estimated daily by calculating the oxidation water obtainable from 1 g of feed and multiplying this figure by the difference between dry food eaten and dry faeces voided (Schoen, 1968). Evaporative water loss was calculated by substracting the sum of faecal and urinary water loss from the sum of water drunk, preformed water and metabolic water.

The study was conducted in March-April (hot, dry season) with maximum temperature 39°C, minimum temperature 21°C, maximum relative humidity (RH) 67°C, minimum RH 13%, sunshine 10.4 hours and rainfall nil. All data collected were subjected to analysis of variance procedures (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Average daily gains in body weight were 0.13 and 0.06 kg for the Yankasa rams and Maradi bucks respectively, the differences being significant ($P < 0.01$). Yankasa rams consumed more feed and water and gained more weight than Maradi bucks. Yankasa rams under the heat stress of the hot dry season and on food of low moisture content required 202.5 $ml/kg^{0.73}/day$, Maradi bucks under similar conditions required 153.4 $ml/kg^{0.73}/day$ ($P < 0.01$). Yankasa rams also had higher faecal water output ($P < 0.01$) than Maradi bucks, 16.08 $ml/kg^{0.73}/day$ versus 9.82 $ml/kg^{0.73}/day$ respectively. Water loss in urine by Yankasa rams was 45.6 $ml/kg^{0.73}/day$ while Maradi bucks lost 42.0 $ml/kg^{0.73}/day$ ($P > 0.01$). Evaporated water loss from rams was 162.4 $ml/kg^{0.73}/day$ while Maradi buck lost 120.4 $ml/kg^{0.73}/day$ ($P < 0.01$).

The study shows that Maradi goats can tolerate heat stress better than Yankasa sheep. Maradi goats drank less water and produced drier faeces than Yankasa sheep, which is an indication of better water conservation mechanism. The percentage faecal water ranged from 50-60% for Yankasa and 40-50% for Maradi goats. This observation is similar to values of 57.1-

57.6% found in Cheviot crossbred wethers (Bailey, 1964) and 54-57% in Columbia wethers (Wallace et al, 1972). Yankasa sheep voided 501.1 ml of urine daily while Maradi goats excreted 382.9 ml daily. This is in agreement with earlier reports that if an excess of water is ingested, urinary volume will rise.

Daily metabolic water intake of Yankasa was 19.02 $ml/kg^{0.73}$ which was sugnificantly higher ($P < 0.01$) than that of Maradi goats 16.95 $ml/kg^{0.73}$. Of the total water intake, metabolic water intake was 8.46% for sheep and 9.84% for goats. This observation is in agreement with other findings which show 5-10% of total water for oxidative water intake in ruminants.

The results of this study show that Yankasa sheep utilized 72.3% of its total water intake for evaporative cooling while goats used 69.9%. Environmental temperatures ranged from 21-39°C during the period of experimentation. The two species had high evaporative water loss because the study was conducted in the hottest time of the year. Wallace et al (1972) reported that Columbia wethers maintained at 20-26°C used 45.2-53.2% of their water intake for evaporative cooling.

At high environmental temperatures, evaporative water loss plays an important role in regulating body temperature. Blaxter (1962) demonstrated in sheep that evaporative water loss was relatively constant up to 25°C, but rose steeply above that temperature. This would appear to account for the high evaporative water loss in the present study.

Degen and Young (1981) reported that evaporative water loss was 38.0-55.7% of total water loss for Suffolk ewes maintained at 20°C. These researchers also reported that the percentage of feacal water ranged between 50 and 63% for Suffolk ewes. Schoen (1968) noted that heat stress stimulated the drinking appetite of East African goats and also induced greater resorption of water by the kidneys as well as by the gut.

CONCLUSIONS

This study indicates that Nigerian indigenous goats economise water better than sheep. Maradi goats are therefore better animals for production than Yankasa sheep under the conditions of inadequate water supply common in arid and semi-arid tropical environmental conditions.

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ETHIOPIA HOPES TO INCREASE GOAT MILK PRODUCTION

(From Ethiopian Herald, February 9, 1989)

The FARM-Africa British Dairy Goat Project in Ethiopia is poised to raise the milk production of goats through improved breeding which it says is of direct benefit to rural women who sell the milk and keep the proceeds.

Dr Christie Peacock, coordinator of the project, said during a visit to the National Artificial Insemination Centre (NAIC) in Kaliti where eight male goats were kept in quarantine, that the project aims to lead to better family nutrition. She noted that it will provide income for poor families who cannot afford to own a cow in areas of high population pressure and small farm sizes.

Dr Peacock said the goats called Anglo-Nubians are imported from Britain and arrived at the centre last Friday and that they are best for cross-breeding because of their tropical ancestry and high milk productivity.

The project coordinator went on to say that they increase the milk production of the offspring without causing them to lose their adaptation to tropical environments and that throughout the tropics the Anglo-Nubians have been found to be the most successful exotic breed to cross with local goats.

Six of the male goats will be taken to the Alemaya University for cross-breeding and two will be kept at Kaliti for semen collection, Dr Peacock noted.

She claimed that the project will cross-breed the best local goats with Anglo-Nubian sires, making it possible to provide the cross-bred offspring on credit to women who will be trained in forage production, goat health and management.

FARM-Africa is currently carrying out the project in collaboration with the Ministry of Agriculture in Gursum province, East of Hararghe Administrative Region, with local goat breeding through a 3 million Birr project agreement. The accord was concluded last December between the organisation and the Office of the State Committee for Foreign Economic Relations.

It plans to expand its activities in other parts of the country in the future.

FACTORS AFFECTING THE PRODUCTIVITY OF DJALLONKE SHEEP IN MALI

(T. Niare, I. Dembele and M.I. Traoré. Institut Polytechnique Rural de Katibougou, P.O.Box 6, Koulikoro, Mali).

SUMMARY

Two village flocks of Djallonke sheep were studied during a two-year period to evaluate reproductive performance, to describe management methods and to analyse flock structure. Age at first lambing was 15 months but was very variable. The fertility rate of 77 per cent showed that very few females gave birth twice in the one year. Lambing intervals varied between flocks and between years. The number of multiple births was very low and the litter size averaged 1.05. A preliminary evaluation of these components leads to an indication of numerical productivity of 0.81 lambs born alive per female per year. This productivity could be improved and some indications of how this may be achieved are given.

INTRODUCTION

The socio-economic importance of small ruminants has been clearly established in the West African Sahel and particularly in Mali following the long years of drought. Small ruminants can contribute considerably to reduce the protein deficiency of rural and urban populations. In order to be able to estimate fully their probable contribution, further information is required so that coherent development programmes can be established. Unfortunately, information is still very limited and relates, for the major part, to data from research stations. Data from traditional systems are more limited (Wilson et al, 1983; Wilson, 1986). Previous studies on Djallonke sheep in Mali date from 1953 to 1957 from the National Research Station at Sotuba (Vallerand, 1977). Such outdated information may not have much relevance in the 1980s and there is a need to carry out studies in the current environment on Djallonke sheep, particularly on reproductive performance. Reproductive performance is fundamental to increasing animal performance and is a key element in livestock productivity. Better total overall productivity of small ruminants in relation to cattle is in large

part related to their better reproductive performance (Branckaert, 1984). A better understanding of reproductive performance is essential if total output is to be increased. The objective of the present study is to provide preliminary information on some components of productivity of Djallonke sheep reared in a traditional system.

MATERIAL AND METHODS

Two village flocks in Feya situated about 20 km from Katibougou were situated for a period of two years in 1986 and 1987. Within each year animals were followed on a daily basis from April to September by a final year student of the Institut Polytechnique Rural de Katibougou. Data collected included the parity of the animal, the age of the ewe, the number of lambings, the sex of the lamb and the type of birth (single or multiple). Animals were not individually identified. Additional data on age at first lambing on the seasonal distribution of lambings and on lambing intervals were obtained by questioning of owners or of shepherds.

RESULTS

Flock structure

Flock structures expressed as age and sex were established during annual vaccination campaigns. Total sheep numbers varied between years being 179 and 252 in 1986 and 1987 in one village and 154 and 113 in the two years in the other village.

Females comprised about 75 per cent of the whole flock with females of reproductive age being equivalent to about 55 per cent. Flock turnover appears to be relatively rapid as 95 per cent of females were less than 6 years old (Dembele, 1987). Both village flocks had a rather large proportion of castrated males with between 30-50 per cent of males (6.8-12.0 per cent of the total flock) represented by this class of animal (Dembele, 1987). The ratio of breeding rams to females was 36:1 in one village but only 3:1 in the second village. Both these ratios are outside

the "optimal" which is normally considered to be 20-30 females to 1 breeding female in a traditional village system.

Management

Management varies according to climatic season. In the rainy season natural feed supplies are abundant and diverse in species composition and are able to fulfill the nutritional requirements of the animals. In the rainy season the animals are herded by a shepherd or by a child within a small radius of the village which does not exceed 3 or 4 km. Some classes of animals are, however, kept on a picket at the house (particularly young lambs of <3 months) or on non-cultivated areas (lactating ewes). Water is not a problem at this time of year as it is usually available from ponds, puddles and other temporary water sourcess. In the dry season, animals are not herded and are free to wander about gathering their own food. At this time of year the main nutritional sources are crop residues or grasses on fallow land. The poor nutritional value of these forages explains in large part the poor state of the animals and indicates the need for some kind of supplementary feeding. Supplementary feeding is, however, not carried out systematically, is given to only a small portion of the animals, and not for the whole of the dry season. Water is available only from village wells and is usually provided to animals either at midday or in the evening.

Weaning took place in both villages at between 3 and 4 months and lambs were rarely transferred from one flock to another. Weaning occurs naturally as no practices are employed to prevent lambs from continuing suckling after 4 months of age. Castration is carried out a short while after weaning (at 6-8 months in 25% of cases) or some time later (12 to 18 months in 16% of cases).

Reproductive performance

Age at first lambing. Based on information from herders, age at first lambing varied from 11 to 20 months with the majority of animals giving birth for the first time between 12 and 14 months (Traoré, 1986). Based on physical observations and on age established from dentition, the average

age for 53 first lambings was 15 months. An average age of 14 months, varying from 11 to 17 months, for Djallonke type sheep has already been quoted elsewhere from a number of studies (Charray et al, 1980). Djallonke sheep appear to be more precocious than Sahel sheep in the north in which type of animal there seem to be various breed differences (Sakiliba, 1987).

The principal cause of variation in age at first lambing appears to be the management system (Vallerand, 1979; Charray et al, 1980). An improvement in management and especially in nutrition can considerably reduce the age at first lambing. Very early first births (resulting from a first conception at 4-6 months) are, however, best avoided, as in addition to a higher mortality rate of young, the future reproductive performance of the female may be affected. It might be useful to arrive at a standard weight for the Djallonke under which females should not be allowed to breed.

Lambing intervals. About 95 per cent of herders estimated that the lambing interval was between 7 and 8 months (Traoré, 1986; Dembele, 1987). This figure is in agreement with documentary evidence for other Djallonke sheep (Charray et al, 1980), but is much shorter than the value of 10 ± 0.5 months for Djallonke sheep on station in Kolda, Senegal, (Fall et al, 1983). A similar figure of about 8½ months between lambings has however been established for Sahel type sheep under traditional management in central Mali (Wilson et al, 1983; Wilson, 1986). Data provided by herdsmen may be unreliable and in order to confirm the interval of 7-8 months, more detailed studies would need to be undertaken.

Improved management would undoubtedly improve the interval between lambings but any attempts to improve, that is to decrease, the lambing interval without improved management could result in disappointment. Previous studies have suggested that 8 months between lambings is an optimal interval (CIPEA, 1983). This means that 3 lambings in 2 years are possible, which is an adequate rhythm and belies the "unproductive" nature of traditional sheep production in the semi-arid areas and is indeed the target of intensive systems.

The lambing interval comprises the period of anoestrus plus the period of gestation. Gestation period is invariable but the interval to

conception is a function of the duration of lactation anoestrus and the appearance of the first post-partum oestrus. The anoestrus period in this study appears to be about 3 months, which is well in excess of the 22 to 66 days quoted by numerous other authors (CIPEA, 1983), but may in fact help to conserve the long-term reproductive potential of breeding females.

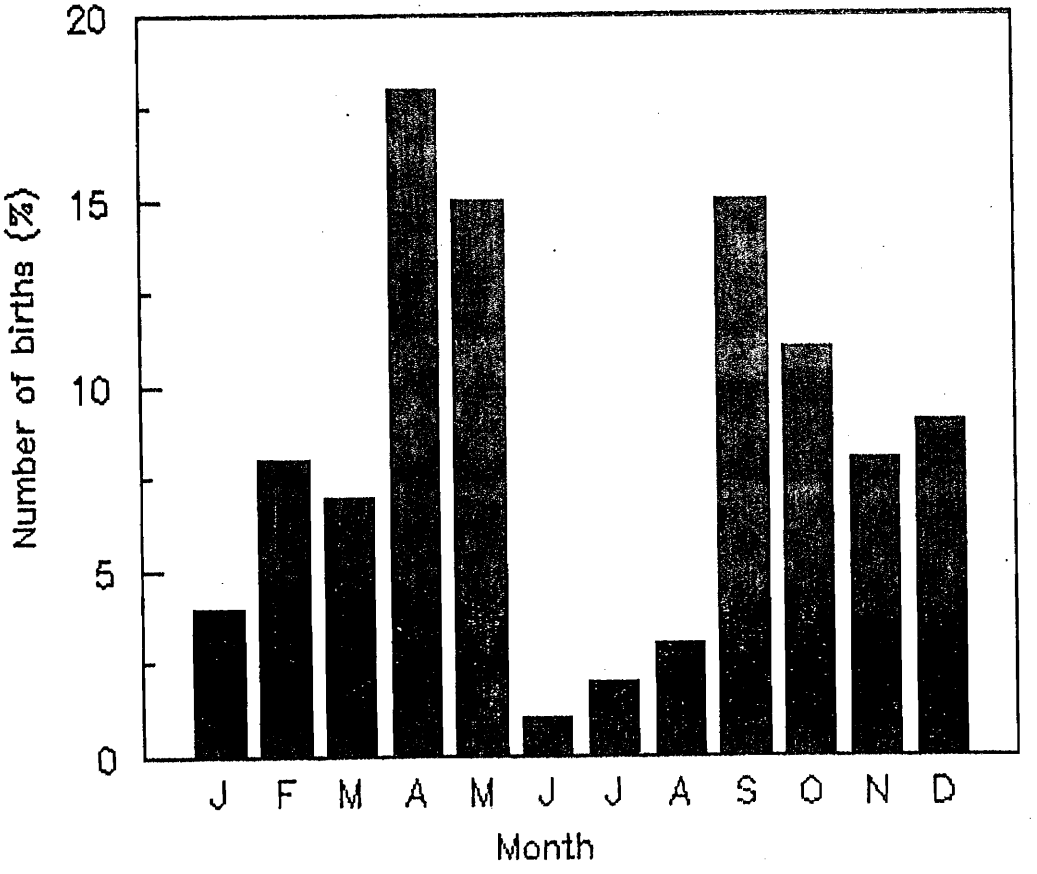
Fertility. Fertility is expressed as the number of births in the year in relation to the average number of females present. Apparent fertility in the two flocks was 78 per cent in 1987 and 76 per cent in 1986. These overall values for the village flock mask the differences between individual flocks within the village which were quite considerable (Traoré, 1986; Dembele, 1987). It seems probable that more than one birth in a year, in spite of herders' estimates of lambing interval, are not very common, although births did occur throughout the year (Figure 1). There were, however, significant differences among months in the number of births as calculated by χ^2 ($P < 0.05$).

There were two major peaks in birth, which accounted for 90 per cent of all births noted, in Feb-May and Sept-Dec. Most conceptions therefore occurred just before and during the period of the main rains. This conception period corresponds to a breeding season which contradicts the idea that the breeding season of tropical and sub-tropical sheep is independent of season (Yenikoye, 1984). The breeding season may be governed by nutritional status and the availability of food as indicated elsewhere (Charray et al, 1980; Fall et al, 1983).

It is possible that low conception rates in Jan-Apr result from low oestrus activity and lengthening of the oestrus cycle as indicated also for the Peul ewe in Niger (Yenikoye, 1984) which may be related to photoperiod and temperature. In Mali, highly positive correlations between the monthly number of births of sheep with temperature and with photoperiod have also been found (Wilson, 1986). The maximum number of births thus takes place during a period when feed quality is declining, which may seriously affect the chances of survival of lambs.

Litter size. Litter size in one village flock was 1.07 in 1986 and 1.05 in 1987, and in the other one was 1.04 and 1.05. Although differences between years in litter size were minimal, it is probable that there were

Figure 1. Monthly distribution of births



differences depending on the age of the ewe. Ewes in the class of 3-6 years usually give a greater number of multiple births, with a maximum in the class of 4-5 years. Triplet births are almost unknown. This litter size is similar to those obtained in many other places (Charray et al, 1980; Wilson et al, 1983; Charray, 1986; Wilson, 1986) but is much lower than those reported for the Djallonke in Togo (Amégée, 1983). A preliminary conclusion is that the litter size in Djallonke sheep under traditional management is low.

CONCLUSIONS AND RECOMMENDATIONS

Reproductive performance in traditional flocks which are characterised by uncontrolled mating and constant changes in animal numbers is not easy to determine. Nonetheless, continued study over a two-year period has enabled some indications of reproductive performance to be obtained. Even though season was not taken into account in these studies, it is certain that nutritional conditions before the breeding season and during the lambing season determine reproductive performance. In order to reduce seasonal variations at these periods, reserve of forage and of agricultural by-products or other forms of feed supply are necessary. Reproductive performance in the two flocks studied is clearly lower than other results obtained for Djallonke sheep (Vallerand, 1969; Berger et al, 1980; Charray, 1986). Reproductive performance is further reduced due to the high mortality rate before weaning. A considerable improvement in reproductive performance can be obtained by better nutrition as has been demonstrated for the Djallonke in Cote d'Ivoire (Berger et al, 1980). Several possible improvements can be envisaged. Improved general management, considered to be an important factor in overall flock performance, is one of the most important improvements to be made. Better management will be achieved through interventions in housing, in disease control and in improved nutrition and in management of breeding. Further improvements in productivity will come from selecting animals which have shown a performance superior to the average of the whole flock.

This short and incomplete study should serve as a basis for further studies aimed at identifying performance and improving the productivity of Djallonke sheep in Mali.

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Thomson E.F. and Thomson, F.S. (editors) 1988. Increasing small ruminant productivity in semi-arid areas. Klumer Academic Publishers, Dordrecht, The Netherlands. ISBN 0 89838 386 2. 296 pp.

This book is the proceedings of a workshop held at the International Centre for Agricultural Research in the Dry Areas (Aleppo, Syria) from 30 November to 3 December 1987. A total of 24 papers and/or summaries appears under the three headings: Livestock Systems and Nutrition (6 titles), Breeding (10) and Health (8). There are 17 Syrian authors, with 9 contributions from UK, 7 from USA, 5 from Australia, 4 from Jordan, 3 from Ethiopia, 2 each from Egypt, Morocco and Cyprus, and 1 each from Turkey, The Netherlands and West Germany.

The 6 papers in the major section on livestock systems and nutrition cover the contribution of livestock products and human dietary needs, the importance of barley, research strategies for development, increasing feed resources for small ruminants, improving livestock production from straw based diets and a comparison of grazing and browsing ruminants. There are some hackneyed themes here, in particular the one on straw based diets, and van Soest's comparison of grazing and browsing ruminants will be familiar

to many readers of this volume. The first 4 papers in the breeding session will also be very familiar to anyone who has attended conferences of this type in this region . They are all by authors from outside the region and indeed, with one exception none of the authors has had any in-depth experience of working in the middle east and semi-arid regions. The remaining 7 papers in the breeding section cover country projects but only 1 is effectively a research paper, and of the remaining 6 only 2 draw on past experience while the other 4 are projections of what might be achieved. Four of the first 5 papers in the section on health are related essentially to the Mediterranean and Near-Eastern region. The remaining 3 are the most interesting papers in this section, being generally reviews of genetic resistance to helminth infections.

These proceedings contain little that is new either in research or in ideas. This book provides a useful background to small ruminant productivity in the semi-arid areas but does, in spite of the wide geographical background of the authors, emphasize the Mediterranean and Near-East areas. It would have been more useful if a greater proportion of the references had been drawn from areas outside this region.

(Reviewed by Azeb Melaku and Trevor Wilson)

Wilson, R.T. and Azeb, M. (editors). 1989. African small ruminant research and development. International Livestock Centre for Africa, Addis Ababa, Ethiopia. 578 pp.

The influence of ILCA's Small Ruminant Network can be clearly seen in the proceedings of a conference held earlier this years entitled "African Small Ruminant Research and Development". It is hard to imagine a volume containing these sorts of papers fifteen or even ten year ago. Yet in these proceedings, containing 44 papers, 40 are by African scientists from 22 countries representing north, southern, east and west Africa. Bringing these scientists together in an African context is in itself an achievement but a general improvement in the quality of papers -- their content and presentation (this latter underlining the efforts made by the editors) -- can also be discerned.

The volume has five sections on: production systems and economics; feed resources and feeding systems; reproduction; health; and breeds. The papers report research for a wide range of situations but there is a welcome dominance of papers relating to smallholder production -- nutrition and reproduction specialists straying farther from the reality of small farms.

Papers in this volume would be useful to researchers working in Africa. There are few, however, which offer much direct help to people involved in the development of sheep and goats.

The editors should be congratulated not only for producing a clear, readable and well-presented document but also in doing it so quickly. Two months between conference and publication of proceedings is an enviable achieved.

(Reviewed by Christie Peacock, FARM Africa)

[Note: Copies of "Small Ruminant Research and Development in Africa" can be obtained on request to the Editors).

AFRICAN SMALL RUMINANT RESEARCH NETWORK: REGIONAL PLANNING MEETING FOR WEST AFRICA, 1-3 AUGUST 1989

The first committee meeting of the Interim Steering Committee of the African Small Ruminant Research Network was held in Addis Ababa from 14-16 March 1989. At the meeting, the modes of collaboration between the Network and the host institution, ILCA, were laid down and research priority themes were also established. Two of the regions delineated by the Plenary Sessions at the Bamenda planning conference were selected for advanced planning during 1989. These regions were West Africa and Southern Africa.

Arrangements are proceeding for the holding of the West African regional network meeting in Togo from 1-3 August 1989. Invitations to attend this meeting have been sent to ministries concerned with livestock development and to research institutions in Benin, Burkina Faso, Côte d'Ivoire, Gambia, Ghana, Nigeria, Sierra Leone and Togo. It is hoped that

during the course of the meeting, research protocols will be prepared relating to the major themes identified at the Bamenda conference. The protocls will then be submitted to potential donors with a view to securing finance so that collaborative research projects may be started during the early part of 1990.

TECHNICAL AND ECONOMIC ASPECTS OF A SHEEP FATTENING TRIAL IN BENIN

(A.B. Kodjo, J.P. Deneux and E. Deka. Section Zootechnie, Département de Production Animale et d'Agronutrition, FSA/UNB, P.O?Box 526, Cotonou, Bénin).

SUMMARY

A total of 18 young male Djallonke sheep (8-18 months) were bought from village flocks and fattened for 84 days before the feast of Tabaski on natural pastures and flour-milling by-products. Animals were assigned to 3 lots of 6 each on the basis of initial weight, Lot 1 averaging 19.3 kg, Lot 2, 15.9 kg and Lot 3, 13.3 kg. Average daily gains of these lots during the experimental period were 34 g, 38 g and 40 g. Average initial prices per kg for the 3 lots were 332 FCFA, 317 FCFA and 310 FCFA. The cost per kg of gain was higher for animals which were initially heavier but the gross margin for each animal in terms of unit of liveweight gain was higher for the heavier animals.

INTRODUCTION

Compared to research on cattle, little scientific research has been done on small ruminants and most of the work done has been carried out under station conditions. The work undertaken has usually been fattening trials with growth performance or reproductive performance also included. In the last few years more emphasis has been given to systems studies in the traditional environment in order that these systems might be improved

but little attention has been given to the economic aspects of these systems.

Improvements in small ruminant production systems will come through encouraging smallholder farmers to see livestock raising as a commercial enterprise. In order for farmers to accept this point of view, it will be necessary to design and introduce production systems which are not technically demanding and which are economically beneficial. Small scale fattening of sheep appears to be one model that could be adopted by small farmers. This article provides results of a study of sheep fattening in Benin.

MATERIAL AND METHODS

Eighteen young male sheep (8-18 months) were bought in central Benin 105 days before the feast of Tabaski. All sheep were entire males of pure or almost pure Djallonke blood, adapted to the climatic conditions of the research site 120 km from Cotonou, the national capital and a potential market for sheep for Tabaski.

Animals were divided into 3 lots of 6 on the basis of weight and age. Animals in Lot 1 with 2 pairs of adult incisors averaged 19.5 ± 2.16 kg, Lot 2 with 1 pair of permanent incisors averaged 15.1 ± 0.86 kg and Lot 3 with deciduous teeth only averaged 13.3 ± 1.69 kg. A simple shelter of uprights with a corrugated iron roof was constructed with each lot having 4.5 m^2 of cover or 0.75 m^2 per animal.

Animals went out to pasture for 6 hours a day (09:00-12:00 and 15:00-18:00) and fed on natural pastures, mainly *Panicum maximum*. The supplement comprised wheat bran, the composition of which was 91.4% dry matter, 5.0% ash, 10% fibre, 17.7% crude protein, 0.6% fat and 57.6% nitrogen-free-extract. The quantity of wheat bran and its nutritional content distributed to each lot are shown in Table 1.

In the transition period of the first 3 days animals first received hay, then hay + wheat bran. Hay was considered to be a suitable transitional feed because in their natural environment feed supply had been essentially dry grass and straw, whereas the pasture at the fattening

Table 1. Amount of wheat bran fed to different experimental groups of Djallonké sheep in Benin

Lot	Amount of bran (g/head)	Nutrient content	
		Nitrogen (g/head)	Metabolisable energy (Kcal/head)
1	200	26	0.562
2	250	33	0.702
3	300	39	0.843

centre was green and luxurious. Animals were treated against internal parasites (Valbazen) on the 6th and 60th days of fattening. Animals were dipped 4 times in Tigal against external parasites at the 30th, 45th, 60th and 75th days of the experiment and were vaccinated against PPR using tissue culture vaccine on the 19th day after their arrival at the fattening centre.

All costs relating to the experiment were calculated from the time of purchase, including transport costs. Depreciation costs were estimated on a per head basis based on the cost of construction and the time of use of the fattening pens and an amount was added to cover the cost of small materials (ropes, books...).

Animals were in the pens for 95 days, an 11-day habituation period followed by a trial period proper of 84 days.

RESULTS AND DISCUSSION

Technical results

Animal health. Following heavy rain in the first 15 days of the experiment, 10 animals fell sick. Classic symptoms of the respiratory disease complex were evident with colourless nasal discharges. Animals

were successfully treated with 10 ml of ozotine and 10 ml of oxytetracycline administered intramascularly.

Growth performance. Relative growth in the different lots illustrates the biological laws of growth and development with the younger animals growing faster than those which were older (Table 2). Average daily gains of Lot 1 and Lot 2 were comparable to those obtained in northern Togo for Djallonke sheep between 106 and 314 days under an intensive production system, in which animals were fed on improved pasture with a supplement of brewers' grains (van Vlaenderen, 1985). The nutritive value of wheat bran is not significantly higher than brewer's grains and it therefore appears that *Panicum maximum*, during a certain period of its growth, is a useful base feed for fattening sheep.

Economic results

The average purchase price per animal was 5139 FCFA (Table 3) with larger animals costing relatively more than smaller animals. Purchase of animals on a per head, as opposed to a per kg, basis -- which is the common practice in Africa -- puts more value on larger than on smaller animals.

With regard to the net price per animal which includes transport costs, it can be seen that small animals cost considerably more than larger

Table 2. Growth performance of intensively fed Djallonke sheep in Benin

Parametre	Lot 1	Lot 2	Lot 3	Overall
Initial weight (kg/head)	19.3 ± 2.2	15.9 ± 0.8	13.3 ± 1.7	16.2 ± 3.0
Final weight (kg/head)	22.2 ± 2.3	18.9 ± 1.2	16.7 ± 1.3	19.2 ± 2.8
Average daily gain (g)	34 ± 5	38 ± 13	40 ± 8	36 ± 9

Table 3. Economic analysis of fattening of Djallonke sheep in Benin

Economic parametres	Lot 1	Lot 2	Lot 3	Overall
Purchase price				
per head	6233	5050	4133	5139
per kg l.w.	332	317	310	317
Net purchase price				
per head	7668	6485	5568	6574
per kg l.w.	397	407	418	406
Rearing costs				
feed per head	4661	4686	4810	4685
total costs	12229	11170	10379	11259
total costs per kg l.w.	552	590	623	595
Sale price	15517	13242	11667	13475
Gross margin				
per head	3288	2071	1288	2216
per kg l.w.	148	109	77	115
per kg l.w. gain	1160	609	286	725

animals. The net price of animals per kg liveweight would have been different if the following model had been adopted for the calculation:

Net purchase price/ kg liveweight = Actual purchase price/kg liveweight + Transport cost/kg liveweight

Fattening costs. The average cost per animal during the fattening period was 4685 FCFA. Differences in costs between the 3 lots were due to differences in feed costs, to a higher cost of smaller animals and to other fixed and variable costs which were debited equally to all animals irrespective of size. Even though the net price of large animals was greater at purchase, the rearing costs were lower and heavier animals thus had a net selling price after fattening which was higher than small animals.

Sales. Animals were sold at the end of the experimental period on the basis of "finished" liveweight. This system obviously differs from sales per head. Animals were sold at an average price of 700 FCFA/kg liveweight, this price being established on estimations of the selling price per head generally practised by livestock traders. In spite of having a relatively high cost after fattening, larger animals (of heavier weight) showed a gross margin greater than animals of smaller size. In spite of a fixed price per kg buyers were still more interested in larger than in smaller animals. It is evident, then, that whatever system of selling is adopted the size of the animal is important in its sale. In fact size relates to two aspects that the buyer looks for in a Tabaski sheep, i.e. the height and the quality. Withers height is one of the factors which leads to a preference for Sahel sheep over Djallonke sheep in the eyes of buyers even though Djallonke sheep have a better dressing percentage than Sahel sheep. Coat colour is also an important aspect in selling price. For equal weight, buyers prefer pure white animals or animals which are mainly white. If price were not fixed per kg i.e. if animals were sold on a per head basis, pure white or almost pure white animals would sell at a higher price than coloured animals.

CONCLUSION

Fattening of young sheep for Tabaski on a relatively simple supplementary ration has shown itself to be profitable. Profits are greater for animals which are heavier at purchase or are able to achieve a heavier weight at the end of the fattening experiment and especially if the net purchase price was low. "Qualitative" aspects of sheep are taken into account much more when animals are sold on a per head than on a per kg liveweight basis. Large size, in particular withers height, and a white coat are two characterstics of Tabaski sheep which positively influence their sale price.

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THE SMALL RUMINANT RESEARCH NETWORK

NEWSLETTER

International Livestock Centre for Africa,
P.O. Box 5689, Addis Ababa, Ethiopia. Telephone: 61 32 15

N° 16 October 1989

NETWORK REGIONAL PLANNING MEETINGS

Following the creation of the African Small Ruminant Research Network at the Bamenda conference in January 1989 (Newsletter 14: 1-5) and the first meeting of the Network's Interim Steering Committee, regional planning meetings have been held for the West African Humid Zone and for the southern region.

The first meeting was held at Bethania in Togo from 1-3 August 1989. Local arrangements were very ably handled by Dr Y.I. Pessinaba, Director of the Togolese National Small Ruminant Project and a member of the Steering Committee of the Network. The southern region meeting, aimed at the nine member countries of SADCC, was held in Bulawayo, Zimbabwe from 18-20 September 1989. Arrangements in Bulawayo were made by Mr Ronny Sibanda, also a member of the Steering Committee. "Intermediate liaison" in Harare was handled by Lindela Ndhlovu of the Department of Animal Science of the University of Zimbabwe.

The purposes of both meetings were to bring together researchers and development workers and to design regional research protocols. Protocols will be reviewed by the Steering Committee at its next meeting in December 1989 before being submitted to potential donors with a view to their funding the collaborative research.

West African Humid Zone meeting: 1-3 August 1989

There were 19 participants when the meeting got under way on Tuesday 1 August, including representatives of 7 of the 9 countries invited. The work programme included an official opening, attendance of the media and a vote of thanks. Four principal working groups operated over the course of the meeting and four protocols, aimed to cover regional projects and within the identified theme areas of the Network, were discussed, debated and designed in outline. The desired standard format of the protocols took some time to explain to the participants but the need for such a format and for a regional presentation of identical or closely similar research projects at several research sites was acknowledged and appreciated.

Only a proportion of participants had, as requested, brought their own outline protocols to the meeting. The input of ILCA staff in the design of experiments and in assisting with the calculation of budgets was much appreciated by national participants.

The first part of the meeting closed with an assurance by the Network Coordinator that clean protocols would be despatched to participants (and to those expected but not able to attend) by 15 August. On the basis of the regional protocols, national participants would provide individual site/country protocols with the minimum of delay for consideration at the next Steering Committee meeting before submission to donors for funding.

Visits to farmers collaborating with the Small Ruminant Project and to the Djallonké sheep station at Kolokopé comprised the second part of the meeting.

Southern African Regional Meeting: 18-20 September 1989

The African Small Ruminant Research Network held an inaugural meeting for its southern region in Bulawayo, Zimbabwe from 18 to 20 September 1989. The meeting was attended by representatives of National Agricultural Research Systems from 8 of the 9 countries of the SADCC region. Only Angola failed to provide a representative, who was unable to travel for "administrative reasons", and most of the other countries had at least two participants.

Participants in the southern region planning meeting of the African Small Ruminant Research Network, Bulawayo, Zimbabwe

The purpose of the meeting was to initiate coordination of research on small ruminant production in the SADCC region and to prepare collaborative research protocols. Participants had been asked to arrive at the meeting with outline protocols which already had the "in principle" agreement of their respective organizations.

Following a formal opening of the meeting by His Worship the Mayor of Bulawayo (Councillor A.L. N*ube), the Chairman of the Network's Interim Steering Committee, Professor L.H.B. Lebbie introduced the Network, which had been formally constituted following the Bamenda meeting in Cameroon in January 1989, the aims and objectives of the Network and the current state

of advancement. Dr Trevor Wilson, the Network Coordinator, then explained to participants the aims of the regional planning meeting and the output expected from it.

Participants then divided into two working groups in two of the Network's identified research themes. The major themes were Nutrition and Development of Feeding Systems and Reproductive Wastage and Health Management. Smaller groups worked on two other Network themes, Breed Improvement, and Systems Economics, outside the main sessions. The meeting was also considered to be a training session, participants being assisted by senior ILCA staff at the meeting to improve protocols to a standard format, and providing all the information required to justify a research project. Participants unanimously agreed at the close of the meeting that ILCA staff had been very helpful in enabling them to adopt a more rigorous approach to protocol preparation, an essential preliminary to any research programme.

The output of the meeting was three protocols related to nutrition, to reproductive wastage and to breed improvement. These protocols were considered as regional projects. Each project was supported by up to 8 sub-projects, these being specific research proposals for implementation by national institutions at their own sites.

Participants were asked to return to their own organizations for final adjustment of the protocols and to resubmit them to the Network Coordinator by 15 November 1989. The completed protocols will be discussed, along with those prepared by the West African regional group, by the Network Steering Committee at its second full session in December 1989. Following discussion, approval and assignment of priorities by the Steering Committee, the proposals will be submitted to potential donors with a request for funding assistance, in January 1990.

A half-day field trip to the Matopos Research Station of the Research and Specialist Services Department provided a welcome breath of fresh air as a change from the intense intellectual activity of the three-day meeting. Mr Tim Smith, the Head of Station, and Mr Ronny Sibanda, in charge of the Small Ruminant programme, and their teams, kindly conducted the participants round the station and explained the research programmes.

16th ANNUAL MEETING OF THE TANZANIA SOCIETY FOR ANIMAL PRODUCTION

The 16th Annual Meeting of the TSAP incorporated the "2nd Regional Conference of Animal Production Societies of Eastern and Southern African Countries". The joint reunion was held at the Arusha International Conference Centre during the period 26-28 September 1989. There were about 120 registered participants most of whom came from the research, extension and development communities in Tanzania. In addition to the large Tanzanian contingent, however, there were representatives of Swaziland, Botswana, Zimbabwe, Malawi, Zambia, Uganda, Ethiopia and Kenya. The last named country had a particularly large presence, mainly from the University of Nairobi but also from the Agricultural Development Corporation.

Some 30 papers on varying livestock topics were presented during the meeting. The papers will eventually be published in the form of Proceedings.

The "1st Regional Conference" had been held in conjunction with the meeting of the Kenya Animal Production Society in 1988. A business meeting was convened during the course of the Arusha conference in order to discuss the possibilities of making more formal arrangements for regional conferences in the future and to encourage the formation of animal production societies in those countries which do not already have them. Only Kenya, Tanzania and Zimbabwe have formally constituted societies but even in these countries it became apparent that membership and objectives differed. The FAO and IDRC, who had provided support for a number of participants, and ILCA were invited as observers to the business meeting. It was agreed that a "3rd" regional meeting should be held in Zimbabwe in 1991 and that in the interim the participants at the Arusha conference would encourage the formation of societies in their own countries.

Among the recommendations made at the close of the conference was one congratulating the African Small Ruminant Research Network on its formation and its progress to date. The recommendation went on to urge that an East African regional planning meeting of the Small Ruminant Network be convened as soon as possible to complement the West and southern regional meetings already held.

NETWORK PERSONALITIES

Dr Sahr H.B. Lebbie apparently does not like the name given him by his parents and is universally known as "Lebbie". Elected as Chairman of the Interim Steering Committee (most probably because of his skill in organizing "meschoui", "braaivleis", "nyama ya kuchoma" or just plain barbeques) he has a long and distinguished career in African livestock production.

Lebbie studied in his own country of Sierra Leone (where he was born in 1947) for his B.Sc. degree which he was awarded in 1970. He subsequently spent two years at the University of Illinois where he obtained an M.Sc. in animal science. A Ph.D. in animal science from the University of Ile Ife brought his academic qualifications to the highest international level in 1980.

Almost all Lebbie's working career has been devoted to University teaching. He is currently a Senior Lecturer and Head of the Animal Production Department at the University of Swaziland where he teaches courses in animal production, nutrition, and genetics and breeding. He is also Team Leader of a goat production systems project, which is financed by IDRC, and a member of several university committees. Lebbie has participated, as a student and lecturer, in a number of ILCA courses and will take up a one-year position at ILCA in January 1990 as a Visiting Scientist during his sabbatical leave from his University.

Mr Ronny Sibanda was born in Zimbabwe in 1953 and was elected as a southern region member to the Steering Committee of the African Small Ruminant Research Network in Bamenda in January 1989. It is probably just coincidence that Ronny also obtained his B.Sc. at the University of Sierra Leone, as he swears that Lebbie had no influence on where he undertook tertiary education. Ronny shortly expects to be awarded an M.Phil. degree by the University of Zimbabwe for work on small ruminants.

Currently employed by the Research and Specialist Services Department of the Ministry of Agriculture of Zimbabwe, Ronny is based at Matopos Research Station near Bulawayo. As Head of the small stock section at Matopos and a member of the Small Ruminant Research Committee of R+SS, Ronny contributes a host of technical and administrative skills to the

Network. His personal research interests at the moment are in the role of goats in mixed species guilds and in the control of bush invasion of natural grasslands.

STAFF CHANGES AT ILCA'S SMALL RUMINANT NETWORK

Daniel Bourzat, well known to most members of the Newsletter through personal contact or correspondence, left the Small Ruminant Network (which he always preferred to call by its former name of the Small Ruminant and Camel Group) on 31 December 1988. Daniel had been with the unit for four years, on secondment from his employers, the Institut d'Elevage et de Médecine Vétérinaire des Pays Tropicaux at Maisons-Alfort, France.

Wide experience in the tropics (and elsewhere, as he did his military service in the French Kerguelen Islands in the South Atlantic) and particularly in small ruminant producton, made Daniel an ideal member of ILCA's small ruminant research team. His particular interests were in the study and classification of production systems and, during his time at ILCA, he assisted several national organizations in the design and execution of research. In particular he collaborated in Congo and in Somalia in field research and helped Djibouti and Cameroon in the initial design of systems studies.

A popular figure with everyone, but particularly as "Godfather" to all francophone visitors to ILCA at Addis, Daniel has returned temporarily to France to complete a State Doctorate in animal production. He continues to be employed by IEMVT and hopes to continue (indeed already has continued as he gave lectures at the training course in Niamey in May 1989) his collaboration with ILCA in collaborative research and training.

Bernard Rey, also on secondment from IEMVT initially for a period of two years, has replaced Daniel in the small ruminant section at ILCA. Bernard brings a new set of skills to the Network and has a degree in veterinary science from the National Veterinary School at Lyon in France in addition to an M.Sc. in farm management from the International Advanced Mediterranean Institute at Zaragoza in Spain. In addition to French and English, Bernard is fluent in Spanish and says he can get by in Italian.

In addition to working as a teaching assistant in the livestock economy section of the Lyon veterinary school and as a practical veterinarian, Bernard has worked on systems studies in Mexico, the Dominican Republic and Mexico. He has most recently collaborated with the International Course for Development Oriented Research in Agriculture at Wageningen in the Netherlands. His initial tasks with the Small Ruminant Network will be to study the potential and possibilities of collaborative research in cross-breeding goats for milk production and the preparation of training manuals in priority research themes of the Network.

FAO SUBNETWORK ON "GOAT NUTRITION AND FEEDING"

The 4th seminar on "Goat Nutrition and Feeding" organized by the FAO subnetwork of Cooperative Research on Goat Production took place at the "Statione di Potenza de l'Istituto Sperimentale per la Zootecnia" (Italy) from 3-5 October, 1988. There were 32 specialists from 10 countries including Cyprus, Egypt, France, Israel, Italy, Morocco, Norway, Spain, Sweden and Tunisia.

The aims of the seminar were:

- presentation of scientific papers
- discussion for the preparation of a book entitled "Goat Nutrition"
- visits to goat farms in Basilica and in Campania.

The range of subjects (8 in total) presented was wider than at previous seminars of the subnetwork. It included feeding behaviour and levels of intake, digestion, energy, feeding of dairy goats, use and dietary value of rangeland vegetation, body condition and composition of goats, feeding of young goats, and feeding and kid carcasses.

This programme allowed the discussion of fundamental and applied aspects of goat nutrition, the nutritional problems of North Europe and Mediterranean countries, and how nutritional parameters were used in studies of goat production systems.

For two days progress in various topics including microbial digestion, transit time, use of pasture and rangeland vegetation, energy and nitrogen requirements, use of new methods (GRF, complete rations) and new feeds (protected lipids, formldehyde treated oilmeals, hydroxide treated straws), use of milk replacers and feeding of young female goats.

It was concluded that studies on specific aspects of goat nutrition must be continued and that new methodologies appearing in the nutrition of other species must be rapidly used on goats.

SMALL RUMINANT RESEARCH IN ZIMBABWE

Zimbabwe, in comparison to many African countries, has a large input into small ruminant research. The principal organization carrying out this is the Department of Research and Specialist Services of the Ministry of Agriculture but the Animal Science Department of the University of Zimbabwe and the French Technical Cooperation Programme are also involved in goat and sheep research.

As the following list makes clear, the R+SS programme at 4 of its research stations is wide ranging and problem solving in nature.

Grasslands Research Station

1. Comparisons of sheep breeds and management systems:
   a) Productivity of Dorper, Merino and Crossbred ewes
   b) Development of (a) to study breed x nutrition interractions

2. Use of sheep as a model ruminant to investigate nutritional problems, especially the use of crop residues.

3. Carcass evaluation of light and heavy sheep breeds at different liveweights.

Henderson Research Station

4. Management and productivity of Stargrass/Silverleaf pastures utilized by sheep.

5. The onset of puberty and other factors associated with reproduction in Dorper and Merino ewes.

6. The use of goat milk in the rural areas of Zimbabwe.

7. The use of whey as a ruminant feed: treatment of roughage.

8. The effects of fly control on intake of feed and liveweight gain in lambs.

Makoholi Research station

9. Comparisons of indigenous and Boer goats with special reference to the supply of meat.

10. The nutritive value of indigenous grains and crop residues for rearing kids from weaning to slaughter weight under commercial conditions.

Matopos Research Station

11. Indigenous sheep improvement programme.

12. Growth and carcass yield of indigenous wethers slaughtered at different ages.

13. Relationship of season of kidding and supplementary feed to the reproductive performance of indigenous goats and the survival and growth of their progeny.

14. A study of the effects of the interactions between cattle and goats on their productivity and also on veld species utilization and ecological change.

15. Assessment of nutritive value of some fibrous forages common in Zimbabwe.

16. Assessment of permanent incisor eruption in indigenous goats and sheep.

17. The effect of ammonia (urea) treatment on the utilization of cereal stover by sheep.

18. Studies of diet utilization, growth and carcass characteristics of indigenous castrated goats fed complete diets at two ages post-weaning.

Further information on ruminant research in Zimbabwe and preliminary results can be obtained from:

- Mr R. Sibanda, Matopos Research Station, Private Bag K. 5137, Bulawayo, Zimbabwe

- Dr L. Ndlovu, Animal Science Dept, University of Zimbabwe, P.O.Box MP 167, Harare, Zimbabwe

- Mr J. Rivière, Head, Goat Dev't Project, Private Bag 88 B, Bikita, Zimbabwe

IMPORTANT ANNOUNCEMENT

The number of addresses to which this Newsletter is sent is currently 1251. The Newsletter is obviously a success and appreciated as a means of information exchange. Publication and postage costs are, however, becoming

prohibitive and we feel that perhaps not all persons to whom the Newsletter is addressed make the maximum use of it. We therefore request **ALL PEOPLE WHO WANT TO CONTINUE TO RECEIVE THE NEWSLETTER TO RECONFIRM THEIR INTEREST BY COMPLETING AND RETURNING TO US THE LAST PAGE.**

NOTE

If your address is incorrect or if a colleague would appreciate receiving a copy of this Newsletter, please fill in the form below and send it to:

The Editor
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THE SMALL RUMINANT RESEARCH NETWORK

NEWSLETTER

International Livestock Centre for Africa,
P.O. Box 5689, Addis Ababa, Ethiopia. Telephone: 61 32 15

N° 17 February 1990

NETWORK STEERING COMMITTEE MEETING

The Interim Steering Committee of the African Small Ruminant Research Network held its second full meeting in Nairobi from 11-15 December 1989. The principal purpose of the meeting was to consider the protocols submitted for funding at, and following, the regional meetings held in Togo in August and in Zimbabwe in September of 1989.

In general, the Committee considered that the protocols approached the objectives of the collaborative research network. The Committee felt, however, that a number of the protocols were insufficiently precise, were too ambitious, or were requesting funding for items properly the responsibiliby of the national institutions involved.

The Committee decided that some basic tenets in order that funding by the Network might be considered should be formulated. The final points were that:

- the Network will provide incremental funding only -- basically this means that there is no intention to finance a national research programme;

- protocols must fall clearly within one of the priority areas defined at the Bamenda Conference, endorsed by the Steering Committee at its

first meeting in Addis Ababa in March 1989, and reiterated at the regional meetings;

. research must be problem-oriented and of regional or zonal significance -- protocols should preferably be established in common with other institutions and be capable of being replicated at a number of sites;

. research should preferably be multidisciplinary in nature;

. within the framework of incremental funding the Network will not consider requests for funding of scientists' salaries which are properly the responsibility of the executing NARS (temporary support staff can be included in budget requests) -- requests for provision of vehicles by the Network will be considered only under exceptional circumstances;

. the work programe must be scientifically sound, clearly identify the experimental design, be realistically capable of achieving the expected output, and be related to the costs detailed in the budget;

. the budget must be sufficiently detailed for an assessment of its relevance to be made, must be clearly identified with corresponding items in the work programme, must clearly show the "counterpart" contribution by the host institution and must clearly state what other funding is being sought or has been received -- contingencies, except for detailed and exceptional circumstances, must not exceed 10 per cent of the total;

. collaborating institutions and executing personnel must be specified by name in the relevant sections of the protocol.

Bearing these points in mind, the Network Coordinator was asked to return some protocols to the executing scientists for modification.

Modified protocols will be considered again by a sub-committee of the Steering Committee at the regional meetings to be held in 1990.

NETWORK PROGRAMME FOR 1990

At the Nairobi Steering Committee meeting it was agreed that the main Network events for 1990 will be:

Regional Planning Meetings

Eastern Region (Sudan, Ethiopia, Djibouti, Somalia, Kenya and Uganda): Addis Ababa 12-15 February

Central Region (Rwanda, Burundi, Zaire, Gabon, Congo, Central African Republic, Cameroon): Kigali 6-9 June

Sahelian and Northern Region (Chad, Niger, Mali, Senegal, Mauritania and Mediterranean littoral countries): Niamey 24-27 September

Small Ruminant Production Techniques Training Course (in English)

Bulawayo 14-25 May

Scientific Conference and Network Planning Meeting

Nairobi 3-8 December

The Network is now calling for contributions to the scientific Conference to be held in Nairobi during December. Contributions should be based on original research and preferably in the themes of the Network. A limited amount of funding will be available from the Network to cover travel and other costs of some participants: potential participants are, however, urged to try and secure their own funding. As with earlier conferences IFS will pay travel and subsistence costs for some of its grantees: these should apply directly to IFS for assistance and inform the Network Coordinator that they have done so. Titles and summaries should be sent to the Network Coordinator at ILCA as early as possible.

A Network Planning meeting will be held consecutive to the Conference. A new Steering Committee will be elected and plans formulated for the succeeding two years.

SMALL RUMINANT PRODUCTION AND RESEARCH IN ZAIRE

[Kafumbo Monga Ilunga, Head of Small Ruminant Reproduction and Multiplication Unit, Lubumbashi University; and Dibanziwa Mwana Nsambu, Head of Small Ruminant Research, Nioka Station, National Agricultural Study and Research Institute. This paper was prepared by the two Zairean participants in the Network training course held at Niamey in May 1989).

Introduction

Zaire has a population of 35 million people whose animal protein and feed supplies are not keeping up with the demographic expansion. Cattle husbandry, inherited from colonial times, is handicapped today and suffers from all the socio-economic constraints which have manifested themselves throughout the Third World.

In an effort to overcome the inadequate meat supply, Zaire has just started a programme to improve small ruminant production. This programme is being undertaken with the other countries of the Economic Community of the Great Lakes countries. The programme comprises scientific research as well as an increased emphasis on small ruminant productivity in schools of higher education and in universities.

Small Ruminant Production in Zaire

Zaire has an area of 2 345 409 km^2 with a very diverse ethnographic population who themselves have considerably different feeding habits. Small ruminant development therefore is related to different aspects of food production including hunting, fishing, agriculture and other aspects of livestock production.

On account of its size, Zaire has areas which include almost all the types of climate found in the tropics. There are, for example, enormous natural prairies which are green for as much as six months of the year, dense forests in which there are many wild mammals, and lakes, rivers and streams full of fish -- in fact one might consider sometimes that one is in

a garden of Eden. The natural resources have in the past contributed to the lack of interest in livestock rearing.

During the colonial period, the native population lived amongst all these resources in the rural areas while emphasis was given to urban development and to some large scale developments, such as ranching, feed-lots, and dairy farms. The local population was unprepared for independence. The lack of development has been aggravated in view of the world economic crisis. Research to improve the productivity of livestock is undertaken particularly by the Department of Agriculture. This department is now making a great effort to support development projects both for agriculture and for livestock throughtout the rural areas. Both government and non-governmental organizations are working throughout the whole of Zaire in an effort to ensure that the country is capable of feeding itself.

The small ruminant population of Zaire is estimated at about 3.9 million of which 3/4 are goats and 1/4 sheep. The predominance of goats is due to the food habits of the Zairean population. The small number of sheep is mainly due to certain taboos and to a lack of familiarity with mutton by the people, such that sheep have still have a lower priority in the rural areas than to goats. The principal small ruminant production system is a traditional one in which the animals are either left to forage for themselves or are attached to pickets during the day. In both cases animals are returned to a small enclosure or to a purpose-built house at night. Some traditional producers are working with development projects in some parts of the country. These development projects are in particular related to animal health and production.

Research

The first attempts at the introduction of exotic breeds were made by INERA at Nioka in about 1934 or 1935. In 1957 Kamori and Toggenburg goats were introduced by INERA to Mvuazi station, but these introductions were unfortunately not successful. Further efforts to introduce exotic types were made in 1970 when Djallonke sheep were imported to Mvuazi. In 1980 an

experimental nucleus was set up at Lubumbashi University and finally, research on small ruminants was again started at Nioka station in 1986.

Research directions. In order to avoid waste of scarce resources, the three countries of the Economic Community of the Great Lakes (Zaire, Rwanda and Burundi) have divided research amongst themselves under the aegis of the Agricultural and Livestock Research Institute (Institut de Recherches Agronomiques et Zootechniques, IRAZ).

In Zaire this has meant that small ruminant research will be carried out jointly by INERA and by the Faculty of Veterinary Medicine of Lubumbashi University. In order the carry out this mandate, two local networks have been created. One of these networks, managed by INERA, covers Upper-Zaire, North Kivu, Goma, Equateur, Kasai Oriental, Kasai Occidental, Lower-Zaire, and Kinshasa and its area. The other network, sponsored by Lubumbashi University, covers Shaba, Bamdundu and South-Kivu. The fundamental task of these netwoks in the early stages is to characterize the local types of small ruminants in the various regions.

Research results. Results of research on Djallonke sheep at Mvuazi station have been published in the information bulletin of INERA. Nioka station established a programme of characterization of the local goat in 1988 in terms of its productive parameters. In the field of animal health, epidemiological studies within a radius of 20 km of Nioka station have allowed the identification of the major diseases in that area. At Lubumbashi Univesity research has so far concentrated on morphometric characteristics of the local goat and on some aspects of productivity. It is expected that results of this work will be published shortly.

Current research. Current work is concentrating on establishing growth and reproductive performance in order that selection for improved productivity can be carried out in the near future. In terms of nutrition, research is concentrating on low cost feeding systems. Research is also looking at the epidemiology of the major diseases identified with a view to establishing priority treatments. In conjunction with these three programmes, research is being undertaken on the economics of livestock production in order to determine the real problems of the livestock producers in each area.

Future prospects

The first objectives in achieving increased meat production will be to supply improved males of local types into the traditional system. Once an adequate knowledge of the potential of the local types is qcquired it will be possible to introduce exotic breeds but of types which have already shown that they are sufficiently productive in the tropical humid zones. A complete typology of production systems will be established. Finally, appropriate and low cost feeding systems for the best use of natural resources will be identified.

Constraints

A major problem to the research programme is the size of the country which makes travel and adequate coverage difficult. So far there are totally inadequate information on small ruminant productivity. There are inadequate extension services throughout most of the country. We have not been able to produce enough improved rams for distribution to the small-scale producer. Pastures are generally in poor condition and animals suffer from ill health. Two final constraints are the lack of adequate documentation on small ruminants and inadequate outlets for research results.

FORTHCOMING MEETINGS

IVth International Rangeland Congress, Montpellier (France), 22-26 April 1991

The IVth International Rangeland Congress (IVth IRC) will convene at the "Corum", the Congress Centre of Montpellier (France), under the aegis of AFP (French Association for Range Management) and of AGROPOLIS (International Center for Research and Higher Education in Mediterranean and Tropical Agriculture).

The official languages of the congress will be French and English; permanent simultaneous translation will be available, including during the field trips.

The Congress will include 4 days of presentations and discussions on 22, 23, 25 and 26 April and a one-day field trip on Wednesday 24 April.

The Scientific committee wishes to emphasize issues related to the Mediterranean isoclimatic zone; but, naturally, other subjects matters will be addressed, as proposed by participants. In particular, general issues of methodologies and management techniques, problems pertaining to other ecoclimatic zones (inter-tropical, temperate, montane, continental, boreal, etc.) are envisaged.

A total of 8 major themes have been identified. These are: fundamental aspects of range science; range resources; animal resources; production systems; fire ecology; legal and socio-economic aspects of range management and development; and education and training.

Registrations are to be made through the:

Société Internationale de Congrès et Services
10, rue Charles-Amans
34000 Montpellier
France

V International Conference on Goats, New Delhi (India), March 1992

Details of this meeting, which could provide an important outlet for Network research results, can be obtained from the President of the International Goat Association (who is alos President of the Conference).

R.M. Acharya
Deputy Director-General
(Animal Science)
Indian Council of Agriculture Research
Dr R. Prasad Rd.
New Delhi 110001
India

The theme areas of this Conference are: production systems; genetics and breeding; feed resources; nutrition; adaptation; male reproduction; female reproduction; dairy processing; meat processing; fibres and skins; diseases; and human nutrition.

DAIRY GOAT PROJECT AT NGOZI (BURUNDI): AN UPDATE

(Bernard Rey, Small ruminant Network)

The collaborative crossbred dairy goat project established by GTZ and the Burundi government since 1980 has already been the subject of an article in Newsletter N°7, pp.14-15. A further visit to this project was made in October 1989 with a view to establishing closer collaboration between the Network and the project. This appears to be a suitable opportunity to up-date the progress made by the project during its almost 10 years of existence. The main objective of the project is to distribute improved bucks of the German Alpine breed in order to increase milk and meat production of the local goat in the heavily populated areas of Burundi.

A major success of the project has been to encourage the drinking of goat milk in the rural areas where, before the advent of the project, it was considered a taboo. Local goats, be it noted, are not milked.

Other major advances are the construction of permanent buildings at the project headquarters for housing of bucks and the construction of a small cheese making facility. The extension of improved management and feeding techniques over a wide area has also been achieved.

Purebred Alpine bucks and their 3/4 bred and 7/8 bred offsprings are kept at the project site where they are supplied green forage, constituting about 2/3 of the ration, and concentrate. About 20 hectares of cultivated forage provide the green material for the goats' rations. Species planted include *Tripsacum* (which is also used as a mulch in the coffee plantations), banagrass, *Panicum maximum* (in mixed cropping with *Desmodium*), *Leucaena diversifolia* and *Calliandra*.

The cheese factory, built in 1987, can deal with 200 litres of milk per day. The cheese makers are now Burundians who were originally trained by a French cheese maker. Currently 150 litres of milk per day, from the station and from the traditional system, are processed. The milk from the traditional system is collected at a series of collecting points.

The villagers closest to the station, where the extension effort was first introduced, constitute a band of high milk supply for the project.

The proportion of crossbred goats in this ring is estimated at 70-80 per cent of all goats. In this zone the number of services by improved bucks in the service stations now appears to be stable at about 8000 per year. Small groups of producers, supported by the extension service, are now becoming self-sufficient in the management of inputs and in the service centres. It is now policy to no longer extend services unless they are demanded by these groups. Villages farther away from the centre of the project have not yet achieved this stage. Milk production can still be increased even though there has been a considerable increase in output due to project activities.

The strategy for the inner band, decided at a recent evaluation of the project, will be the provision of 3/4 bred Alpine bucks which are better adapted to conditions in the service centre than pure Alpine. This is probably because the 3/4 bred are still well adapted to the local environment. Some bucks, selected on their dams' milk production, are now being produced by some of the more advanced local producers of the project. The Ngozi project is now of the opinion that better use should be made of all the information and data available, both on station and in the traditional system. In addition, if it is considered that the distribution of crossbred bucks is an objective which has been partially achieved, it is now time to evaluate their impact on local systems and on productivity in the traditional system. With this consideration in mind, the Livestock Department of the Ministry of Agriculture has asked the Small Ruminant Network to assist in the scientific work of the project which goes beyond the purely development activities.

BODY WEIGHT, TESTICLE AND BEHAVIOURAL DEVELOPMENT OF DJALLONKE LAMBS

(G. Touré and C. Meyer, Institut des Savanes, B.P. 1152, Bouaké, Côte d'Ivoire).

Summary

Preliminary results of a six-month study on 11 male lambs of the Djallonke breed aged 116.6 ± 4.7 d at the start of the study are presented. The animals were fed on Panicum and a supplement of cotton seed cake and

rice hulls. The measures taken were liveweight, the diameter and circumference of the testicles and the sexual behaviour at puberty. Age and liveweight were highly correlated as were these two parameters with the diameter and the circumference of the testicles. Liveweight development of lambs is related to nutrition which influences the reproductive performance of which, in particular, testicular growth is the best indicator. Djallonke lambs achieved first service at an age 173.3 ± 27.1 d at a liveweight of 15.6 ± 2.6 kg. At first ejaculation testicular diameter was 3.8 ± 0.6 cm and testicular circumference 21.5 ± 2.3 cm.

Introduction

Reproduction is one of the major factors which influence the economic performance of a livestock production system (Rasbech, 1984). In sheep, fertility is related to sperm production by the ram. The quantity and quality of spermatozoids available for reproduction is dependent on the production of gametes in the testicle, of their maturation in the epididymis, and of the sexual activity of the ram (Colas and Courot, 1977). The development of sexual activity in the ram is affected by numerous physiological, genetic, nutritional, health and environmental factors (Orgeur et al, 1984): it can be measured by the libido and by the characteristics of the semen on the one hand, and by histological studies of the testicles on the other (Hafez et al, 1955). Although sexual development of male sheep is well-known for the common European races, it is hardly known at all for African races. In the latter case there are hardly any data available on male development. This study was undertaken to determine the sexual development of male sheep around the time of puberty. Testicular development has been considered as the most important criterion in male sexual development because it is related to gamete production (Amann, 1970; Amann and Almquist, 1962). In addition, it would be of interest to know the age at first service in order to have an idea of the age at which male lambs are capable of impregnating females.

Materials and Methods

Fifteen weaned male Djallonke lambs, of which only 11 were actually

measured until the conclusion of the trial, were used; 2 of the original 15 died and 2 never ejaculated. All the lambs were born at about the same time, in March at the beginning of the rainy season, and all were born singles. Weaning was at 3 months and at the start of the experiment lambs averaged 113.6 ± 4.7 d and weighed 11.4 ± 0.9 kg. The experiment lasted 6 months from the beginning of July to the end of December.

Three measurements were taken regularly. The anterio-posterior diameter of the testicles (gonads + scrotum) and the total circumferance were measured by, respectively, of pair of calipers and a tape-measure; the measurements were taken twice each month by the same observer.

Libido was observed in a pen of 15.3 x 14.3 m in which was placed a ewe in heat to which were the male rams introduced one by one. Observations of libido were carried out during a 15-minute period. Sexual maturity was considered to be achieved following a complete sexual act, defined as an intrimission followed by an effective ejaculation, this being judged by muscular contractions on the part of the male lamb. Libido observations were carried out twice a week and the number of complete services in the 15-minute observation period for each lamb was noted.

Lambs were weighed twice a month on a weigh-bridge accurate to 100 g. Data are presented as means and standard deviations. Correlation coefficients were calculated between pairs of variables, these being age, liveweight, testicular diameter and testicular circumferance.

Results

Liveweight development. Liveweight increased with age (Figure 1). Lambs weighed 11.4 ± 0.9 kg at 113.6 ± 4.7 d and achieved 24.5 ± 2.0 kg at 288.6 ± 4.7 d. Average daily gain was 74.8 g.

Testicular development. Testicular diameter and circumference increased with age but not in a linear manner. There was a slowing down in goats at about 180 d (Figure 2, Figure 4) which was less pronounced in the measure of circumferance than in the diameter. The increase in testicular diameter was 6 times more rapid at 4-6 months than it was at 6-9 months. The same pattern was noticed in the development of testicular circumference but it was less marked. Increase in testicular circumference was twice as

fast between 3 and 7 months as it was between 7 and 9 months. This dichotomy of growth was also evident if expressed as a function of liveweight rather than as a function of age (Figure 3, Figure 5).

Sexual behaviour. Lambs which achieved service first were not those which achieved the first ejaculation. First ejaculation by the two most precocious lambs was at 153.5 ± 6.3 d. At 168.6 ± 4.7 d 50% of the lambs had ejaculated at least once (Figure 6). Overall average age at first ejaculation was 173.2 ± 27.1 d at which age average weight was 15.6 ± 2.6 kg. Testicular diameter and circumference at this stage were 3.8 ± 0.6 cm and 21.5 ± 2.3 cm respectively .

Correlations between variables. The correlation coefficients between the different variables are shown in Table 1. All were greater than 0.90 and were highly significant ($P < 0.001$).

Table 1. Correlation coefficients between different variables (n = 14)

	Liveweight	Testicular diameter	Testicular circumference
Age	0.99	0.92	0.94
Liveweight	-	0.90	0.93
Testicular diameter		-	0.98

Discussion

The ADG of 74.8 g achieved in this experiment is within the normal range for Djallonke sheep. Growth in Djallonke lambs even under good nutritional conditions is rarely greater than 90 g per day (Berger and Ginisty, 1980).

It is known that in the young male gonadal development in the young male is more closely correlated with weight than with age (Courot, 1962). The start of spermatogenesis is also more closely correlated with a certain state of development than with age. In cattle it has been shown that ejaculate volume is directly related to liveweight (Wildeus et al, 1984; Feliciano et al, 1988). In view, however, of the fact that there is a

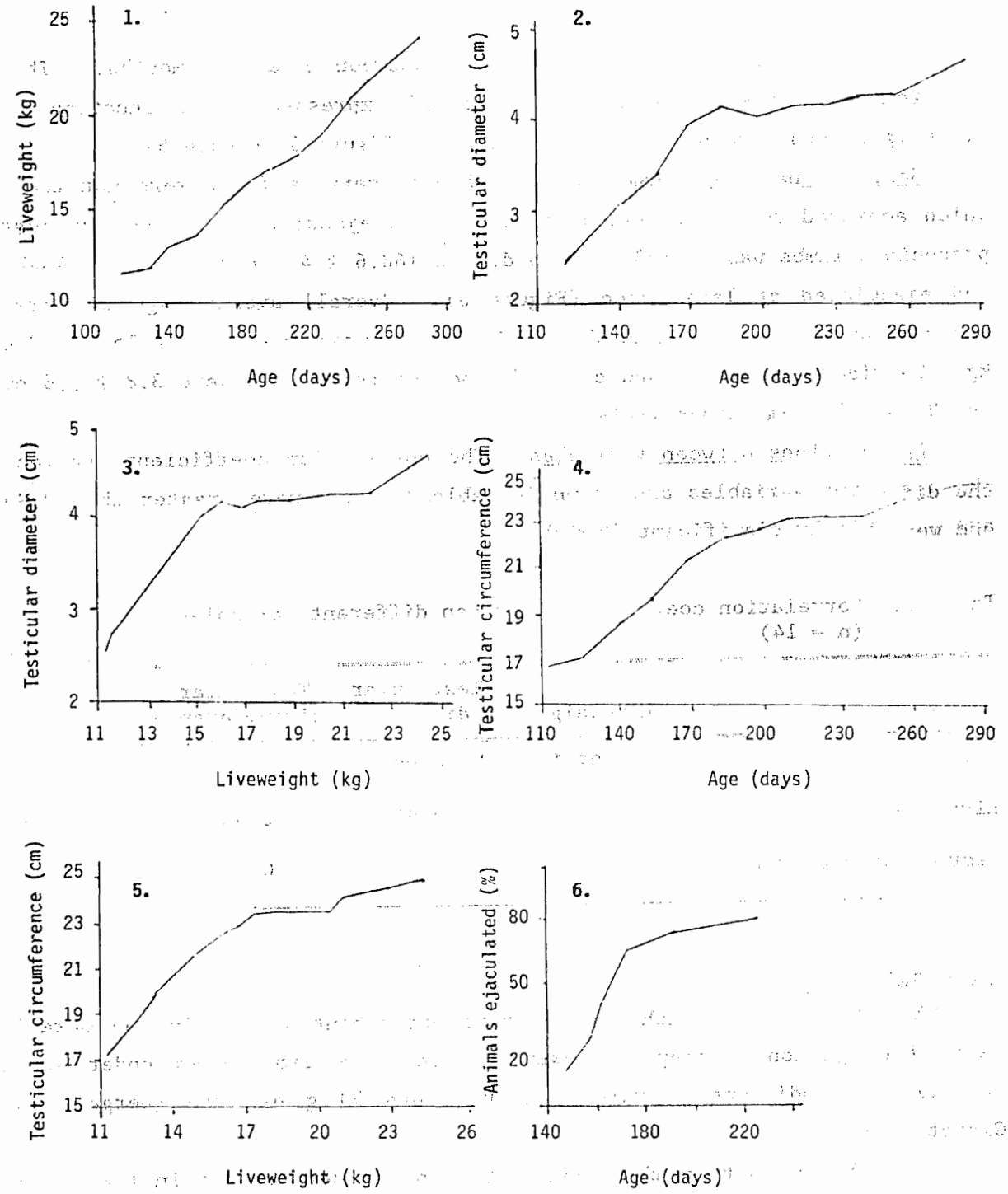

Figure 1. Weight development in relation to age

Figure 2. Testicular diameter in relation to age

Figure 3. Testicular diameter in relation to weight

Figure 4. Testicular circumference in relation to age

Figure 5. Testicular circumference in relation to weight

Figure 6. Development of puberty in relation to age

highly significant positive correlation between age and weight of lambs until 9 months, liveweight can be used as a criterion for the evaluation of sexual development of male Djallonke lambs.

The experimental measurements started at a period which corresponded to the rapid growth phase of testicles at about 3 months (Courot, 1962). It has been suggested (Feliciano Silva et al, 1982) that it is at this period of rapid testicular growth that selection should be made at least in zebu cattle. The strong positive correlation found between age and weight shows that growth is dependent on nutritional status which in turn influences sexual development. As other authors have observed (Adu and Olaloku, 1979; Alberio and Colas, 1976) this experiment has shown that liveweight and testicular dimensions are very closely correlated. The slowing down of testicular development noted at 6 months was not related to a slowing down in liveweight. This indicates that factors other than liveweight influence testicular growth from 6 months of age. In the case of Ile-de-France lambs external factors, in particular the photoperiod, influenced testicular development from 5 months of age (Curot, 1975; Alberio and Colas, 1976). In Bouake where the difference in day length between the longest and shortest day is only 50 minutes, photoperiodic effects can be considered to be almost non-existent.

Slowing down in testicular growth in Djallonke lambs can therefore be related to nutritional or physiological conditions. It is known that the development of testicular tissue is labile and closely related to nutrition (Lindsay et al, 1976). The nutrition provided to the lambs in this experiment did not vary quantitatively or qualitatively during the experiment even though nutritional requirements of the animals increased: it is therefore possible that nutrition was inadequate for full expression of testicular growth. It has been shown for the Ile-de-France (Courot, 1971) that the slow testicular growth phase is initiated at about 200 d: in order to see if this is the case for Djallonke sheep it would be necessary to continue for longer than the period of 6 mo used in this experiment.

Age at first ejaculation of Djallonke lambs in this experiment is similar to those noted in European breeds (Louw and Joubert, 1964; Skinner

and Rowson, 1968) as well as to the age for the West African Dwarf sheep in Nigeria (Adu and Olaloku, 1979).

Although the age at first ejaculation is comparable to the Préalpes (175.0 ± 8.1 d) and the Ile-de-France (182.5 ± 5.8 d) (Colas and Zinsner-Pflimlin, 1975), the weight of the Djallonke at the same age is clearly much lower than these two breeds. Age at first service is known to vary between breeds and between individuals and may be due to environmental factors such as climate, light, nutritional status, presence of another male or of a female, or delayed onset of puberty (Rasbech, 1984).

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NATIONAL SMALL RUMINANT NETWORKS

It is a great pleasure to announce the formation of a number of national networks. We know that such Netwoks have been created in Rwanda,

Tanzania and Zambia. For further information on the objectives and composition of these networks please correspond direct with:

Rwanda	Dr G. Sibomana ISAR P.O.Box 138 Butare
Tanzania	Dr S.M. Das Faculty of Agriculture Sokoine University of Agriculture P.O.Box 3004 Morogoro
Zambia	Dr Judith Lungu Lecturer/Researcher School of Agricultural Science University of Zambia P.O.Box 32379 Lusaka

THE SMALL RUMINANT RESEARCH NETWORK

NEWSLETTER

International Livestock Centre for Africa,
P.O. Box 5689, Addis Ababa, Ethiopia. Telephone: 61 32 15

N°18 June 1990

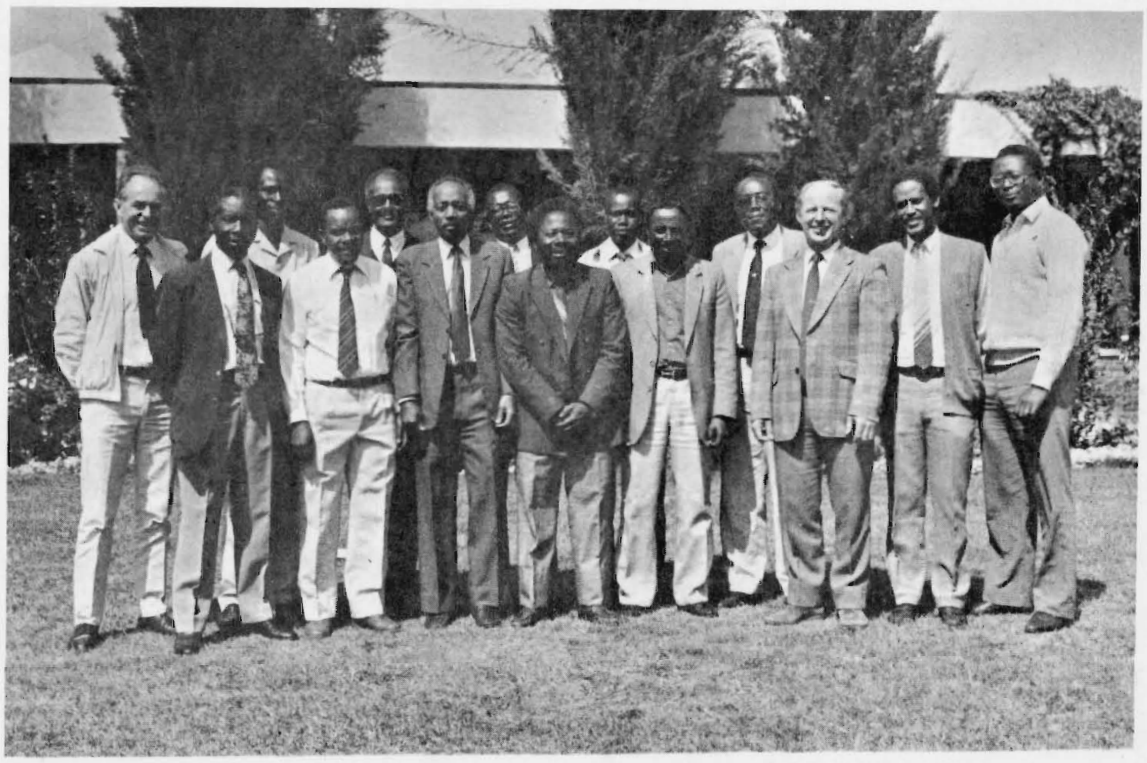
REGIONAL PLANNING MEETINGS

The Network has held two planning meetings so far in 1990. These meetings were called in accordance with the Steering Committee mandate to encourage the Network regions to prepare common protocols related to regional problems and priorities.

Eastern Region Planning Meeting

The Network's Eastern region held its planning meeting at ILCA headquarters in Addis Ababa on 12-15 February 1990. The Eastern region comprises Sudan, Ethiopia, Uganda, Kenya, Somalia and Djibouti. Network members from Somalia failed to arrive but submitted protocols afterwards. A total of 19 participants engaged in discussions establishing priorities for research in the region, designing regional protocols in detail and national or institutional protocols in outline.

Among the participants were Dr Robert Shavulimo from Kenya and Professor Beyene Chichaibelu from Ethiopia, both members of the Network Steering Committee. Professor S.H.B. Lebbie of the University of Swaziland and Chairman of the Steering Committee attended ex-officio. Participants included representatives of the Kenya Agricultural Research Institute; the University of Nairobi; the Kenya SR-CRSP; the Veterinary Faculty, University of Khartoum, Sudan; the Veterinary Faculty, Makerere University, Uganda; the Agriculture Faculty, Makerere University; the Institute of Agricultural Research, Ethiopia; and Alemaya University of Agriculture,



Network members at the Eastern region planning meeting held in Addis Ababa, 12-15 February 1990

Ian Fletcher (Ethiopia), Okeyo Mwai (Kenya), Beyene Chichaibelu (Ethiopia), Epelu-Opio (Uganda), Vincent Chemitei (Kenya), Robert Shavulimo (Kenya)

Gabriel Kiwuwa (Uganda), Petterson Semenye (Kenya), Hashim Mohamed (Sudan), Sahr Lebbie (Chair.), Kassahun Awgichew (Ethiopia), Trevor Wilson (Coord.), Getachew Gebru (Ethiopia), Peter Ngategize (ILCA)

Ethiopia. Resource support was provided by ILCA in the areas of reproductive wastage, biometrics and economics.

Central Region Planning Meeting

There were 29 participants present in Kigali, Rwanda for the Central region planning meeting held from 6-9 June 1990. The Central region comprises Cameroon, Central African Republic, Gabon, Congo, Zaire, Burundi and Rwanda. All countries planned to send representatives and in the event all these countries actually attended. Institutes that sent participants included: Dschang University Centre, Cameroon; Institute of Animal Research,

The group of participants at the central region Network planning meeting, Kigali, 6-9 June 1990

Cameroon; the Directorate of Animal Production, Central African Republic; the Directorate of Scientific and Technical Research, Congo; the University of Lubumbashi, Zaire; the Zairian National Institute of Agricultural Research; the University of Burundi; the Burundi Institute of Agricultural Science; the Burundi Ministry of Agriculture (represented by the Ngozi Goat Development Project); the University of Rwanda; the Rwanda Ministry of Agriculture (represented by several development projects); and the Rwanda Institute of Agricultural Sciences. The Institute of Agricultural and Livestock Research of the Great Lakes Economic Community sent to observers and the European-African Small Ruminant Research Network, based at Eschborn in Germany, sent one.

Among those present were Dr Reuben Njwe, Steering Committee member from Cameroon and Dr Gaeten Sibomana, Steering Committee member from Rwanda. Professor Lebbie was also present. Resource support was provided

by ILCA in the fields of nutrition, reproductive wastage, biometrics and systems analysis. The Chairman and members of the Steering Committee, together with the Network Coordinator, constituted a disbursements sub-committee of the Network and decided on the allocation of EEC funding for the Network for 1990 on the basis of protocols submitted and accepted at the West, Southern and Eastern regional planning meetings.

The Central region meeting would not have been possible without the organizational and logistic support provided by Dr Gaetan Sibomana who was authorized by Dr Leopold Gahamanyi, Director of ISAR, to act as local liaison officer.

SMALL RUMINANT NETWORK RESEARCH REGISTER

Over the past two years the Network Coordinator and his support staff have been occupied compiling a register of African small ruminant research and development projects. A preliminary document containing some 250 entries has now been prepared. A sample entry is presented at the end of this section of the Newsletter. All projects listed in the register are being sent a copy of the entry related to them for verification, completion and updating. Pages 22-23 of this Newsletter comprise a questionnaire: it is requested that research and development projects wishing to have entries in the register complete the questionnaire and return it to the Network Coordinator. We would request that particular attention be paid to listing academic qualifications, fields of speciality and experience of all staff listed. Publications should be listed in detail and, whenever possible, be in "scientific" format to include authors' names, date, title and source.

It is hoped to have a first detailed edition available for distribution during the first half of 1991. The value of such a register as a source book of information on small ruminant research and development work in Africa will depend on it being constantly revised. The cooperation of all research managers and individual workers is solicited in this respect.

Sample entry of Small Ruminant Research Register

Country:	Zimbabwe
Institute:	Department of Animal Science, University of Zimbabwe
Project title:	Improving productivity of Communal Area goats and sheep
Project objectives:	To improve productivity of small ruminants in communal areas through improved nutrition; To collect baseline data on production
Animals available:	2000
Project Research themes:	Reproductive physiology (male, female); Genetics, applied breeding; Nutrition, applied feeding, pastures
Project type:	Research and Development
Project leader:	Dr L.R. Ndlovu (Ph.D. Guelph; M.Sc. Wales; B.Sc. Sierra Leone: 5 years experience post Ph.D.)
Other staff:	Mr M. Nyamangara (M.Phil. U.Z.; B.Sc. U.Z.). Ms L.M. Sibanda (Ph.D. Reading; M.Sc. Reading; B.Sc. Alexandria). Mr C. Chakoma (M.Sc. U.Z.; B.Sc. U.Z.). Mr N.T. Kutsina (M.Phil. U.Z.; B.Sc. U.Z.).
Duration:	1985-1992
Current research:	Use of crop by-products in goat feeding; Breed evaluation of indigenous goats
Research summary:	Kidding percentage, survival rate of kids and basic characterization data of indigenous goats have been collected. New improved (selected) indigenous bucks have been introduced and impact of progeny size is very encouraging
Publications:	(i) Hale, D.H. 1986. Systems of production and productivity of goats. In: Adeniji K.O. and Kategile J.A. (eds) Proceedings of the Workshop on the Improvement of Small Ruminants in Eastern and Southern Africa. OAU/IDRC, Nairobi, Kenya. (ii) Kusina, N.T. 1988. Performance of indigenous fat-tailed sheep fed high quality diets (M.Phil. Dissertation). University of Zimbabwe: Harare. (iii) Phase I report submitted to IDRC. (iv) Annual Report, Phase II submitted to IDRC.
Address:	P.O.Box MP 167, Mount Pleasant, Harare
Telephone number:	263 4 303211
Telex:	26580 UNIVZ ZW
Telefax:	263 4 303392

WOOL AND MOHAIR PRODUCTION: PART OF THE BASOTHO WAY OF LIFE FOR OVER 100 YEARS

(John P. Hunter, LAPIS Project, Ministry of Agriculture, Maseru, Lesotho)

Lesotho would be a very different place without its flocks of Merino sheep and Angora goats. Many Basotho perhaps taking them for granted, assume that they have always been there. Newcomers to Lesotho, knowing that neither Merino sheep nor Angora goats are indigenous to the area, may think that their introduction was the result of a colonial development project. Both perspectives are misleading. The story of the origin and development of Merino sheep and Angora goats in Lesotho is not so simple and much more interesting.

Wool

Initially, Basotho herded fat-tailed sheep and an indigenous goat. Both were raised for meat. The story of their replacement by fibre-producing Merinos and Angoras, like so much else in Lesotho, begins with the "time of troubles" (or 'lifagane'), in the 1820s which led to the birth of the modern nation under Moshoeshoe I.

For protection during the turmoil, some Basotho sought refuge in the Maloti with Moshoeshoe. Others left the area and migrated to Cape Colony. About that time an English textile boom was boosting wool prices and Merino wool production (which had been introduced into Southern Africa in 1789) was expanding rapidly. Herding jobs were plentiful and wages were high: in addition to room and board, a herder could earn six sheep a year (a not uncommon wage for herders in Lesotho today). Within a few years, a Masotho could build a flock and gain, at the same time, valuable knowledge of Merino husbandry. Drawn by these high wages, some Basotho continued to seek herding jobs even after the end of 'lifagane'.

The establishment of relative peace in the 1830s brought prosperity and the return of some of the first migrants. Basotho were quickly linked to the Cape's expanding commercial economy by itinerant traders bringing new products such as woven cloth, blankets and household utensils. To earn money, many Basotho began exporting grain to Boer communities in what is

now the Organge Free State. Others, encouraged by missionaries and high wool prices, produced wool for sale. Between about 1850 and 1880, Lesotho's sheep were almost completely transformed from the traditional meat-producing type to the wool-producing Merino.

Mohair

Angora goats came to Southern Africa rather later than Merinos. The first importation from Turkey to Cape Colony of 12 males and one female was in 1838. Fearing competition in mohair production, the Turks had castrated the males before shipment but, unknown to them, the female was pregnant. Although there were later importations, its progeny, a male, became the progenitor of the Southern African mohair industry. Spurred by high mohair prices and further imports of breeding stock, the Cape Angora industry grew rapidly after 1860.

Basotho responded more slowly to Angoras than they had to Merinos but the income opportunities from mohair sales gradually compelled the transformation of the goat flocks from the traditional meat to mohair-producing variety. By 1900, records indicate that a majority of goats were probably Angoras.

Commercial prosperity from grain production

Until the end of the 19th century, wool and mohair production were largely secondary foci of Basotho agricultural activity. Production and export of maize and wheat to the South African diamond and gold fields received more attention and earned Basotho farmers more money. Basotho agricultural productivity compared favourably with that of white farmers in South Africa and incomes were similar to the wages of agricultural labourers in England at that time. During much of the last third of the 19th century, Lesotho was prosperous and its economy growing rapidly. By the mid-1870s, over 70 trading stores had been established in Lesotho to exchange all manner of manufactured goods for the rapidly increasing agricultural output. Thirty-one stores were opened in the last quarter of the century.

From grain to wool and mohair production

Several factors conspired to bring this prosperity to an end. First, the completion of the railway from Cape Town to Kimberley opened Basotho grain to competition from cheap Australian and American grain. Second, the Orange Free State and Transvaal governments, in an effort to shore up the position of white farmers, imposed duties and transit taxes on Basotho produce which further eroded its competitiveness. Finally, the farms, mines and railways of South Africa needed cheap African labour and steps were taken by the newly-installed Basutoland colonial authority after 1868 to encourage or compel labour migration. The loss of the major portion of Lesotho's prime agricultural land (the "lost territories") to the Orange Free State did not help the continued viability of the grain-exporting agricultural sector.

With the decline of grain exports, Basotho had to turn elsewhere to earn the income necessary to survive in an increasingly cash-based economy. Migratory labour to the mines, farms and railways of South Africa became the chief means by which this was accomplished. Some Basotho had been engaged in labour migration for some time. After about 1900, however, this became a definitive feature of Lesotho's economy and society and not, as before, an activity engaged in by an adventerous few. Wool and mohair moved to the fore as the major agricultural outputs as a result of labour migration.

Labour migration and stock keeping were complementary activities. Commercial grain cultivation, which required a great deal of labour, was competitive with labour migration for time. No such competition existed with herding, however, especially if done by boys and adolescents as in Lesotho. Then, men could migrate, earn wages, invest some of these in sheep and goats, and continue to migrate. The growing flock could provide cash from wool and mohair sales to supplement wages, serve as savings to be drawn on in an emergency, and provide a "pension" against retirement. After retirement, the flock could help support the family as it was gradually reduced, either through slaughter and home consumption or through sales.

Increasing livestock numbers

Between about 1900 and 1930, as the proportion of Basotho working in the mines increased from less than two to almost seven per cent (and, more importantly, as the proportion of able-bodied males migrating approached 50 per cent), the sheep and goat population in Lesotho increased ten-fold. This was paralleled by an equally rapid increase in cattle numbers. These large numbers place an enormous burden on Lesotho's rangelands which they could neither long sustain nor from which they could easily recover. Rapid soil erosion and the invasion of undesirable and less palatable plant species 'sehalahala' were the result. The loss of alternative domestic income opportunities, the close complementarity of migrant labour and stock-keeping, and rising wool and mohair prices during the period seem to be chiefly responsible for this explosion in animal numbers.

Complications of drought and overgrazing

A severe drought and widespread crop failure hit Lesotho in the early 1930s. This disaster exacerbated by overgrazing and soil erosion, coincided with a worldwide economic decline which saw the collapse of wool and mohair prices. So many Basotho migrated to South Africa in search of work that the resident population scarcely grew between 1930 and 1940. Those who remained were forced to slaughter their now much less profitable livestock for food and animal numbers were halved between 1930 and 1935. They remained more or less stable at this level for the remainder of the colonial era.

Prior to this period, the colonial administration had had only a veterinary interest in Basotho livestock. With the reduction in livestock numbers and in the face of severe soil erosion, the attention of the colonial government turned, belatedly, to soil conservation and livestock development. Bunding and terracing of fields, the import of improved Merino breeding stock and simple wool and mohair classing to improve the price were all initiated in the late 1930s, although most efforts were delayed by the onset of the Second World War in 1939. After the war, these efforts were renewed with increased vigour and improved Angora breeding

stock were imported, as well. Attempts were also made to cull undesirable animals from farmers' flocks. Although a gradual improvement in the quality of Lesotho's wool and mohair resulted, accompanied by an increase in average fleece weight, the methods used often appeared to farmers to be arbitrary and encountered stiff resistance.

Situation at Independence

At Independence in 1966, Lesotho's livestock numbers were virtually the same as they had been 30 years before, despite a human population increase of more than 50 per cent. The proportion of sheep had, however, declined at the expense of Angoras. The well-known ability of goats to take advantage of overgrazed conditions, combined with high mohair prices, probably accounted for this shift. Since Independence livestock numbers have increased, mostly in response to rising mine wages and employement. Basotho miners still find livestock one of the best investments for earnings. Initially, cattle were the major focus of this investment. After about 1980, however, the focus has shifted towards sheep and goats. Because of these livestock increases, agricultural officials are again concerned about the problem of overgrazing and are seeking ways to reduce pressure on the rangelands. Partly as a result of this overgrazing, fleece weights have declined, eliminating much of the earlier 30-year improvement.

Situation today

Today, Basotho have about 1.5 million sheep producing 3400 tonnes of wool and 1.1 million goats yielding 800 tonnes of mohair. Combined, wool and mohair sales bring in about Maloti 20-25 million to the Lesotho economy -- its single most important export item. Although only about 27 per cent of rural households have sheep or goats (far fewer than the 50 per cent who have cattle), their ownership is strongly influenced by the age of the household head. Young men, burdened with marriage expenses and the cost of starting a new household, can rarely afford to invest in sheep and goats. Elderly people often sell off their flocks to live. According to survey data, however, ownership may be as high as 40 or 50 per cent amongst middle-aged household heads.

The mountain areas have the highest rates of ownership and the largest flocks. There, sheep flocks, at an average of 53 head, are more than twice as large and goat flocks, at an average of 24, are about 25 per cent larger than lowland flocks. A few owners have flocks of several thousand animals. Like a diversified investment portfolio, most stockholders keep a mixture of sheep, goats and cattle. Although mohair prices are currently depressed, wool prices are high and a typical flock can earn for its owner Maloti 800 to Maloti 900 a year. Coupled with the flock's investment and retirement functions, these are important supplements to earnings.

With the exception of a small amount of mohair used in local handicrafts, all Lesotho's wool and mohair is sold on the world market. Although much of the wool and mohair is somewhat short, it is very fine and is normally in good demand for blending. This fineness owes less to good breeding than to an overgrazed range and the inadequate nutrition it provides. This highlights the industry's long-term problems, for overgrazing and poor nutrition lead to low productivity today and further soil erosion and still lower productivity tomorrow.

Continuing problems and possible solutions

Range management specialists believe that there are about 40-50 per cent more animals grazing on the range than it can sustain. Part of the problem derives from the fact that access to the range is free to all Basotho with animals. Because grazing costs are extremely low, owners find it profitable to keep even very old and unproductive animals in their herds. High grazing costs would compel their culling. Changing a centuries-old free-access tradition is not easy, however. Part of the problem derives from the lack of alternative savings and investment options for Basotho miners. Although rural banking facilities have expanded enormously since Independence, inflation-eroded savings accounts have a difficult time competing with livestock. Finally, part of the problem derives from the fact that few Basotho are covered by pensions after their retirement. Pensions would reduce some of the pressure for keeping livestock for support in old age.

Identifying reasons for overgrazing is easy; devising a solution is more difficult. Inflation-resistant investments are hard to find, even in industrial countries and pensions are expensive to implement. The solution should probably combine improved herding and range management, vigorous culling, livestock marketing, development of alternative investments, and the gradual implementation of monetary disincentives against keeping poor quality, unproductive livestock. Difficult though they may be, solutions to the problem must be found if Lesotho is to continue to support wool and mohair production in the future.

FINANCING FOR SWAZILAND NETWORK PROJECT

The first Network funding for a specific protocol submitted to the Steering Committee has been provided for Swaziland. The research project is a follow up to a systems study carried out by the University of Swaziland. The project will start on 1 January 1991. Its main objectives are to carry out a census of agro-industrial by-products in developing feeding systems for small ruminants, particularly goats. The main by-products are somewhat unconventional being pineapple pulp and citrus waste from the canning and juice-extracting industries.

Finance and technical inputs will be provided by the Overseas Development National Resources Institute of the United Kingdom. Total funding over a 3 year period will be £Stg 47 000 and will include an element for overseas training for Swazi scientists on the project.

PRODUCTION TECHNIQUES TRAINING COURSE

The fourth annual Small Ruminant Production Techniques training course was held in Bulawayo, Zimbabwe from 14-25 May 1990. This was the second time the course had been held in English and the first time an English course had been held outside ILCA headquarters in Addis Ababa. There were 15 participants from seven countries, these being Ethiopia, Tanzania, Kenya, Uganda, Zambia, Mozambique and Zimbabwe itself.

Trainees at the Bulawayo Small Ruminant Producting Techniques Training Course on a field trip at Matopos Research Station

The course comprised a series of 30 theoretical lectures (although most of these had the character of seminars and workshops), supported by visits to Communal Area and Commercial farms and to the Matopos Research Station. Practical demonstrations of disease diagnosis on both live and dead animals were given at Matopos and at the Bulawayo slaughterhouse. At the end of the course participants made presentations of small ruminant production constraints and possible future research directions in their own countries based on their course learning.

Course instruction materials were distributed to participants. These now form the basis, having been tested and modified in both French and English, for a projected manual. The manual will comprise a series of modules divided into five sections: Production Systems and Field Methods; Productivity; Nutrition and Feeding Systems; Health and Disease; and Genetic Improvement. These five sections will be supported by an extensive

and up-to-date bibliography. In addition to modules by Small Ruminant Group staff there will be ones by guest lecturers at the courses. Notable from this year's course are contributions to nutrition and feeding systems by Dr Lindela Ndlovu of the University of Zimbabwe and to health and disease by Dr David Sherman of Tufts University, Boston, USA.

SHEA BUTTER NUT CAKE AS A FEED FOR SMALL RUMINANTS

[R.H. Bosma (Projet RUG/IDR, Nutrition Animale, Université de Ouagadougou, C/o Amb. Roy. Pays Bas, B.P. 1302, Ouagadougou) and B. Diarra (Département Elevage, IDR, Université de Ouagadougou, B.P. 7021, Ouagadougou, Burkina Faso) and with the technical assistance of O. Kabore and B. Traoré)]

SUMMARY

The shea butter nut (*Butyrospermum parkii*), known in French as 'karité' is collected from natural growing trees to produce a kind of butter. After extraction the oil from the nut is used for the production of cosmetics and in cooking. Traditionally the residues are dried and used as a heating fuel. In spite of some scepticism about the use of the by product as an animal feed, principally because of the tannin levels (16.6 per cent), the local factory requested that the value of the cake be subjected to test.

The experiment aimed at determining the influence of a supplement based on shea butter nut cake on the growth of small ruminants. Four groups each of sheep and goats were raised in pens or attached to pickets and the feed of one group of each was supplemented with a compound containing 67.5 per cent of air-dried butter nut cake. Brewers grains, a mineral mixture and molasses constituted the other parts of the concentrate. An analysis of variance for average daily gain showed an interaction between management and supplementation. Supplementation with the cake was better only for animals attached to pickets for both goats and sheep. In cages no effect of supplementation was shown on average daily gain for either species. This study has shown that shea butter nut cake is

not very useful as a major supplementary feed for small ruminants and should not be used as such for totally enclosed animals.

INTRODUCTION

The shea butter nut (*Butyrospermum parkii*) is a tree well represented in the Sudan Savanna zone of West Africa. It is used mainly to produce a local butter. The butter, after extraction, is normally used in the production of cosmetics and as an ingredient for cooking. The residue is normally dried and used as a heating fuel. Attempts to encourage the use of the residue as a fertilizer are not very successful as returns to this use are low. This has led to suggestions that the cake could be used in animal feeding, especially as its proximate composition is similar to that of brewers' grains from the manufacture of maize beer (Table 1) which has a reasonable crude protein composition and a high energy value.

Table 1. Proximate composition of two by-products in Burkina Faso (as per cent of dry matter)

By-product	Dry matter	Crude protein	Ash	Ether extract	Organic matter
Shea butter nut cake	93.9	14.4	13.9	18.2	92.2
Maize brewers' grains	91.0	16.1	11.8	7.0	96.6

A high level of tannins (16.6 per cent) could, however, result in a limited nutritional value. Most previous results with rabbits (Gasnier, 1943), sheep (Leroy, 1943), pig (Thiery, 1943) and the rat (Jacquot, 1943) have led to only mediocre results. It has, however, been recommended as a fuel and then as a fertilizer (Bagot, 1964).

This study, which was requested by the semi-industrial factory at Boussé and financed by the Netherlands Government, was established to determine the influence of a feed supplement based on shea butter nut cake on the growth of small ruminants in total confinement or attached to a picket. The article is based on two student dissertations carried out by

O. Kaboré and B. Traoré, mentioned as technical collaborators in the title of this article.

MATERIALS AND METHODS

Animals

All the animals were born at the experimental farm of the Rural Development Institute of the University of Ouagadougou. This institute is situated at Gampela where the experiments were carried out. There were 16 animals each of Mossi (Djallonké) sheep and Djallonké x Peul goats. All animals were castrated. Sheep averaged 7 months of age and weighed approximately 13 kg: goats averaged 9 months and weighed approximately 15 kg.

Experimental design and feeding

For each species, 4 lots each of 4 animals were constituted using a table of random numbers. The 4 lots were then subject to an adaptation period in their respective housing and feeding treatments. For the two species, management and feeding comprised:

So — Individual penning with cut grass *ad lib* (110 g/kg$^{0.75}$) given twice a day and with a mineral block permanently available.

Sc — Individual penning with cut grass (16 g/kg$^{0.75}$) in the morning and the concentrate mixture *ad lib* in the afternoon.

Po — Grazing attached to a picket (within 3 m radius at two different stations per day) for 8 hours with a mineral block permanently available in the night pen.

Pc — Grazing at the picket (within 3 m radius moved twice a day) for 8 hours with the supplement fed *ad lib* in the night pen.

For lots totally confined, each animal was installed in a digestibility cage fitted with a feeding trough and with a permanent supply of water. Animals attached to pickets were done so by a metal chain attached to a collar with a feeding radius of 3 m. For this latter

treatment, animals were placed so that there was no overlap of grazing area between adjacent animals. The cut grass given to animals on permanent confinement was cut and wilted from the night before. The grass was primarily composed of *Brachiaria laeta* and *Pennisetum pedicellatum.*

The shea butter nut cake was obtained at the semi-industrial butter nut factory of Boussé. The wet cake was air dried before use. During the adaptation period the butter nut cake, either on its own or mixed with salt was refused by the goats and was eaten only in small quantities by the sheep. In permanent confinement a mixture with maize brewers grains and with salt was, however, better appreciated by the sheep. Goats, on the other hand, were able to select the brewers' grains and the salt and to ignore practically all the butter nut cake on offer. It was therefore necessary to formulate the mixture into a granular compound. Brewer's grains, salt and a mineral mixture were obtained from sources within Burkina Faso, and the 4 components of the mixture were also granulated in Burkina Faso with a composition of 67.5 per cent butter nut cake, 14.0 per cent brewer's grain, 3.5 per cent mineral mixture and 15.0 per cent molasses.

RESULTS

Group So and particularly the goats showed a preference for *Brachiaria laeta* with a refusal rate overall of 27 per cent for sheep and 45 per cent for goats. For the Sc groups with restricted forage on offer, there was not so much selectivity with only 8.7 per cent refusal by sheep and 18 per cent by goats. Intake of the granular compound in relation to dry matter intake was higher at 33 per cent in sheep than it was at 23 per cent in goats. Grass intake in the *ad lib* (So) group was greater in sheep at 4.2 per cent of live weight than it was in the more selective goats at 3.9 per cent of live weight.

Dry matter intake for both goats and sheep was similar in both non-supplemented and supplemented animals which were in total confinement. Note that in the Sc group the grass offered was limited and was available only during the first part of the day, which limited total intake. For

animals which were picketed in the Pc group, the supplement intake was variable. There was a tendency for it to increase with the passage of time but supplement intake was still low in comparison to the Sc group for both species. These animals had more grass available than the Sc group and as a consequence had no great need to consume the granulated compound. In this group, more granulated compound was eaten by sheep than by goats (Table 2).

Average daily gain

The analysis of variance showed a significant effect ($P < 0.05$) of management (confinement or picketed) with the supplementation treatment. In confinement there was a difference between the rate of gain with or without supplement for both species. For picketed animals, the results were not significant at the 5 per cent level but were at the 10 per cent level, again for both species.

DISCUSSION AND CONCLUSIONS

Confined animals showed a lower average daily gain when offered the granulated supplement. Intake of the granular supplement was higher (33 per cent) in sheep than it was in goats (23 per cent). The negative effect of butter nut cake noted for confined animals is probably related to the

Table 2. Daily dry matter intake ($g/kg^{0.75}$) and daily gains (± s.d.) of sheep and goats in Burkina Faso

Species and treatment		Dry matter intake: Grass	Dry matter intake: Granulated compound	Dry matter intake: Total	Average daily gain(g)
Sheep	So	79.7	-	79.7	60.3 (12.0)
	Sc	52.1	26.5	78.6	46.8 (12.5)
	Po	?	-	?	62.4 (14.1)
	Pc	?	14.3	?	83.4 (10.2)
Goats	So	60.7	-	60.7	36.2 (10.9)
	Sc	50.0	15.0	65.0	24.3 (5.5)
	Po	?	-	?	18.4 (9.7)
	Pc	?	9.4	?	38.6 (17.6)

high tannin content, to the high intake and to the low digestibility of organic matter (*in vitro* about 30 per cent). For picketed animals the low intake of 15 g/kg$^{0.75}$ of granulated compound for sheep and 9 g/kg$^{0.75}$ for goats led to greater daily gains.

For both confinement and at picket, the sheep seemed better adapted to a grass diet than goats. These latter were more selective and showed a preference for browse species when on open range grazing. The use of shea butter nut cake would appear to require some treatment in order to improve its appetability and its digestibility. Reduction of the tannin content might improve appetability and possibly digestibility and therefore intake, but the effect on digestibility (9.6-27.4 per cent improvement) is low and the cost appear too expensive for the treatment to be worthwhile. It might be possible at some stage to reduce the tannin content by some form of treatment, that of heat probably being the most economic.

Quantitative and qualitative availability of animal feeds is low during the Burkina Faso dry season (Diarra and Bosma, 1988). The availability of protein at this period seems to be a major factor limiting animal production. In view of the negative effects of supplementation of butter nut cake and the conditions of restricted feeding, and the probable negative effect of this on protein digestibility, as well as other elements (Pare, 1988), it is not possible to recommend that this by-product be used as a supplement for sheep and goats during the Sahelian dry season.

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COORDINATOR APPOINTED FOR ILCA SMALL RUMINANT THRUST

Dr Len Reynolds has recently been appointed as Coordinator of ILCA's Small Ruminant Meat and Milk Thrust. Len has most recently been Team Leader of the Humid Zone Programme based at Ibadan in Nigeria, where he has has been since 1985.

Len has a first degree in biochemistry obtained at Leicester University in the UK in 1968. Following graduation he went on to do research in animal nutrition for his Ph.D. which was awadred him by the University of Leeds in 1971. Before working in Africa Dr Reynolds taught in a number of secondary schools in the United Kingdom. Prior to joining ILCA, Len lectured in animal nutrition at the Universities of Malawi and Zimbabwe.

In conjunction with his appointment as Thrust Coordinator, Len is being transferred to the ILCA Sub-humid Programme on the Kenya coast, from where the Thrust will be managed.

STAFF CHANGES AT NETWORK COORDINATING OFFICE

Trevor Wilson has resigned from his position as Coordinator of the African Small Ruminant Research Network and from ILCA after 12½ years service with the organization. Trevor came out to Africa in 1961 and first worked in Tanzania on commercial farms and on settlement schemes before managing a 32000 ha ranch, with 7500 Boran cattle, 9000 Blackhead Persian sheep and about 5000 game animals, on the slopes of Kilimanjaro. He later worked with a British consulting firm designing development projects in western Sudan, in the Kenya highlands and in northern Ethiopia. Joining ILCA on 1 January 1978, Trevor was coordinator of field research in Niono in Mali before being appointed Team Leader of the West African Arid and Semi-arid Zones Programme. On transfer to Addis in 1983, Dr Wilson set up and was Head of the Small Ruminant and Camel Group before becoming Coordinator of the African Small Ruminant Research Network. The Wilsons' permanent address in the United Kingdom is Bartridge House, Umberleigh, North Devon EX37 9AS.

Azeb Melaku has been Secretary to the Small Ruminant and Camel Group and the African Small Ruminant Research Network since 1 December 1984. During this period she has become well known and well appreciated by Network members for a multitude of reasons, not least her ability to converse and write about small ruminants in both English and French. In addition to discharging her usually onerous duties efficiently and without fuss, Azeb has courageously pursued a part-time degree course, over seven years, in English Literature, at the University of Addis Ababa. Azeb takes up her new post as Senior Secretary to ILCA's Director of Training and Information on 1 July 1990.

SMALL RUMINANT RESEARCH AND DEVELOPMENT
PROJECT QUESTIONNAIRE

COUNTRY: _____

TITLE OF PROJECT: _____

OBJECTIVE (S) OF PROJECT: _____

SCALE OF PROJECT: N° of Animals [ ] PROJECT CODE [ ] RESEARCH [ ]
N° SMY [ ] [ ] DEVELOPMENT [ ]
[ ] TRAINING [ ]

MANAGEMENT SYSTEM: _____

STARTING DATE: _____ TERMINATION DATE: _____

SOURCE OF FUNDING [ ] National [ ] Bilateral [ ] International
(name of agency) (_____) (_____) (_____)

NATIONAL INSTITUTION: _____
(implementing the project) _____
(postal, telephone and _____
telex addresses) _____

PROJECT STAFF: Leader _____ _____
Scientists _____ _____
_____ _____
_____ _____
_____ _____

SUMMARY REPORT/ACHIEVEMENTS _____

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(Internal and external publications)

Previous Page Missing

Notes on Completing Questionnaire

1. Definition of project: Avoid describing broad programmes as projects;
   Avoid describing individual specific experiments as projects.

Examples (a) Selection for increased fleece wight in Romney ewes
(b) Evaluation of Suffolk and Texel rams in crossbreeding on native ewes
(c) Evaluating the use of by-products in the nutrition of dairy goats
(d) Strategic drenching in the control of stomach parasites in sheep

2. Scale of project:

   (a) SMY - Scientist man years over the life of the project
   (b) Project Code - the project encompasses a number of areas of specialization lis the three most important areas under Project Code.

3. Areas of Specialisation or Special Interest

Area	Code	Area	Code
Administration/ Policy Formulation	1	Genetics/Applied Breeding	1
Behaviour/Husbandry/ Management	2	Marketing/Product Development	12
Biochemistry/Physiology	3	Mechanisation/ Automation	13
Biometrics/Statistics	4	Nutrition/Applied Feeding/Pastures	14
By-products: (a) fibre (b) meat (c) skin	5	Product Quality/ Processing/	15
Disease Prevention/ Control	6	Sociology/Labour Relations	16
Economics/Farm Management	7	Teaching/Tertiary Education	17
Reproductive Physiology: (a) male (b) female	8	Environmental Impact	18
Environment Control/ Housing	9	Population Dynamics/ Survey	19
Extension Methods/ Communication	10	Metrology/Histology/ Laboratory Techniques	20

NOTE

If your address is incorrect or if a colleague would appreciate receiving a copy of this Newsletter, please fill in the form below.

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The Small Ruminant Network Newsletter
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Addis Ababa
ETHIOPIA

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THE SMALL RUMINANT RESEARCH NETWORK

NEWSLETTER

International Livestock Centre for Africa,
P.O. Box 5689, Addis Ababa, Ethiopia. Telephone: 61-32-15

No 19 November 1990

REGIONAL NETWORK PLANNING MEETING FOR THE SAHEL AND NORTH AFRICA.

The regional meeting of the Small Ruminant Network for Northern Africa and the Sahel was held in Niamey from 24 to 27 September 1990.

Member countries of this region comprise Mauritania, Senegal, Mali, Niger, Chad and the North African countries of Morocco, Algeria, Tunisia, Lybia and Egypt. Unfortunately,it was not possible for all the countries to be represented at this meeting. However,the contacts made promised that protocols of research scientists previously contacted would be forwarded to the coordinating office of the Network. The work of the fifteen participants focused on identifying priority areas of research on small ruminants in the region and the drafting of regional protocols on collaborative research. All research protocols on small ruminants prepared at the national and institutional levels and submitted were reviewed by working groups in Niamey.

Professor Alhassane Yenikoye of the University of Niger who represents the Sahel and Northern Africa in the Steering Committee was mainly responsible for the local organisation of the meeting in collaboration with the ILCA team in Niger. He also participated in the deliberations of Network members. Professor Sahr H. Lebbie of the University of Swaziland and Chairman of the Steering Committee participated in the deliberations in his capacity as Chairman of the Steering Committee.

(Network members present at the regional meeting for Northern Africa and the Sahel , Niamey, 24-26 September 1990).

Doctor Daniel Bourzat of IEMVT, who will be in charge of a regional small ruminant research programme for Niger, Chad and Northern Cameroon from next autumn on, also participated in the meeting which served as an opportunity to link the activities of the regional programme with those of the Network. Doctor Selmi of GTZ and co-ordinator of the Euro-African Small Ruminant Network (REAPER) also attended the meeting. The participants represented the Institut Universitaire de Techniques d'Elevage de D'Njamena, the Laboratoire de Recherche Vétérinaire et Zootechnique de Farcha, the Centres de Recherche Zootechniques of Bamako and of Niono, Mali, the Laboratoire Central Vétérinaire of Bamako, the Laboratoire Central de l'Elevage du Niger, the Institut National de Recherche

Agronomique du Niger, the Faculty of Agronomy of the University of Niamey and the Non-Governmental Organisation Vets Without Frontier (VSF) which is implementing a goat development programme in Maradi District, Niger. ILCA provided scientific support for the meeting in animal nutrition, biometrics, economics and production systems.

TRAINING COURSES AND MEETINGS

The Course on Small Ruminant Production Techniques of the African Small Ruminant Research Network will be held in French at the end of 1991 or the beginning of 1992. Applications are now being received. The course programme will be re-organised to widen its practical scope.

The Network is also pleased to publish in its bulletin the following information on several training programmes directly or indirectly concerned with small ruminants which was communicated to the Network at ILCA Headquarters.

1) The Institut Agronomique Méditerranéen de Saragosse will organise a course on goat production in French and English from 2 to 22 February 1991. The address is:

IAMZ, appartado 202

50 800 Saragossa Spain (TLX 58672 IAMZ)

2) Pastoralism and Development . This course will be organised jointly by the Institut Agronomique et Vétérinaire Hassan II of Rabat , the Institut Agronomique Méditerranéen of Saragossa and the Institut Agronomique Méditerranéen of Montpellier from 20 May to 15 June 1991. It is an intensive international course for development officers, planners, and administrators involved in pastoral development. The course, which

will be held partly in Spain and partly in Morocco, will focus on the need to deal with rangeland management and pastoral systems development problems in the most comprehensive way possible, taking into account specific interactions between agriculture and livestock production, and on the specific nature of the serious socio-economic constraints affecting these systems. For further information please contact A. Bourbouze. IAM , 3191 route de Mende , B.P. 5056; 34033 Montpellier Cedex 1, TLX 480 783 F, France, or the Institut Agronomique et Vétérinaire Hassan II, B.P 6202 , Rabat Institut, Morocco, TLX 31873 M.

3) "International Course on sheep and goat production and diseases". 11 March - 5 April 1991. This training course will be organized jointly by the Ecole Nationale Vétérinaire of Maisons-Alfort, the Institut d'Elevage et de Médecine Vétérinaire des Pays Tropicaux (IEMVT) and the IAV Hassan II , Rabat. The aim of the course is to review the most recent developments in small ruminant production, improvement and marketable value and propose suitable solutions for individual production systems, taking into consideration the major constraints to each system. The course is intended for senior research and development officers in Europe and developing countries. Applications should reach the Training Division, IEMVT, 10 Rue Pierre Curie, 94704 Maisons-Alfort Cedex, France, by 14 February 1991.

The Fourth International Rangeland Conference will be held in Montpellier from 22 to 26 April 1991. The main theme will focus on rangelands of mediterranean and subtropical isoclimatic zones. The Scientific Secretariat will be provided by IAM, 3191 Route de Mende, 34100 Montpellier.

SMALL RUMINANT PRODUCTION IN THE PEOPLE'S REPUBLIC OF CONGO*

(Andre MFOUKOU-NTSAKALA, Rural Development Scientist, Research Officer,CRVZ, B.P. 235 People's Republic of Congo.)

INTRODUCTION

The People's Republic of Congo, situated astride the equator in Central Africa experiences a hot humid equatorial climate with relative humidity of between 70 and 90% and mean annual temperature of 25°C. Mean rainfall is over 1200mm. Annual rainfall in certain regions is between 1800 and 2000mm. The vegetation consists of 60% forest and 40% savanna. The dry season lasts 3 to 4 months.

With a total area of 342 000 km^2 and an estimated population of 2 070 800 inhabitants, (C.N.A, 1987), the Congo is predomi-nantly an agricultural country in which livestock production plays a quasi-marginal role. Absent with regard to cattle, sheep and goat production is historically well established. The presence of these animals in this regard has been reported in all villages since the sixteenth century.

The national livestock population in 1986 was estimated at 94 00 sheep and 250 000 goats, almost all of which were under village management. Although previously excluded from national livestock development programmes, small ruminants currently occupy an important place in livestock production systems in the Congo because of their numbers and their socio-economic importance, and renewed interest is currently being shown in their production.

The following article on small ruminants production reviews literature published on the subject and places this production within the socio-economic context of the Congo. It also attempts to identify the constraints to increasing the production capacity and productivity of these animals.

THE SOCIO-ECONOMIC FACTOR IN SMALL RUMINANT PRODUCTION

The total contribution made by small ruminant production to the national economy is negligible,amounting to less than 5% of the gross national product (G.N.P.) in the best year (1970). The agricultural sector as a whole accounted for 17% of the G.N.P.

This is due to the low livestock productivity level which can meet only 33.5% of the national needs in animal products (mainly meat).

An estimated 2 299.5 tonnes of red meat, including 52.5 tonnes of mutton and 1 306 tonnes of goat meat is produced. However, this amount is inadequate for the country's needs, estimated at 8 559.7 tonnes of red meat of which 135.7 tonnes of mutton and 1 316 tonnes of goat meat. National production accounts for 26.6% of total red meat , 38.68% of the mutton and 99.24 % of the goat meat consumed. The cost of importing the animal products required to make up this shortfall has become a strain on the economy (1).

Calculations based on the consumption pattern of 1986 indicate that the demand in mutton and goat meat will be met locally by the year 2000, a step towards resolving the problem of available sources of animal protein. But what is the role of small ruminant production in the farming systems of the Congo ?

Small ruminant production in farming systems

In the Congo, 45% of the population live in the rural area and 50% of this rural population is engaged in farming activities, either on smallholdings

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* Paper presented at the ILCA training course on Small Ruminant Production Techniques.

or as part of a co-operative. These farmers,who own most of the sheep and all of the goats are a major potential for small ruminant production under traditional management in Congo. In the modern sector only the Centre d'Appui Technique Ovin (C.A.T-ovin) is engaged in small ruminant production.

The plateau region of central Congo accounts for 26.6% of the goat population. Pool, Niari and Bouénza regions account for 23.8 %, 14.5% and 11.8% respectively. Average flock size is between 3.8 and 5.6 head.

The largest sheep populations are in Pool (25.8%), Niari (24.8%), Bouénza (18.1%) and Lékoumou (11.7%). Average flock size rarely exceeds 5 in number. Nevertheless,livestock production is generally of secondary importance in rural areas in the Congo. The Congolese peasant is primarily a farmer and depends on "farming, hunting, gathering and fishing". According to SAVOU (1982) and KINGA (1983), livestock production is practised almost exclusively by males, who are furthermore adults and old.

Small ruminant production was for long regarded as a prestige occupation and a kind of capital investment to be used on occasions such as weddings, death, feasts, as dowry, to welcome an important guest, or gifting and was not practised for commercial purposes.

However, due to the scarcity of game in certain regions and the increase in commercial contacts there has been some changes in approach over the last few years. MFOUKOU-NTSAKALA (1983) noted that small ruminant production is currently being developed to meet short-term financial and home consumption needs. More animals are also produced for marketing. (AMOUNDALA 1982, MFOUKA-NTSAKALA 1983). Mixed farmers in the traditional

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The total cost of food imports in the Congo for 1986 has been estimated at 70 000 million F.CFA.

system are aware that the demand for meat resulting from improved urban-village contacts and the influx of large numbers of civil servants into the rural area could prove a lucrative source of income.

It should however be emphasized that the increasing demands resulting from this new trend cannot be adequately met by the traditional production systems.

PRODUCTION SYSTEMS

Small ruminant production systems in the Congo are in general, similar to other traditional livestock production systems in Africa described by various authors ((VALLERAND and BRANCKAERT 1975, ROMBAUT and VAN VLAENDEREN 1976, AMEGEE 1978, DUMAS 1980). In this traditional extensive livestock production system animals are allowed to graze freely around the compound, the farmers providing no care whatsoever. When shelter is provided, it consists of an enclosure in which the animals are housed during inclement weather or at night. Animals are usually fed kitchen waste or crop residues and native forage. They also sometimes eat food crops in neighbouring farms, creating a frequent source of conflict between farmers. Livestock production departments provide no technical or veterinary services for farmers.

C.A.T Inoni in the plateau region operates an extensive improved production system with an adequate technical staff. A local breed is being used for this trial system, which will eventually be extended to other potential areas of small ruminant production development.

GENETIC RESOURCES

Breeds

Small ruminants breeds in Congo belong to the Djallonke type. They are small, with a relatively low bodyweight. The Djallonke sheep is a mutton

sheep 40 to 60 cm at withers. Liveweight is between 20 and 40 kg and dressing out yield is between 48 and 50%. The Sahel sheep, which measures 75 cm at withers and has a liveweight of 80 kg is also found.

The Djallonke goat is stocky with a good body conformation. Height at withers is between 30 and 50 cm and liveweight between 15 and 20 kg.

The *fusca* type of tsetse fly, the trypanosomiasis vector , is found in all regions of the Congo (ILCA,1979). The indigenous breeds of sheep and goats are adapted to the environment and may be considered as trypanotolerant breeds (MAE,1983).

Fecundity remains unchanged under improved conditions (95%). Meanwhile, prolificity is between 110 and 115% and productivity 130% with a replacement rate of 20%. Mortality among the 0-4 month and 5-11 month age classes are 12% and 8% respectively. Adult mortality rate is 2%. Three lambings in two years under traditional management compared with three lambings in 27 months under improved management have also been recorded.

Performances

Production performances recorded under village management are given in Table 1.

These performances vary depending on the sector and do not reflect the actual potential of local breeds of sheep and goats as there are certain obstacles to the improvement of small ruminant production and productivity.

Table 1. Performances of sheep and goats under traditional management.

Production parameters	Sheep	Goats
Lambing/Kidding rate	78%	70%
Fecundity rate	95%	-
Prolificity rate	I20-130%	-
Productivity rate	140%	-
Twin birth rate	10%	40%
Mortality 0-1 year old	33%	33%
Mortality over 1 year old	10%	10%

Source: M.A.E., 1983 modified

CONSTRAINTS TO INCREASED PRODUCTION AND PRODUCTIVITY

The major obstacles to development in this sector might appear to be technical . A more comprehensive evaluation of the situation indicates that the constraint is more psychosocio-economical than technical.

Psycho-sociological and economic constraints

Despite the potential for developing animal husbandry as a family enterprise in Congo, livestock production activities still remain traditional. This situation is due to the more "agricultural" than pastoral nature of the activity of the Congolese farmer:in contrast with the Fulani for example,for whom animal breeding is an exclusive activity,the Congolese farmer does not possess the mystic of livestock breeding and pays little attention to his livestock.

Furthermore, in spite of an increasing trend towards production for commercial purposes, the social, cultural and even sentimental aspects of livestock breeding, as opposed to the utilitarian aspect, remain the reality.

A further major psycho-sociological obstacle is the fact that small ruminant production remains the exclusive domaine of adults and old men who are not receptive to changes in the traditional societies.

A third factor is the scant resources allocated to small ruminant production which has always been and will continue to be a major obstacle to the development of this sector. Technical and veterinary services cannot be provided on a regular basis due to a shortage of the necessary materials.

Technical constraints

Nutrition

Extensive traditional management is the most common livestock system in the Congo. Nutrition constitutes the major technical constraint when the diet consists of natural forages. Supplementary feeding is usually not practised or is inadequate in quality and quantity. The mineral deficiencies of the soils in the Congo are also reflected in the pastures. Mineral supplements in the form of mineral blocks are often not provided. The low nutritional level significantly affects productivity during the 4 month long dry season and predisposes animals to parasitism and infection.

Even though crop residues and agro-industrial by-products are available in some regions, they are not utilized consistently as animal feed.

Brooding

Reproductive wastage remains extremely high in small ruminant breeding particularly in the rural areas where the mortality rate for young animals is 33% (Table 1).

This situation is a further constraint to increasing small ruminant production capacity and productivity in view of the fact that the traditional sector accounts for most of the livestock population. This high mortality rate, which is a major cause for concern, is certainly due to climatic factors and in particular, to the free-range management system which exposes young animals to inclement weather and parasites. Breeding is not controlled and inbreeding is high.

Diseases

The major causes of death among small ruminants under traditional management are gastrointestinal and lung parasites and gastro-enteritis.

This parasitism, complicated by a low nutritional level, constitutes a major constraint to small ruminant production. The fact that the Congo has so far not experienced outbreaks of the major epidemics is an asset which should contribute towards the success of this sector.

Information and Training

Extension work with a view to promoting small ruminant production under better conditions was introduced only recently. Because of this lack of information and training,mixed farmers have not changed their ancestral methods.

The actions of C.A.T. ovin of Inoni have proved that rural farmers are amenable to certain changes when they are well informed. A total of 860 pilot farmers with 9 500 sheep are participating in the pilot improved

management system. Supplementary feeding in the form of mineral blocks, introduced by C.A.T is widely practiced and farmers are willing to purchase mineral blocks and medicines.

Particular mention should be made of the inadequate level of training given to technical extension staff. Livestock production scientists and technicians receive extensive training in the theoretical aspects of animal production. Intensive training (specialization), which would enhance their skills, is often lacking. As a result, there are currently few Congolese sheep production scientists.

Research

Research as a component of logistical support upstream to production has long remained indifferent to small ruminant production, a reflection of the interest of government authorities in this field.

Consequently, few reliable or recent data are available on small ruminants. The most recent data available are for 1982.

However, the Congolese government is now giving priority to sheep and goat production with a view to providing short and medium term solutions to the shortfall in animal products (CNA,1987).

Ironically, only a few research scientists are currently engaged in this sector. One of them is conducting research on the problematics of small ruminant production in the humid forest zone (Mayombe Project), and another is a research assistant in the University currently working on small ruminant reproduction. The third is in charge of the sheep selection programme at the Centre Expérimental ovin of Inoni.

Human resources in this aspect of animal production should therefore be increased to reach a critical mass of research scientists in this field.

CONCLUSION

Sheep and goats, though well adapted to the environmental conditions in the Congo, have always being of secondary importance in national development programmes. However, the renewed interest being shown in these species recently have made them a priority in national livestock development policies in which they have been called upon to play a dynamic role. Such a development,associated with an increase in the production and productivity of these animals,can only be possible when the existing constraints have been removed in order to attain the practical objectives. These constraints, which are not only technical but also, and above all, psycho-socioeconomical, could be overcome when the vast resources of the country are effectively utilized.

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THE SMALL RUMINANT RESEARCH NETWORK

NEWSLETTER

International Livestock Centre for Africa,
P.O. Box 5689, Addis Ababa, Ethiopia. Telephone: 61 32 15

N° 20 March 1991

EDITORIAL

Organising such a major event as the first Biennial Conference of the Network has kept the secretariat in Addis Ababa busy during the second semester of 1990. We apologize for the delay this caused in the distribution of number 19 of the newsletter.

Pending the publication of the conference proceedings, an account of the meeting, which was a reflection of our network's direction, is given on page 2. This direction, and more especially the direction of the small ruminant research and development efforts in Africa, results in the establishment of an increasing number of national networks, such as the one created in Burkina Faso (page 9).

The short communication sent to us by Ir Dibanzilua from the Nioka Station in Zaïre (page 10) is a good example of how useful it is to study farmer practices in order to identify constraints to goat and sheep productivity at village level.

Dr. Bernard Rey
Acting Coordinator of the African Small Ruminant Network

FIRST BIENNIAL CONFERENCE AND GENERAL MEETING

The African Small Ruminant Network held its first Biennial Conference at ILRAD's headquarters in Nairobi on 10-14 December 1990. The meeting was attended by more than 80 scientists from 27 sub-Saharan and North African countries, out of which 2/3 were anglophones and 1/3 francophones. Invited scientists from Angola, Zaïre, Mauritania, Zambia, Swaziland and Gabon were the only representatives who had not been able to come to Nairobi.

The opening session was chaired by Dr. C. Ndiritu, director of KARI (Kenya Agricultural Research Institute). After acknowledgement addresses by Prof. S.H.B. Lebbie, chairman of the Network Steering Committee, and by Dr. L. Reynolds, coordinator of ILCA's Small Ruminant Meat and Milk Thrust, the opening speech was delivered by His Excellency J.J.M. Nyaga MP, Minister of Livestock Development of the Governement of Kenya. He especially emphasized the need to strengthen small ruminant research and adopt a development-oriented systems approach as was the case with the CRSP project in Kenya.

Six scientific sessions were held during the first few days of the conference and 47 papers were presented. These papers are listed in this network newsletter. The first session focussed on small ruminant production systems and economics, the second on small ruminant performances and reproductive physiology, the third on sheep and goat health and reproductive wastage, the fourth on sheep and goat feeding, the fifth on small ruminant genetic resources, reproduction and breeding, while the sixth session was a workshop on the development of small ruminant production in Africa and its implications for research. Drs. Boutonnet and Tulasne and Prof. Njwe, Kiwuwa and Yenikoye made an introductory speech of half an hour for each of these sessions to present the problems on a continental level.

Participants of the Network Conference looking at some animals of the Ol' Magogo farm of the Kenya Agricultural Research Institute in Naivasha.

On the last day of the meeting, participants visited the Ol Magogo farm of the KARI station in Naivasha where the Small Ruminant Collaborative Research Project (SR/CRSP) is located. Participants to the Conference watched the four-way crossbred goats, which are promising as dual purpose goats for western Kenya. During this visit, and the lunch that followed, the participants met with their Kenyan collegues who had not been able to attend the Conference.

Because it enabled such a large number of scientists working on small ruminant in Africa to get together, the meeting was also an occasion to organise the Biennial General Assembly of the Network. Following the presentation of the interim report by the Acting Coordinator of the African Small Ruminant Network, Dr. Bernard Rey, discussion was soon started under the chairmanship of Dr. Rey and Dr. S.H.B. Lebbie. The participants

expressed their appreciation for the network activities and the efforts made by the Steering Committee and its secretariat to facilitate the establishment of collaborative research programmes, but they were dissatisfied with the lack of resources so far available and with establishment problems associated with the geographical remoteness between many of them. The General Assembly ended with the election of the first Steering Committee of the Network. Prof. Beyene Chichaibelu (Ethiopia), Dr. Robert Chavulimo (Kenya), Prof. Lahlou Kassi (Morocco), Prof. Al Hassane Yenikoye (Niger), Dr. Pessinaba (Togo), Prof. R. Njwe (Cameroon) and Dr. Sibomana (Rwanda), all former members of the interim Steering Committee, were re-elected by the scientitsts of their respective regions as members of the Network's first Steering Committee. Newly elected members are Dr. Adu of Nigeria, Dr. Das of Tanzania and Dr. Ndlovu of Zimbabwe; they will replace Prof. Lebbie, Dr. Akussu and Dr Sibanda.

The first Steering Committee of the Network met on 14 December 1990 and unanimously elected Prof. Beyene Chichaibelu of Ethiopia as its new chairman.

The Biennial Conference also gave the scientists of different regions an opportunity to organize at the same time a number of unscheduled meetings. Indeed each region elected its regional representatives to the Steering Committee while the East African region also elected a network chairman and secretary for each country in the region. Moreover, a small regional planning meeting was organized by the representatives of humid and subhumid West Africa to revise existing protocols and develop new ones with the assistance of Drs. Lahlou Kassi and Pessinaba. These meetings were held as a follow up on the Togo June 1989 meeting.

The Steering Committee met twice before the Conference started, especially to review the protocols of 7 countries funded under European Economic Community funding mechanism for the Network. The progress report to be submitted by the Coordinator to the General Assembly was also reviewed and the 1991 activity programme was discussed. This made it possible to approve funding for several research protocols to be implemented by the Secretariat from early 1991.

The African Small Ruminant Network wishes to renew its thanks to the Kenyan Government for facilitating the presence in Kenya of representatives from most countries in Africa; to the International Laboratory for Research and Animal Diseases (ILRAD) for allowing the meeting to use its facilities and to the International Livestock Centre for Africa, and especially its Nairobi staff, for their assistance in organizing the meeting and providing their logistical support.

LIST OF PAPERS PRESENTED AT THE FIRST BIENNIAL CONFERENCE

The proceedings of the First Biennial Conference of the African Small Ruminant Network are being edited and will be published in the second quarter of 1991. They will then be available on request. The papers presented are listed below; an (*) indicates that the document is in French.

SMALL RUMINANT PRODUCTION SYSTEM AND POLICY (Chairman: Miss L. Sibanda; University of Zimbabwe)

Which intensification process for small ruminant production in Africa? (J.P. Boutonnet) (*)

Economics of small ruminant meat production and consumption in Sub-Saharan Africa (Senait Seyoum)

A Short-Run Demand for Goat Meat in Cameroon (Ayissi Mballa)

Differences by Geo-Climatic Zone in The Economic Returns from Wool Productivity and Quality in Lesotho (J. P. Hunter)

Some Factors Influencing Intra-Annual Price Variations in the Central Highlands of Ethiopia (K. Andargachew, Ray F. Brokken)

Partial Budget Analysis for On-Station and On-Farm Small Ruminant Production Systems Research: Method and Data Requirements (S. Ehui, B. Rey)

Panurge: Survey System Used in Research Activities on traditionalLivestock Production System in Africa (O. Faugère) (*)

Development of Small Ruminant Production in the Densely Populated Highlands of Africa (I. Nsabiyumva) (*)

Summary of the Survey and Trials on Small Ruminant Health Conducted by the Research Section of the Mali Livestock Production Sector Project (Tahirou Tangara, Mamadou Doumbia) (*)

SMALL RUMINANT PERFORMANCE AND REPRODUCTIVE PHYSIOLOGY (Chairman: Dr. Pessinaba, Centre d'appui Technique de kolokope, Togo)

Seasonality of Sexual Activities of African Sheep and Goats (Prof. Yenikoye A.) (*)

Production Parameters of Mossi Sheep in Gampela (A.J. Nianogo) (*)

Major Demographic Parameters for White Somali Goat and Blackhead Somali Sheep (D.Bourzat; K.D. Gautsch; M.P.O. Baumannn; K.H. Zessin) (*)

Reproductive Performance of Indigenous Goats in Traditionally Managed Flocks in North East of Zimbabwe (L.R. Ndlovu)

A Statistical Analysis of the Lambing Records of West African Dwarf Sheep Kept at Ile-Ife, Nigeria (I.K. Oudubote)

Factors Influencing Flock Structure and Production Performance Dynamics of Breeding Sheep and Goat Station Flocks in Kenya (Geoffrey N. Angwenyi)

Rams Control in Sheep Breeding Management (Mazouz) (*)

Puberty in two Moroccan Sheep Breeds: The Early Maturing D'Man and the Late Maturing Sardi (Derqaoui Lahsen) (*)

The Relative Importance of Tactile, Visual, Auditory and Olfactory Stimuli in Oestrus Detection in West African Dwarf Ewes (G.O. Oyediji, M.O. Akusu and G.N. Egbunike)

Peripheral Plasma Levels of Progesterone and Oestradiol-17^{B} of West African Dwarf Goats During the Oestrous Cycle (M.O. Akusu, E.Nduka and B.A. Soyebo)

SMALL RUMINANT REPRODUCTIVE WASTAGE AND HEALTH (Chairman: Dr R. Shavulimo, Egerton University, Kenya)

Which can be the research priorities for small ruminant health in Africa? (J.J. Tulasne) (*)

Effect of Gastro-Intestinal Parasites on "Anoestrus post-partum" duration of Djallonke ewe (S. Hounzangbe Mwale M.) (*)

The Effects of Endoparasites on the Productivity of the Ethiopian Highland Sheep (Tekelye Bekele and O.B. Kasali)

Lamb and Kid Wastage Through Slaughtering of Pregnant Ewes and Does at Enugu and Nsukka Abattoirs, Nigeria (L.O. Wosu and E.C. Dibua)

Mortality Rate of 0-3 Month Old Animals in Extensive Traditional Livestock Production systems of the Southern Sudanian Zone of Senegal (Nagatte Ndiaye)

Optimal Time for Vaccination Against Peste des Petits Ruminants (PPR) disease in Goats in Humid Tropical Zone in Southern Nigeria (L.O. Wosu, J.E. Okiri, and P.A. Enwezor)

Prophylaxis for SmallRuminants in Senegal: Technical and Economic Evaluation of its Effect at Village Level (O. Faugère) (*)

Gastrointestinal Parasites in Small ruminants in Mali: Geographical distribution Epidemology and Chemotheraphy (Saidou Tembely) (*)

SMALL RUMINANT FEEDS AND FEEDING SYSTEMS (Chairman: Prof. B. Chichaibelu, Alemaya University of Agriculture, Ethiopia).

Strategies for matching (available) food resources to Small Ruminant needs (Prof. Njwe)

Some Experiences in Adapting Previously Free-Ranging Traditionally Managed Matebele Goats of Zimbabwe to Individual Stall Feeding (L.M. Sibanda, L.R. Ndlovu and M.J. Bryant)

Fattening Mature Indigenous (Matabele) Goats: Effects on Animal Performance. Body and Carcass Composition (P.R. Hatendi, T. Smith, L. Ndlovu and C. Mutisi)

The Utilization of Sorghum Stover Fed to Sheep as Influenced by Urea or Graded Levels of Lablab Supplementation (I.F. Adu, B.A. Fajemisin and A.M. Amadu)

Lablab (Dolichos Lablab) Meal as Protein Supplement for eaned Fattening Lambs (W.D. Mafwere and L.A. Mtenga)

Experiences in Protein Supplementary Feeding of Weaned Lambs and Goat Kids in Tanzania: The Issue of Dietary Energy (L.A. Mtenga and A. Madsen)

Lamb Production from Stargrass-Silverleaf Desmodium Pastures (A. Warambwa)

The Role of Poultry Waste as a Nitrogen Supplement to Fibrous Crop Residues Commonly Fed to Sheep and Goats (S.B. Kayongo and M.M. Wanyoike)

SMALL RUMINANT GENETIC RESOURCES AND BREEDING (Chairman: Prof. A. Oya, SODEPRA, Côte d'Ivoire)

Breeding Strategies for Small Ruminant in the African context (Prof. Kiwuwa)

The Performance, the Potentialities and Limitations of the West African Dwarf Goat for Meat Production in the Forest Belt of Ghana (A.K. Tuah, M.K. Buadu, F.Y. Obese and K. Brew)

Comparative Performance of Improved Meat Goats in Malya, Tanzania (S.M. Das and D.S. Sendalo)
Composition, Yield and Acceptance of Milk from Non-Dairy Goats and Sheep in Malawi (J.W. Banda, J. Steinbach and H.P. Zerfas)

Dairy Goat Breeding in Malawi: Gestation Length, Birth, Weights and Growth of the Indigenous Malawi Goats and their Saamen Crosses (S.K. Karua and J.W. Banda)

Performances of Alpine x East African Dwarf Goat with Varying Proportions of Alpine Blood at Vyerwa Livestock Breeding Station (Ngoze, Burundi) (C. Ntahimpereye) (*)

Body Weight Measurements relationship in Nigerian Red Sokoto Goats (W.A. Hassan and A. Ciroma)

Eruption of Permanent Incisors in Indigenous Goats and Sheep (O. Matika, R. Sibanda and M.L. Beffa)

Growth Traits of the Dorper Sheep
I. Factors Influencing Growth Traits
II. Genetic and Pheyotypic Parameters (B.A.O. Inyangala, J.E.O. Rege and S. Ituyla)

Milk yield of Cameroon Dwarf Blackbelly sheep (R.M. Njwe; Y. Manjeli)

SMALL RUMINANT DEVELOPMENT IN AFRICA: IMPLICATION FOR RESEARCH (Chairman: Dr B. Rey; ILCA/CIPEA, Addis Abeba

Research Highlights from the small ruminant collaborative research support program: The dual-purpose goat (DPG) (P.P. Semenye; A.N. Mbabu; B. Mwandotto; F.B. Nyaribo; J.M. Onim and F. Rurangirwa)

The National Sheep Selection Programme (PNSO) in Côte D'Ivoire Establishment of On-farm Performance Evaluation (A.Oya) (*)

Considering cash crops in developping small ruminant production in Togo (I.Y. Pessinaba; N.Y. Hadzi; A.Y. Nagnango) (*)

NATIONAL NETWORKS NEWS

The Network Secretariat has been informed by the Director of the Animal Production and Industry Department, Ministry of Agriculture and Livstock, Burkina Faso that a national small ruminant production development network has been created in Burkina Faso following the workshop

held in Ouagadougou on 12 and 13 July 1988 on small ruminant production development. On 18 December 1990, this network met to establish its main operating bodies and to lay down the by-laws that will legitimate its existence. The Head of the Animal Production and Industries Department, T. Ambroise Nitiéma, indicated to the African Small Ruminant Network that the national network is to be considered as its contact for Burkina Faso and that it is a means for collaboration in small ruminant production. To inquire about the names and adresses of the national network members please write to: Direction de la production et des industries animales, 03 B.P. 7026, Ouagadougou, Burkina Faso.

MEASUREMENTS AND LIVE WEIGHT OF VILLAGE EAST AFRICAN DWARF GOATS IN THE NIOKA AREA, ZAIRE

(Ir Dibanzilua Mwana Nsambu, Nioka Research Centre, INERA, Republic of Zaïre)

Goat production in the Nioka area in eastern Zaïre is gaining in scope because of the growing population density and the increased pressure on grazing lands it causes. Characterisation and evaluation of indigenous breeds based on their adaptation to various production systems are needed to guide the breeding policies entrusted to the Nioka Station as part of the national small ruminant program.

This article presents the body measurement of goats maintained under village conditions. Grazing practices differ markedly between livestock systems and their effects on goat weights at several ages are examined.

MATERIALS AND METHODS

Village goat production has been surveyed within a radius of about 20 km from the Nioka Research Centre.

The Nioka area is located in the N-E of Zaïre in the Ituri sub-region, Mahagi Region. Rainfall ranges from 1 100 to 1 400 mm; altitude averages 1600-1750 m a.s.l. and temperature ranges from 18 to 25°C (Chartier, 1989). Body measurements and weighing were made on 890 goats of varying sexes and

ages. Out of these animals, 439 only were used to compare three grazing management systems, taking into account the homogeneousness and the representativeness of these sub-samples based on the structure of the herds surveyed. Goat age was estimated on the basis of dentition, with animals having more than 6 permanent teeth considered to be adult (Larrat et al, 1971).

Height at withers and at rump, chest depth, heart girth, body length, width at hips and pins were measured using a measuring stick and a tape.

A spring balance was used to weigh animals allowed to free-range during the day under the surveillance of a herder, animals confined during the day and allowed to free-range between 12 and 2 p.m. and animals tethered all day long. Systems where animals are allowed to free-roam every day coming rarely inside the compounds have not been considered. All these animals graze natural pastures.

RESULTS AND DISCUSSION

Weight and slaughter value of adults goats

The value of body measurements and weight variables of adult male and female goats are shown in Table 1 while relationships between some of these variables are given in Table 2 to indicate the slaughter value of the animals (Arnous, 1986).

Table 1 Height (cm) and weight (kg) of adults goats (more than 6 permanent teeth).

VARIABLES	Males (N=35)			Females (N=160)		
	X	S.D.	CV%	X	S.D.	CV%
WITHER HEIGHT (WH)	57,61	4,29	7,44	53,90	3,56	5,61
HEIGHT AT RUMP (HR)	59,44	4,51	7,59	56,11	3,14	5,60
DEPTH OF CHEST (DC)	27,34	4,06	14,85	26,21	3,21	12,27
HEART GIRTH	75,26	5,17	6,86	71,66	4,72	6,58
WIDTH AT HIPS	13,21	1,31	9,92	13,19	1,46	11,12
WIDTH AT PINS	9,09	1,43	15,75	8,84	1,52	17,23
BODY LENGTH (BL)	56,23	4,66	8,28	54,51	4,40	8,08
WEIGHT (W)	32,38	6,5	20,07	28,49	5,64	19,80

X = Average; S.D. = standard deviation; CV = coefficient of variation

Table 2. Slaughter value of adult goats.

ANIMALS	DC/WH	BL/WH	BL/HR	W/C^3
MALE	0,47	0,97	0,94	75,97
FEMALE	0,48	1,01	0,97	63,31

Despite the high level of the coefficients of variation, values as a whole, especially heights at withers and at rump, chest depth, heart girth and live weight, are higher for males.

The ratio of chest depth and height at withers (Table 2) shows that the Nioka goat is short-legged while its dropping chest gives it a good slaughter value. The ratios of body length and height at withers and of body length and height at rump show that the Nioka goat belongs to the short-legged type (Turadosour, Petrescu, 1974).

The fattening coefficient W/C^3 classifies the indigenous goat, reared under traditional management system, in the category of animals with middle-level fattening potential which is typical of extensive animal husbandry. This coefficient is higher in males.

Effect of grazing practices on weight gain

The effect of grazing practices on goat weights at different ages as estimated on the basis of the number of permanent teeth is given in Table 3. Three practices have been considered:

- Free grazing under the supervision of a herder, a system usually practiced by grantees of land and by particular livestock producers who use communal pastures marked with boundary stones and delimited by the Livestock Development Project. The animals are taken to graze in the morning with a herder who occasionally watches the animals, and return in the evening after having eaten their fill (193 goats were weighed).
- Partial confinement of the animals with free grazing in the afternoon, usually between 12 and 2 p.m., is found in areas where mixed crop-livestock farming is practised. Fields are a long way off the sheep or goat sheds so that freely grazing animals do not

have the time to reach the crops. 138 goats reared under this system were weighed.

- Tethering is a system used by many livestock producers for lack of pastures of their own and because of dwellings being surrounded by cropping lands. The animal is tethered all day long to a 3-4 m long rope, traditionally made of sisal, delimiting the grazing radius. The tethering stake is sometimes moved to another place during the day. 108 goats fed this way have been weighed.

Table 3 Live weight (kg) distribution according to grazing practices.

PRACTICE	0 TOOTH	2 TEETH	4 TEETH	6 TEETH	8 TEETH
FREE GRAZING WITH HERDER	9,94	18,08	21,16	23,52	29,75
CONFINEMENT BEFORE NOON	9,68	18,64	20,30	23,44	26,50
TETHERING	8,07	16,60	17,31	19,69	21,06

Table 3 shows that tethering reduces weight gain compared to the other two practices which do not differ for this trait.

CONCLUSION

Measurements have been made to estimate the size and weight differences between male and female East African dwarf goats maintained at Nioka, Zaïre. It has been shown that the Nioka goat has a good slaughter value and that it belongs to the short-legged type. Its fattening coefficient places it in the category of animals with an average level potential fattening.

Weighing the animals to compare three grazing management systems has shown that tethering affects animal growth due to the limited grazing area. Animals reared this way need to be continuously moved during the day, or 6-

10 m long ropes need to be used, as recommended by the extension services, to increase the grazing area. Effects of these practices on other productivity traits are being investigated.

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THE SMALL RUMINANT RESEARCH NETWORK

NEWSLETTER

International Livestock Centre for Africa,
P.O. Box 5689, Addis Ababa, Ethiopia. Telephone: 61-32-15

NO 21 November, 1991

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EDITORIAL

The growing readership (over 1200 readers) of our network newsletter over the past years is a clear testimony of its need and usefulness. If we are to continue to meet this increasing demand for our newsletter, we have to keep it viable and sustain it.

The viability and sustainability of any newsletter lies squarely with its audience that has the indisputable obligation to regularly provide the editor with the news items. I know you enjoy reading the newsletter, but how many times have you contributed to its contents?

I know a lot of you out there have a lot of "grey literature" tucked away in your drawers or achieves. You have not been able to publish these because the journal of your choice wants to drain your meagre economic reserves. Or may be the information has a local or continental flavour. Well, your network newsletter caters for all types and levels of information. In our stage of development your information could be of use to somebody out there.

So why not share your knowledge with all of us? The editor accepts submissions ranging from short articles on small ruminant research and development, announcements of workshops, conferences, seminars, meetings and courses, and views and suggestions on how to improve the newsletter or matters generally related to the network.

Thank you in advance for being so responsible and responsive.

Submissions should be sent to:

The Editor
SRNET Newsletter
ILCA
P.O. Box 46847, Nairobi, Kenya

SRNET COLLABORATIVE RESEARCH PROGRAM GETS UNDERWAY

I am happy to announce that the EEC-ILCA and NRI funded collaborative research programmes have started.

A total of 14 research projects have so far been approved by the Network Steering Committee for funding. The funding formalities of six of these projects have already been completed. The details are as follows:

1. Project N° SRNET/SAHEL-NORD/REPR/1

Regional Protocol: Effect of different pathological conditions on the reproductive performance of flocks among agropastoralists.

Titre: Effect of genital infections, helminthiasis and hemoparasites in pregnant ewes and does in Southern Senegal: impact on breeding and mortality of the offspring before the age of 3 months.

Location: Senegal, Kolda region

Executing scientist: Dr. Magatte NDIAYE

Duration: July 1st, 1991 - December 31, 1993

Grant : 50,000 US $

2. Project N° SRNET/SAHEL-NORD/ALIM/1

Regional Protocol: Nutrition and flock productivity

Title: Evaluation of the effect of level of feeding on the performance of milch does under controlled environment in the Sahel.

Location: Senegal

Executing Scientist: Dr. Maimouna CISSE

Duration: Septembre 1991 - November November 1993.

Grant: US $ 28,767.

3. Project N° SRNET/SAHEL-NORD/SYST/1

Regional Protocol: Improving Small Ruminant Production Systems.

Title: Factors responsible for variation in the milk production among Peul sheep.

Location: Senegal, the Niaye and Sahlien regions

Executing Scientist: Maty BA DIAO

Duration: July 1, 1991 - June 30, 1993

Grant: US $ 30,900

4. Project No. SRNET/EAST/RWH/1

Regional Protocol: Reproductive wastage and health management

Title: Trials on production and efficacy of a killed mycoplasma vaccine containing a single or multivalent antigen

Location: National Veterinary Institute, Debre Zeit

Executing Scientists: Dr. Mebratu Giyesus

Starting date: September, 1991 Ending date: June 1993

Grant amount, in US$ 23,400

5. Project N°. SRNET/SOUTH/FFSYST/1

Title: The effect of supplements of crop residues or agro industrial by-products on the performance of small-holder goat production.

Location: Swaziland

Executing Institution: University of Swaziland, Faculty of Agriculture

Executing Scientists: Dr. B.H. Ogwang, Dr. Shandomo
Mr. D. Mavimbela and
Ms R. Vilekati

Duration: March 1991-March 1994

Grant Amount: £46,440 (4 yrs)

6. Project No: SRNET/SOUTH/FFSYST/2.

Title: Supplementary feeding of sheep and goats in Zimbabwe.

Full Title: Improving productivity of sheep and goats in Zimbabwe through supplementary feeding.

Location: University of Zimbabwe farm
Henderson Research Station
Nyanga North Communal Areas
Gwanda Communal Areas

Executing Instition: Department of Animal Science, University of Zimbabwe

Executing scientists: Dr. L.R. Ndlovu
Dr. C.T. Kadzere
Ms L.M. Sibanda
Ms A.R. Warambwa

Funds requested: US$41,250 (3 years)

On behalf of the network Steering Committee and all network participants particularly those countries and NARS scientists benefiting in this first round of funding, I wish to thank and express our sincere gratitude to the EEC, ILCA and NRI (Natural Resources Institute of Britain)

for their timely support to the network's collaborative research programme. I strongly believe that there could be no better or more effective and faster means of achieving any more measurable and sustainable impact from research efforts than by channeling these efforts through committed network participating NARS scientists who carry the direct responsibility for livestock research and development in their respective countries. I therefore wish at this point to plead to our current and potential well wishers to redouble their efforts to get more collaborative research work done in those countries not yet benefiting in terms of actual research.

COUNTRY INFORMATION ON SMALL RUMINANT RESEARCH AND DEVELOPMENT

One of the striking revelations during the regional network planning and protocol development meetings was how little NARS scientists knew each other and what their research interests and priorities were. The importance of such knowledge in our current level of development cannot be overemphasized. The next series of network issues will attempt to address this information gap by briefly highlighting available information on small ruminant research in the participating countries/institution on the african diaspora. You are therefore kindly requested to send your own country/institution information on small ruminant research to the editor. The main purpose here is to create a forum where you can let other people know what you are doing and for you to also know what others are doing. Through this, scientists having common interests can contact each other and exchange ideas or decide on collaborative links. In this same issue we will start with a dispatch from Ethiopia.

Small Ruminant Research activities

Country: Ethiopia

Institute: Department of Animal Sciences, Alemaya University of Agriculture (AUA)

Project Title: Improving the productivity of sheep and goat

Project Objectives:
- To improve productivity of sheep and goats through improved nutrition and breeding
- Characterization of local goat types
- Generate base line data on production systems
- Test the survival, adaptability and performance of cross-red goats on-station and on-farm

Animals available: 600

Project Research Theme: Applied breeding; applied feeding and pastures; teaching, tertiary education

Project team leader: Dr. Kano Banjaw, Senior Animal Breeder (PhD Gottingen, MSc Gottingen. 12 years experience post PhD). Head, Animal Breeding and Genetics section.

Other Scientists:
- Getachew Gebru, Senior lecturer and and small ruminant nutrition researcher, (MSc AUA/Agric. Univ. Norway, Bsc AUA). Head, Small Ruminant Section.
- Dr. Christie Peacock, Farm Africa Dairy Goat Programme Coordinator, (PhD and MSc, Reading)
- Dr. Girma Tefera, Veteinarian, (DVM)
- Alemayehu Reda, Graduate Student, (BSc AUA)
- Workineh Ayalew, Graduate Student (BSc AUA)

Duration:

- Short-term nutritional studies
- The first phase of the dairy goat programme ending in Dec. 1991. The on-farm testing component will begin in the second phase of the programme (expected to be three years).
- The sheep breeding research is a long term on-station study.

Current Research: Crop residues, Agro-industrial by-products and forages in small ruminant feeding

- Characterization of indigenous goat types in Eastern and Southern Ethiopia

- Breed improvement of local sheep (Black Head Ogaden) and goat (Ogaden types) through cross-breeding.

Research Summary: Performance parameters for sheep and goats, and basic characterization data of indigenous goats in Harrarghe, Eastern Ethiopia, have been collected. Research of similar nature is being extended to South Western Ethiopia. Exotic sheep (Dorper and Awasi) and goat (Anglo-nubian) breeds have been introduced and data is being recorded on-station.

Distribution of F1 cross-bred does and testing on-farm will be implemented soon. Pure breeding of dairy type indigenous goats is being planned.

Address: P.O.Box 138, Dire Dawa, Ethiopia
(251-5) 11 15 25

For further information, please contact Mr Getachew Gebru of the above address.

GENETIC RESISTANCE TO ENDOPARASITES AND OTHER DISEASES IN SMALL RUMINANTS - ILCA RESEARCH

ILCA's major research effort in the areas of genetics of disease resistance over the last ten years has been in the Trypanotolerance Thrust. Trypanotolerant breeds of cattle such as the Taurine N'Dama and West African Shorthorn have been identified and extensively characterized, not only for criteria of trypanotolerance, but also for production traits. More recently, available evidence suggests that packed red cell volume, as an indicator of the extent of anaemia and therefore resistance of trypanosomiasis, is both a repeatble and heritable trait within the N'Dama breed. This suggests that genetic improvement programmes within the N'Dama breed should be feasible to improve both disease resistance and overall productivity.

Research with very similar objectives to the trypanotolerance studies with cattle is now being planned with small ruminants. In particular, it is planned to determine and compare genetic variation in resistance to internal parasites between and within breeds of sheep and goats in a Pan-African, multidisciplinary research context. Where other diseases are also of importance it is planned to characterize genetic variation for them, as well as the usual array of production traits (e.g. growth, reproduction, etc.).

There has, of course, already been some research in this area in Africa. For example, in Kenya, research by Allonby and colleagues in the early 1970's suggested that the indigenous Red Maasai fat-tailed sheep breed was relatively resistant or tolerant to endoparasites relative to exotic breeds such as the Corriedale, Merino or Hampshire. More recent studies in Kenya by KARI and ODA in the highlands (Muguga) and KARI and ILCA on the coast (Mombasa) suggest that the Red Maasai may be more resistant to endoparasites than the Dorper breed. Similar studies are also being carried out by SR-CRSP in Kenya as part of their programme to develop the Kenyan Dual Purpose Goat (a 4-way cross synthetic breed composed of the

Small East African, Galla, Toggenburg and Anglo-Nubian breeds). While it has not yet been possible to identify significant relationships between DNA markers and haemonchus resistance in this goat population, an encouraging heritability estimate (40%) for resistance to haemonchus infection (assessed by faecal egg counts) has been reported.

There are also less well documented reports from West Africa that Djallonke sheep and West African Dwarf goat may be relatively resistant and/or tolerant to internal parasites and trypanosomiasis.

In February 1991 ILCA held a Research Planning Workshop in Addis Ababa to discuss and develop a Pan-African research programme to investigate genetic resistance to endoparasites in small ruminants. This workshop included three expert consultants (i.e. Dr. L. Gruner, INRA, France; Drs. R. Windon and R. Woolaston, CSIRO, Australia). They made some very useful suggestions on the proposed research, both from quantitative genetics and parsitology view points. The proceedings of this workshop is available from the ILCA library in Addis Ababa or Nairobi. It includes an up to date summary of research in this area in France and Australia, and much of the discussion about this research.

Among the recommendations of the February research planning workshop was the need to do a literature survey and review of a number of aspects of endoparsitism in Africa, including:

1. Information on different parasite genera present in different locations and ecological zones

2. Information on levels of parasitism in untreated animals (e.g. in terms of faecal egg counts or packed cell volume)

3. Comparisons between the production of animals treated or untreated with anthelmintics

4. Information on between breed or within breed differences in resistance or tolerance to endoparasites. Criteria which could be used to assess this could include faecal egg counts, worm counts, packed cell volume and live weights or liveweight gain in untreated animals.

Participants in the workshop suggested that much of the African evidence on the above questions was likely to fall in the "grey" rather than the published literature. ILCA would very much like to hear NARS scientists, and particularly members of the African Small Ruminant Research Network, that might know about or have access to such grey literature. If useful data was available that had not been analysed or summarised ILCA may be able to assist with this.

The project leader of this research is Dr. R.L. Baker who recently joined the ILCA staff as a quantitative geneticist with a special interest in genetics of disease resistance. He would appreciate hearing from people in Africa who have an interest in this area of research, or who have information on the subject matters listed above.

Contact Address: Dr. R.L. Baker
ILCA, P.O. Box 46847
Nairobi, Kenya

ANNOUNCEMENTS

A. CONFERENCES/WORKSHOPS/SEMINARS

1. Consultations are currently going on for the holding of an "ALL AFRICA CONFERENCE ON ANIMAL AGRICULTURE"

Theme: Achievements, challenges and prospects of Animal Agriculture

Venue: Kenyatta International Conference Centre, Nairobi, Kenya

Date: November 23rd to 27th, 1992

For more information contact:

The Organizing Secretary
Animal Production Society of kenya
Hill Plaza
P.O. Box 34188
Nairobi, Kenya
Tel: 254-2-722637/35/02
Fax: 254-2-722844

2. 2nd BIENNIAL CONFERENCE OF THE AFRICAN SMALL RUMINANT RESEARCH NETWORK

Theme: African Small Ruminant Research and Development

Date: December 11-15, 1992

Venue: To be announced in due course

The scientific sessions will include Systems and Economics of Production, Reproductive Physiology and Performance, Reproductive Wastage and Health, Feed Resources and Feeding Systems, Breeds and Breed Evaluation and Relationship between Research and Development Programmes for Small ruminant Production.

Those interested in presenting papers at this conference are kindly requested to submit the detailed abstracts of their papers to the co-ordinator latest by the end of May, 1992. Those whose abstracts are

accepted will be notified and will be expected to submit their full manuscripts not later than July 31, 1992. All submissions with a postmark later than the indicated deadlines will not be accepted. We will like to edit these manuscripts and where necessary return them to you for resubmission so that the the proceedings could be released early.

If you have any questions, please contact the co-ordinator immediately.

B. RELOCATION OF THE NETWORK CO-ORDINATION OFFICE

The African Small Ruminant Research Network Co-ordination office has been relocated to the ILCA Office in Nairobi, Kenya.

You are therefore kindly requested to address all future communications related to the network to:

The Co-ordinator
SRNET, ILCA
P.O. Box 46847
Nairobi
Kenya
Telephone: (254-2) 632066/13/93
Telex: 25747 ILCA KE
Fax: (254-2) 631481

C. ASSUMPTION OF DUTY

The substantive SRNET Co-ordinator, Dr. S.H.B. Lebbie assumed duty on June 24, 1991 at the Nairobi Office. He looks forward to working for and with you. Your co-operation is highly solicited.

As Dr. Lebbie moves in, Dr. Bernard Rey, who was acting for the co-ordinator, takes on new responsibilities in the Animal Breeding and Production Systems section of the Animal Science Division at ILCA HQs.

Dr. Rey's timely acceptance to shoulder the responsibilities of the network when the then co-ordinator left ILCA's services went a great way to ensure the continuity of the network. His hard work and dedication contributed immensely to the few enviable successes recorded by the network to date.

On behalf of the Steering Committee and the network participants, I wish to thank Dr. Rey for all his contribution to the development of SRNET. We look forward to his continuous support in our work.

NOTE

If your address is incorrect or if a colleague would appreciate receiving a copy of this Newsletter, fill the attached form and send it to:

The Editor,
The Small Ruminant Network Newsletter,
ILCA,
P.O. Box 46847,
Nairobi,
Kenya.

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Name: .....

Address: .....

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Please note my new address:

Name: .....

Address: .....

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