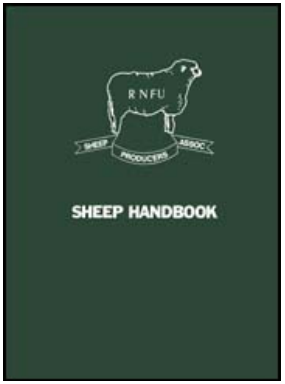

Sheep Handbook

Author(s)*:** ***D. J. Donkin
Publication date*:** ***1973
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General Information

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GLOSSARY

ANOESTRUS	A term used to describe a ewe which will not mate with a ram.
"BRAK" WATER	Water with a moderately high salt content; brackish.
CASTRATION	The removal of the testicles of the male animal.
COLOSTRUM	The milk secreted by the udder immediately after lambing and for the following three or four days. It acts as a natural purgative and source of antibodies.
COW-HOCKED	A term used to describe the weakness in a sheep when the hocks are inclined inwards at all times.
CREEP	An area for the supplementary feeding of lambs and from which the mature sheep are excluded by a gate with a low or closely spaced

bars through which the lambs can pass freely.

CRYPTORCHID	A male animal in which one or both testicles have not descended into the scrotum. Such animals may be partly fertile, but should be culled because the condition is hereditary.
CYCLING	A colloquial term used to describe a ewe that has commenced her oestrus cycle and is ready for breeding.
DOCKING	The removal of part or all of the tail, usually as a young lamb.
DRIFTING	A term used to describe the control of ewes at lambing, whereby each ewe that has lambed is left behind in its maternity camp when those that have yet to lamb are moved to the next paddock.
EARTAG	A metal or plastic strip or disc on which figures or letters are marked, and which is placed in the ear of the animal for identification purposes.
FOUR TOOTH	A sheep of about 21 to 24 months of age which has only two pairs of its permanent incisor teeth.
FULL-MOUTH	A mature sheep over three years of age; all eight permanent incisor teeth are fully developed.
GESTATION	The period of pregnancy; average in sheep 150 days.
HAMEL	See "wether".
HEAT	See "oestrus".

HOGGET	A young sheep of either sex from about nine months of age until it is a two-tooth.
INBREEDING	The mating of closely related sheep.
IN-LAMB	A term applied to a ewe that is pregnant.
JOINING	A term describing the introduction of the ram(s) into the ewe flock for mating (tupping).
LACTATION	The period during which a ewe suckles her lamb.
LAMB	(i) The unweaned young sheep.(ii) A young sheep (or carcase therefrom) which has no permanent incisor teeth - see "milk tooth".
LIBIDO	The desire and energy expressed in the sexual impulse.
LINEBREEDING	Breeding from the same family or "blood line" but not from close relatives.
MAIDEN EWE	Specifically, this is a ewe that has not yet been mated; the term is often used more loosely to denote a ewe that has not yet had her first lamb.
MILK-TOOTH	A term denoting a young sheep before it has cut its first permanent incisors.
MOUTHING	Examination of the teeth to determine their soundness or the animal's age.
OESTRUS	Also known as "heat" or "season", this term describes the period

OESTRUS	Also known as "heat" or "season", this term describes the period during which a ewe will accept a ram's service and is able to conceive. The ewe's oestrus period lasts 12 to 36 hours and, if she has not conceived, is followed by a period of anoestrus lasting 16 or 17 days before she recommences oestrus.
OVERSHOT JAW	An undesirable condition in which the lower jaw is too long to permit the incisor teeth to meet on the dental pad. Conversely an "undershot jaw" is the condition when the lower jaw is too short for the incisor teeth to meet with the dental pad. **Note:** In some countries and books these definitions are reversed i.e. an "overshot jaw" is when the upper jaw is too long relative to the lower jaw.
PREPOTENCY	The ability of an individual breeding animal - usually the sire - to impress its own characteristics or likeness on a large proportion of its progeny.
RADDLE	A dye or marker applied to the brisket or belly of a ram. The ewes he has mounted can thus be identified by the colour left on their rumps after service.
RIG	A male sheep that has not been properly castrated i.e. one testicle may not have been removed.
SCROTUM	The purse or bag containing the testicles of a male animal.
SEASON	See 'oestrus".

SHORN	A term applied to a sheep that has had its wool removed by shearing.
SICKLE-HOCKED	A term describing the weak bone structure that results in the hind legs being so curved that the feet are positioned abnormally far forward.
SIX-TOOTH	A sheep aged between 27 and 33 months of age which has only three pairs of its permanent incisor teeth.
STAG	A term describing a male sheep that has been castrated after reaching maturity, and which therefore shows some characteristics of the entire male.
TEAZER RAM	A vasectomized ram i.e. one that has undergone an operation to cut the ducts leading from the testicles to the penis, so that although the animal remains sexually active, no service will be fertile.
TUPPING	A term used synonymously with "mating" in sheep.
TWO-TOOTH	A young sheep of about 12 to 18 months of age, which has cut its first pair of permanent incisor teeth.
UNDERSHOT JAW	See "overshot jaw".
WEANER	A lamb that has been weaned from its mother or has stopped sucking its mother.

WETHER A male sheep that has been castrated as a lamb, before developing masculine characteristics.

Some useful addresses

1. Rhodesia Sheep Producers' Association

Secretary Mr. F. J. B. Atkinson, P.O. Box 1241, Salisbury. Telephone 28515.

Chairman Mr. F. C, Newland, P.O. Box 16, Bromley.

Vice-chairman Mr. M. W. Lamb, P.Bag 513D, Salisbury.

Executive members

Matabeleland Mrs U. McAllister, P.Bag R5319, Bulawayo.

Eastern Districts Mr. P. Froggatt, P.Bag 2012, Melsetter.

Victoria Mr. J. J. P. La Grange, P.O. Box 26, Chatsworth.

Lomagundi Capt. L. P. J. Boshoff, P.O. Box 60, Darwendale.

Midlands Mr. F. F. L. Hein, P.O. Box 613, Gwelo.

S.W. Mashonaland Mr. P. J. Cocker, P.O. Box 262, Gatooma.

Salisbury Mr. M. W. Lamb, P.Bag 513D, Salisbury.

Marandellas Mr. F. C. Newland, P.O. Box 16, Bromley.

2. Breed societies

Dorper Sheep Breeders' Association, Postal Agency, Tengwe. (Secretary: Mrs. J. Brereton).

Wiltiper Sheep Breeders' Association, P.O. Box 34, Norton. (Secretary: Mrs. J. Souchon).

3. Livestock Improvement Committee

(Applications for import permits for pedigree stock)

Livestock Improvement Committee, P.O. Box 8117, Causeway. (Secretary Mr. G. Rumsey).

4. Veterinary Research Laboratory

(For diagnostic investigations and vaccine supplies).

Veterinary Research Laboratory, P.O. Box 8101, Causeway.

(Borrowdale Road, Salisbury).

5. Research stations: sheep breeding and nutrition

Grasslands Research Station, P.Bag 701, Marandellas.
Matopos Research Station, P.Bag K19, Bulawayo.
Henderson Research Station, P.Bag 222A, Salisbury.
Makoholi Experiment Station, P.Bag 9182. Fort Victoria.

6. Buyers of wool in Rhodesia

Barwon Downs (Pvt.) Ltd., P.O. Box 10. Troutbeck.

Burger, Mrs. J. C, P.O. Box 33, Chatsworth.

Fleming, Major R. W., Braemar Farm, P.O. Salisbury.

Harari Weavers, c/o African Administration Department, Salisbury Municipality, P.O. Box 1976, Salisbury.

Houghton, Mrs. G., P.O. Box 107, Bindura.

Nyafaru Development Co. (Pvt.) Ltd., P.O. Box 24, Troutbeck.

Wyrley-Birch, Mrs. H.., P.O. Box 12, Troutbeck.

Zuwa Weaving Centre, c/o District Commissioner, P.Bag 12, Inyanga.

7. Wool Brokers in South Africa:

BilIsons and Coutts (Pty.) Ltd., P.O. Box 483, East London.

Boere Saamwerk Beperk, P.O. Box 2002, Port Elizabeth.

Farmers' Co-operative Union, P.O. Box 2012, Port Elizabeth.

Koöperatiewe Wolmaatskappy Beperk, P.O. Box 1907, Durban.

For specific advice on sheep production or disease control contact your local office of the Department of Conservation and Extension or Department of Veterinary services. Addresses are listed in the Government Section of the Telephone Directory.

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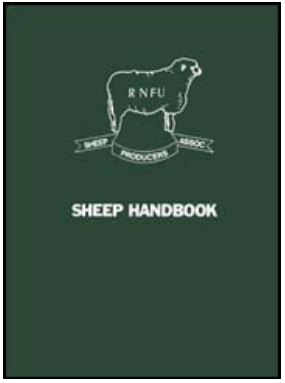

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Introduction

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The publication of this Handbook by the Rhodesia Sheep Producers' Association will, I believe, be of great benefit to the sheep industry of this country.

New knowledge is constantly being derived from research and from practical experience. Therefore, the looseleaf design has been chosen so that from time to time, chapters can be revised and replaced in the folder. Provision has been made for readers to be sent supplementary pages as they become available.

I should like to thank the Ministry of Agriculture for making staff available to undertake the production of this valuable publication.

Particular tribute must be paid to Mr. D. J. Donkin, Animal and Pasture

Specialist of Conex, who was the principal author. Dr. R. L. McKenzie of the Department of Veterinary Services has contributed the very important section on veterinary matters and Mr. B. B. Wilson, Farm Management Specialist of Conex, was responsible for writing the chapter on economics. It would be wrong to omit mention of the sterling work being done by research workers in this country whose findings have formed the basis of some of the information contained within these pages. I commend this Handbook both to established producers and those wishing to enter the industry.

In the past, new producers have, unfortunately, in many instances, embarked upon sheep production without a sufficient knowledge of husbandry, particularly in the fields of nutrition and disease control. As a result, failures have occurred and sheep production has acquired, unnecessarily, an unfavourable reputation.

Sheep are perhaps one of the most rewarding of the many forms of livestock farming, both in financial terms and in satisfaction. On the other hand, sheep can be more frustrating and unsatisfactory to produce than any other animal if good management is not applied to them. In other words, they are particularly sensitive to the level of management.

However, the whole of animal husbandry cannot be learnt from text books. The intangible quality of stockmanship, tempered by experience, is necessary as well. This Handbook will supply the theoretical knowledge and information gained from other people's experience. It comes at a time when the sheep

industry is experiencing very satisfactory prices for mutton and lamb and, in consequence, increasing interest is being shown by farmers in sheep production.

The Handbook is being provided free to all members of the Association who require it and copies are being issued to Government departments which are associated with the industry.

In conclusion, I should like to thank those who have bought advertizing space, thereby relieving the sheep levy fund of some of the cost of producing this Handbook.

F. C. NEWLAND, Chairman.
Rhodesia Sheep Producers' Association.

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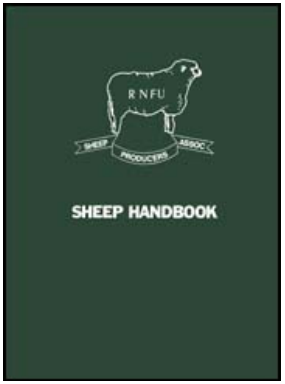

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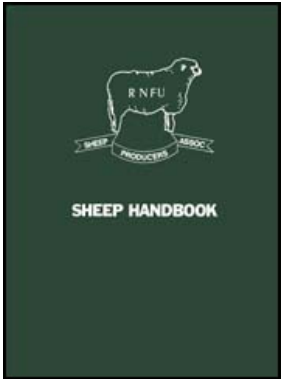
I would first of all like to congratulate the Rhodes/an Sheep Producers" Association on its enterprise in producing this Sheep Handbook and for making it available to registered sheep producers tree of charge.

This is the first comprehensive technical manual on sheep production to have been produced in this country. I believe that it will be a welcome addition to the farming manuals in this country and will be of considerable assistance to established sheep producers. No less important, of course, it will also be of

immense benefit to those wishing to commence sheep production as it should help them to ensure that their sheep producing ventures start on the right lines.

The Hon. David Colville Smith, LCD., M.P.
Minister of Agriculture



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Chapter 1. The Rhodesian Sheep Industry

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D. J. DONKIN

The history

Ever since the turn of the century farmers in Rhodesia have kept sheep. In

several cases, flocks of Merino wool sheep were brought up by new settlers from South Africa, but owing to the prevalence of internal parasites, disease and grass seeds, most of these flocks did not survive more than a year or two. Blackhead Persians proved to be far hardier and, together with the indigenous sheep breeds, formed the bulk of the European-owned sheep population in Rhodesia until after the Second World War.

It was at about this time that there was a large increase in the European farming population and, simultaneously, the first crosses of Wiltshire Horns on Persians and the first importations of Dorper sheep took place. These factors contributed largely to a tripling of the European-owned sheep flock over the next twenty years and to a significant change in the type of sheep produced. Simultaneously, more effective roundworm remedies and a wider range of vaccines made it possible to control disease to a far greater extent, and a deeper knowledge of nutrition and management suited to local conditions all contributed to far better prospects of improving flock profitability.

Present trends

The European-owned sheep population in Rhodesia reached its peak in 1969 (Table 1.1) having climbed sharply after 1966, largely as a result of agricultural diversification. Subsequently there has been a marked drop in sheep numbers.

Table 1.1 Sheep population by provinces (European Owned) (CSO)

Province	1966	1969	% increase over 1966	1972	% decrease below 1969
Manicaland	23 320	39 421	+69%	28 441	-27,9%
Mashonaland North	46 890	79 879	+70,0%	57 781	-27,6%
Mashonaland South	76 577	102 421	+33,7%	77 224	-24,6%
Matabeleland	39 900	59 659	+49,5%	47 256	-20,8%
Midlands	39 132	46 486	+18,7%	35 623	-23,4%
Victoria	19151	28 141	+46,7%	20 841	-26,0%
Rhodesia (total)	244 970	356 007	+45,5%	267 166	-25,0%

It is likely that part of this decline is the result of disillusionment among

those farmers who diversified into sheep under the impression that this was an easy way of making quick money. If this is indeed the case it is likely that the industry is currently entering a period of consolidation and increased profits as a result of the improved producer prices.

The distribution between the provinces indicates that nearly two-thirds of the European owned sheep are in the two Mashonalands and Manicaland. Not only does this indicate that there are more sheep in the better-favoured rainfall areas but, probably more realistically, that the distribution of sheep is roughly in proportion to the number of farmers in the different provinces.

It is interesting to note (Table 1.2) that approximately three-quarters of the European-owned flocks consist of less than 200 sheep. The Rhodesia Sheep Producers' Association's Sheep Population Survey indicated that most of these small flocks were kept for home consumption only and, as such, make an insignificant contribution to the agricultural economy of the country. Bearing in mind the average profitability of sheep, less than four per cent of the flocks can be considered to be major enterprises and a further 20 per cent important enterprises. The African-owned sheep population is very similar in size to the European-owned sheep flock, but the annual off-take into the cash economy is very low and is relatively insignificant at the present time.

Although it is difficult to estimate the size of the consumer market in Rhodesia, it would appear that the annual consumption is below five kilograms of mutton or lamb per person. This compares with a consumption

of 12 kg in South Africa and 10,5 kg in the United Kingdom where the relative consumer price of mutton and lamb is similar to the Rhodesian price.

The future

It is stated government policy to protect the Rhodesian sheep industry from unfair import competition and under these circumstances it is apparent that the scope for a profitable expansion of sheep production in this country is still considerable.

The ensuing chapters will illustrate the extent to which profitability is dependent on the degree of attention afforded to all aspects of management. In Rhodesia, which has so many alternative fields of farm production, only farmers who have a real bent towards sheep production are likely to contribute to the stability of the country's sheep industry.

Table 1.2 Classification by size of European owned flock (C.S.O. 1972)

Flock size	No. of farms (%)	No. of sheep (%)
0-99	1 131 (55,7)	52 387 (19,6)
100-199	512 (25,2)	71 997 (26,9)
200-499	328 (16,1)	96 698 (36,2)
500-999	50 (2,5)	32 516 (12,2)

1000 +	10 (0,5)	13 558 (5,1)
Totals	2 031 (100,0)	267 166 (100,0)

The eye of the master fattens the flock.

Photo Rhodesian Farmer

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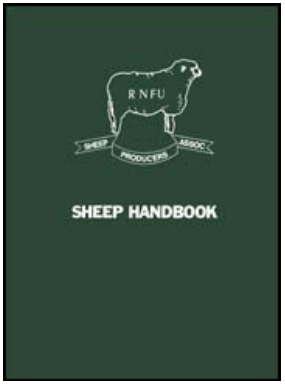

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D. J. DONKIN

(1) MUTTON BREEDS

Sheep in Rhodesia can be broadly classified into mutton breeds, dual purpose breeds, and specialized breeds for cross-breeding.

(a) Indigenous sheep

The indigenous sheep of the country is a fat-tailed type characterized by a hairy coat and a multiplicity of colours from black, through all shades of brown to pure white. The "Sabi" sheep as bred and selected at the Makoholi Experiment Station is one of these indigenous types. It is noted for its hardiness and fecundity under arduous conditions and, in addition. for its resistance to certain local diseases. As is common among hardy animals, the Sabi sheep are generally small and relatively slow growing, and the finished carcass is poorly fleshed by European standards. An interesting feature is their ears. These can be very small - almost non-existent in some cases - in certain families, and quite big in others. Most noteworthy is the wide, swinging fat tail which, like the camel's hump, would seem to function as a reserve for periods of nutritional stress.

Most sheep flocks in Rhodesia have been founded on the indigenous ewe, although since the turn of the century, there has been a continual infusion of Blackhead Persian blood; in many areas this influence predominates in indigenous flocks.

Black head Persian ewe and lambs.

Photo Rhodesian Farmer

(b) The Blackhead Persian

This breed holds a unique place in Rhodesia in that, not only is it the major fat-tailed sheep in the country, but it also provided the foundation ewes used for the development of the two most successful and common improved breeds in the country, the Dorper and the Wiltiper.

The Blackhead Persian in South Africa is reputed to originate from a ram and six ewes that were rescued from a ship wrecked off Cape Agulhas in about 1870 while on a voyage from the Middle East to Europe. Whether or not such a romantic means of arriving in South Africa is verifiable, the fact remains that the local farmers were quick to appreciate these new sheep, not only for their hardiness, but also for the fat tail which could be rendered down and used either for cooking or for soap making. The characteristic colour marking of black head, neck and undertail, with an otherwise milk-white body-cover of short hair, was also a distinguishing feature that stamped itself on the progeny.

The breed spread quickly throughout southern Africa, particularly in the more arid areas of Namaqualand and the north-western Cape that were unsuited to the wool-bearing Merino.

Today, although numbers are declining, the Blackhead Persian is still in evidence in many parts of the country. In particular its thick skin - much favoured for glove making - is resistant to the penetration of grass seeds and this is a major consideration in many areas. Furthermore, an almost unique characteristic of the Blackhead Persian is its ability to mate at any time of the year.

Like the indigenous sheep, the Blackhead Persian is hardy and disease resistant, and tolerant to dryness, heat and low levels of management. Like the indigenous sheep too, it lacks the fleshing considered desirable for our

top grades; today the excessively fat tail is trimmed off at slaughter and, as such, represents a direct loss to the farmer.

Mature ewes weigh up to 55 kg (120 lb.) and lambs reach a suitable slaughter finish at about 35 kg (77 lb.).

(c) The Van Rooy

This breed is not a "Whitehead Persian" as is sometimes thought, but a fat-tailed sheep developed in South Africa by Senator J. C Van Rooy who lived in the Bethulie district.

He is reputed to have mated a white Blinkhaar (shiny-haired) Afrikaner ram with eighty Rambouillet ewes - a French strain of the Merino which has a rather coarse wool, but which is noted for its fertility. Certain authorities state that some Blackhead Persian ewes were also used. The selected progeny of these were later mated to an English Wensleydale ram, a hornless longwool breed which has a good conformation and lustrous curly very strong wool. From this basic stock, the breed as it is known today was derived by selective breeding.

Selection was aimed at producing a strong hardy sheep of high fertility and good conformation. However, it was found that the fat tail was positively correlated with hardiness, and this was retained as a desirable feature.

The Van Rooy is covered with strong chalky-white bristly hair, which has

along the back, a slight woolly admixture that is shed after the winter. It has a good frame with sound bone and is slightly bigger than the Persian. Other notable characteristics are the big broad ears and the medium-size semi-circular dewlap.

Like other fat-tailed breeds the Van Rooy is adaptable to a wide range of conditions and is well able to survive periods of adverse nutrition. It is fertile - three lambs in two years is not uncommon - the ewes are good mothers and generally make a very satisfactory basis for crossbreeding and upgrading.

(d) The Dorper

This is the major mutton breed in present-day Rhodesia. It was developed in South Africa before World War II as a cross between the Dorset Horn and the Blackhead Persian. The aim was to achieve, by selection among the crossbred progeny, a sheep breed that retained the hardiness, wide mating season and good mothering ability of the Blackhead Persian, but the improved frame, growth potential and mutton conformation associated with the Dorset Horn. The Dorper today is noted for its hardiness, fertility, high milk production and ability to produce a good fat lamb of around 38 kg (85 lb.) livemass at five months of age under semi-extensive conditions. Well grown ewes weigh between 50 and 70 kg (110 to 150 lb.).

Dorper ram.

Photo Modern Farming.

Phone 00441

Good specimens of the breed have no remnant of the Persian's fat tail and carry a good degree of fleshing on a well-developed frame. The back covering consists of a short fleece of mixed wool and hair which serves as a protection against extremes of cold or wet. The legs, underline and face are free from wool which means that the breed is much less susceptible to grass-seed trouble than breeds which have complete wool covering. Under severe grass-seed conditions, however - particularly Speargrass - the backcover is a major drawback and the Dorper is not recommended for extensive use in these areas. A long-term experimental attempt at Matopos Research Station to breed a "hair only" Dorper has revealed that the light wool backcover is closely correlated with the good mutton characteristics of the breed, and that animals having little or no wool tend to show a reversion to the less desirable Blackhead Persian conformation.

Both black-head and white-head Dorpers are available - the latter derived by grading up on Van Rooy ewes instead of Blackhead Persians - and although they are not mixed in stud breeding, the Breed Association does not discriminate against either type. In both cases the whole of the body is white in well-bred specimens.

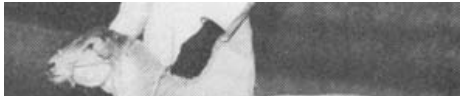
The Dorper Sheep Breeders' Association is an active organization which has, in no small part, been responsible for the popularity and good reputation of the breed.

There is a good supply of Dorper rams in Rhodesia, from some really excellent flocks, and this is always an important consideration when deciding upon a breeding policy.

(e) The Wiltiper

This is marketed under the slogan "Rhodesia's Own Breed"; indeed, it is the only non-indigenous breed developed entirely in this country. It is more than twenty-five years since Wiltshire Horn rams were first crossed with Blackhead Persian ewes. The breed has since developed by selection within the progeny, with only a few subsequent infusions of Wiltshire Horn blood.

This flock has been bred up and is personally managed by Mrs. Jasmine Souchon	**RUANDA WILTIPERS**	*Breeding and slaughter stock are for sale all year round*
	P.O. Box 34, Norton Telephone 74213	



The statistics for this flock are - presently running at over 2 300 head with an overall mortality rate averaging over the past years between 3 and 4 per cent.

Unrestricted veld grazing is the basic food supply with supplementary feeding when needed. So far this financial year 1 250 lambs have been born.

Wiltipers are Rhodesia's very own breed of sheep, bred to fit into Rhodesian conditions with the minimum of trouble to give the maximum returns.

The Wiltshire Horn is an ancient British breed which has a mutton conformation similar to that of the Dorset Horn. It is the only British breed that carries no permanent wool, and this was an important consideration when it was selected as a foundation sire for a new breed in Rhodesia. In addition, the Wiltshire Horn is considered hardy in its home country and its lambs grow rapidly.

Having these characteristics, selection led to the development in the Wiltiper of greatly improved mutton conformation and milk production compared with

the Blackhead Persian, and without localized fat in the tail region in well-bred specimens. Ewes mature at between 55 and 70 kg (120 to 150 lb.) livemass and lambs reach slaughter finish at around 38 kg (85 lb.). Young Wiltipers have a short-wool winter coat that is shed in spring; it does not redevelop in the mature animal. This makes the breed better suited to grass-seed areas than other exotic breeds.

Wiltiper sheep have three main colours, namely black, white and a brownish dun. Acceptable sheep must be whole coloured; only a moderate amount of flecking is permitted.

Wiltiper ram.

Photo C. N. Newmarch.

Where a hardy adapted ram is required to up-grade a fat-tailed flock and so obtain better conformation and growth potential, the Wiltiper is generally a

sound choice, especially in areas where awned grass-seeds can seriously affect the well-being of the wool-bearing breeds.

Further information about the Wiltiper breed can be obtained from the Secretary of the Wiltiper Breeders' Club.

(2) DUAL-PURPOSE BREEDS

Where more intensive sheep management methods are practised and where improved pastures are available, farmers might consider the dual-purpose (wool/mutton) sheep which, in addition to being good mutton producers, have the advantage of the wool as an extra, saleable end-product. In view of the variability of wool-prices in the world today however, dual-purpose breeds in Rhodesia should be looked on fundamentally as mutton sheep and any profits from wool should be regarded as no more than an extra bonus.

It must be emphasized that the exotic, dual-purpose breeds currently available in Rhodesia need regular attention in terms of blue tongue and other inoculations, as well as good general management all round.

(a) The Corriedale

This breed was developed in New Zealand and Australia towards the end of last century. Lincoln and later, Leicester, long-wool rams were crossed with Merino ewes and from then on the Corriedale was developed by line-breeding coupled with vigorous selection among the progeny.

The Corriedale is a fairly fertile animal and under good management and nutrition usually averages 100 per cent or more lambs per year. The ewes have plenty of milk and even twins can usually be reared successfully.

Despite its Lincoln ancestry - one of the largest sheep breeds whose rams weigh up to 175 kg (390 lb.) - mature Corriedale ewes average 68 kg (150 lb.) while rams are normally around 90 kg (200 lb.), although exceptional rams may weigh as much as 135 kg (300 lb.).

Corriedale ewe.

Photo Rhodesian Farmer.

In addition to quick growth and a good mutton conformation, the Corriedale also produces a long staple, 100 mm (four inches), and lustrous wool with a well-defined crimp. The wool has a soft handle, but is much stronger (bulk 56s) than pure fine Merino wool. Prices on the international market are somewhat lower than those paid for Merino wool, but Corriedale wool is in

good demand and the heavier yields compensate for the lower prices. Ewes will produce four to six kilograms (9 to 13 lb.) wool per year on average. High-quality Corriedale breeding stock is available in Rhodesia.

(b) The South African Mutton Merino

Until recently, this breed was known in South Africa as the "German Merino." It was developed in Germany about 100 years ago from the Saxony, using mutton-type Merinos from France (probably the Rambouillet) as well as infusions of English Longwool mutton sheep.

The breed, which has been purebred since 1920, is now widely distributed in southern Africa. Developed originally for intensive production, the breed expresses its potential most fully under intensive systems of management.

They are potentially big sheep and have a good mutton conformation. Ewes weigh between 60 and 90 kg (130 to 200 lb.) and rams between 100 and 112 kg (220-250 lb.). The ewes are highly fertile - over 100 per cent lambing is common - and are noted for their good milk production and wide breeding season.

South African Mutton Merino ewe.

Photo P. E. Horncastle.

The face and lower legs of the South African Mutton Merino are bare of wool and this makes them slightly more tolerant of longer grass conditions.

Wool yields are generally fairly low, four to six kilograms (5 to 9 lb.), and although the wool has a much finer spinning count than the Corriedale, it lacks the quality and handle that makes pure Merino wool so outstanding.

(c) The Döhne Merino

This is a relatively new breed that was developed in the grassveld area of the eastern Cape Province. The South African Mutton Merino was crossed with pure wool Merinos in an endeavour to improve the conformation, fertility and mutton characteristics of the latter, while retaining its wool yield and quality.

A Döhne Merino flock.

Photo George Warren.

Two or three flocks of these sheep have been established in Rhodesia, but low fertility and difficulties of adaptation to local conditions, particularly the intense humidity and rain of midsummer, have been experienced. As the main value of the Döhne Merino is its super quality wool, it is unlikely that its popularity will greatly increase in this predominantly mutton producing country.

(3) SPECIALIZED BREEDS FOR CROSSBREEDING

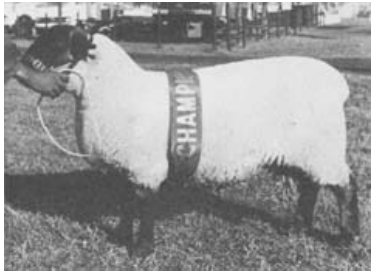
Planned cross-breeding is an important part of sheep production in other mutton producing countries and there are indications that this might achieve greater significance in Rhodesia. Currently, rams of three different breeds are available in small numbers for cross-breeding.

(a) The Suffolk

This is one of the most popular fat-lamb sires in the British sheep industry and it has also been widely used for cross-breeding in other parts of the world. The Suffolk has an outstanding mutton conformation and is also noted for the growth rate of its lambs and the fertility of its ewes. Mature rams can weigh up to 135 kg (300 lb.) and mature ewes up to 90 kg (200 lb.).

Although the Suffolk is slowly gaining popularity, its wider use in Rhodesia is restricted at present by the limited number of breeding rams available each year.

The Suffolk bears a moderate length (50 mm) of a strong (54-58s) coarse white wool.



Suffolk ram.

Photo P. F. E. Horncastle.

(b) The Hampshire Down

Interest in this breed appears to have declined in Rhodesia during the past few years, but it is still very popular in Britain and in body size, is the second largest of the "Down" breeds.

The rams pass on a high degree of fleshing to their progeny, but many of the crossbred lambs do not appear to have growth rates as outstanding as their looks might indicate.

The Hampshire bears a strong white fleece of moderate length.

Hampshire Down x Mutton Merino lambs.

Photo Ministry of Information

(c) The Dorset Horn

Every so often a Dorset Horn ram is imported into Rhodesia, but at present there is no established stud flock.

The Dorset Horn is a long, well set-up sheep, noted for its fertility and its ability to mate at any time of the year. However, owing to its susceptibility to pneumonia and lungworm, it does not appear to thrive in its pure form in Africa. A further problem associated with crossing on to indigenous ewes has been a lambing difficulty arising from the large head and shoulders of the crossbred lamb.

As far as southern Africa is concerned, the most notable feature of the Dorset Horn is its place as one of the parent breeds of the Dorper breed which has achieved such wide popularity over the last decade.

Dorset Horn ram.

Photo Martin Ferriera.

(d) The Wiltshire Horn

Although rams of this breed are not usually available in Rhodesia, it is undeniable that further infusions of pure Wiltshire Horn blood are desirable, if only to broaden the "genetic base" of the Rhodesian Wiltiper breed.

In Britain the Wiltshire Horn is mainly used in a first cross with a hill breed. The lambs are noted for their high survival rate to weaning, as well as for their sturdiness and good fleshing qualities.

Wiltshire Horn ewe.

Photo Sidney J. Smart.

While the absence of a permanent wool backcover does not appear to be a serious disadvantage in its native country, a non-wool coat is a major

recommendation in Rhodesia.

(4) FACTORS AFFECTING CHOICE OF BREED

(a) Climate

The sheep, as a species, is one of the most widely adapted of the domesticated animals. It is found in many diverse forms, from the cool, moist, temperate regions of the world to the relatively hot desert areas. Figure 2.1 Illustrates how the best suited type of sheep varies according to the effects of temperature and rainfall.

Sheep are not adaptable to the hot humid areas of the world and only the hairy and fat-tailed breeds are well adapted to the hot dry areas. These hardier animals can be run successfully in the more favourable zones but the more improved breeds cannot normally be run outside the zones in which they were developed, unless special steps are taken to adapt the environment, particularly as far as nutrition is concerned.

Figure 2.1 illustrates that, according to the mean annual rainfall and temperature, much of Rhodesia is theoretically suited to some form of sheep production. However, the high levels of humidity associated with fairly high temperatures during the short rainy season are far from ideal for sheep, and because this wet spell is followed by a long, dry winter it is apparent that rainfall *distribution* is just as important, if not more so, than *total* rainfall.

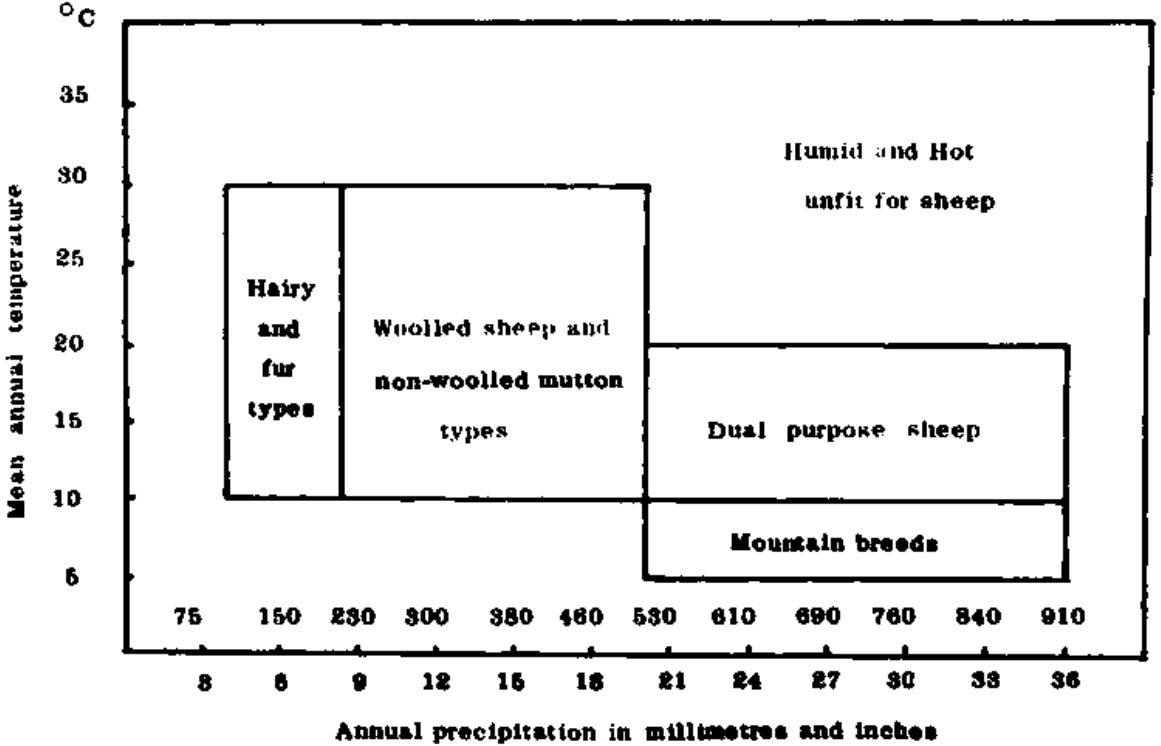


FIGURE 2.1 SUITABLE CLIMATE ZONES FOR DIFFERENT TYPES OF SHEEP (after Le Roux 1970)

The long, dry winter also has a marked effect on the natural grazing which declines seriously in quality once it has set seed towards the end of the rains.

Unless management techniques and supplementary feeding are applied to minimize these effects, only the hardy fat-tailed breeds are likely to survive and produce.

(b) Vegetation

Most of the natural vegetation in Rhodesia is either woodland or woodland savannah, neither of which is very well suited to sheep production. Relatively, very little suitable grass is found in the patches of true woodland, although certain woody species provide a valuable source of browse in the low rainfall areas.

In the more open tree-bush savannahs of the high-rainfall areas the grasses grow extremely rank and coarse, while the dominant grasses in the medium and lower rainfall areas are characterized by sharp barbed-awned grass seeds, particularly in seasons of better rainfall. The most notorious of these species is Speargrass, *Heteropogon contortus,* a grass which is distributed by the seeds which attach themselves to passing animals. The wool coat of any passing sheep is particularly attractive, so much so that in "bad" grass-seed areas the use of any sheep breed having a wool covering is virtually impossible. The seeds adhere to the wool and then penetrate the skin and finally the flesh of the animal. This not only reduces the growth rate of the animal and the value of the wool and skin, but also renders the meat unfit for human consumption.

Le Roux (1970) has shown a dramatic 25 per cent reduction in growth rate experienced by lambs infected with as few as 50 awned grass seeds per carcase. These were all Dorper type sheep which had an inherently good growth potential, but a woolly backcover. Under the same conditions smooth-coated Blackhead Persian lambs did pick up a number of grass seeds, but owing to their thicker skins - 28 per cent heavier than the skin of a Dorper of equivalent size - no grass seeds had penetrated, and growth was not depressed.

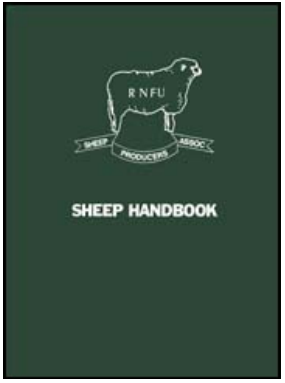
Le Roux concludes that "the obvious solution to the grass-seed problem would be to breed a type of sheep that possesses both good mutton qualities and a thick (tough) skin to prevent grass seed penetration." He acknowledges, however, that this would be a long-term project and would not provide an immediate solution to the problem.

(c) Internal parasites

Internal parasites in sheep are a worldwide problem, but they are particularly so during the warm summer months. Egg-count surveys by Le Roux (1970) and others, as well as more detailed investigations by Grant (1972) have revealed that roundworms are particularly active during the warm months of October to May. Unless regular dosing is undertaken to control these parasites, only the indigenous and related breeds with their low production potential are likely to survive.

(d) Availability of feed

Most intensification of sheep production in Rhodesia is dependent on the availability of farm-produced grains - principally maize and, to a lesser extent, sorghum. The more exotic breeds should be considered only when reliable rainfall permits the regular production of sufficient grain for stock feeding.



Sheep Handbook

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D. J. DONKIN

1. MATING SYSTEMS

The breeding system is an important aspect of mutton and lamb production

because, when coupled with a sound selection of flock replacements, it has a significant influence, both on immediate and long-term flock productivity. It must be borne in mind however, that environmental factors, particularly quality of grazing, feeding levels and standard of management, have a dominating influence on flock productivity. In consequence, the full advantages of sound breeding policies will only be realized When combined with suitable levels of feeding and management.

There are two main systems of breeding domesticated animals, namely random mating and assortive mating. Random mating is the easiest and therefore the most common method used, in that a number of rams are put in with a large flock of ewes so that any particular mating is more or less at random.

That this method is a poor one when it comes to breeding the best replacement ewes is shown by Table 3.1.

Table 3.1 Probabilities of mating best to best by Random method

Quality of stock		Ewes			
		Good	Average	Below average	Poor
Rams	No.	50	50	50	50
Good	1	12	12	12	12

Average	1	12	12	12	12
Below average	1	12	12	12	12
Poor	1	12	12	12	12

This table shows that, if each ram has the opportunity to mate with an equal number of ewes in each quality group, it is obvious that only one in four of the best 50 ewes (about 12) is likely to bear the progeny of the best ram, and only six will be ewe lambs that could be retained as replacements. In a flock of 200 ewes approximately one in six would need to be replaced each year and, under this system of random mating, only 20 per cent of the replacement ewes could have come from a best sire/best dam mating.

The way to improve this situation is to practise assortive mating, by which some form of selection is used to ensure that the best ewes are put to the best ram. This, of course, indicates the need for one or more single-sire flocks, unless numbers are very big, and these in turn demand a higher level of management. It is perhaps pertinent to note here that the "best" rams can only be positively identified if they are selected from a performance recorded flock.

2. BREEDING SYSTEMS

(a) Crossbreeding

In most of the major sheep producing countries of the world, crossbreeding is the accepted conventional method of commercial lamb production and it is often only the ram breeder who runs a pure flock.

There are several reasons for the popularity of crossbreeding in sheep which may be summarized as follows:

- **to combine the good points of various breeds. These may be as simple as the high numbers and availability of the one breed, the female parent, to combine with the superior mutton or other characteristics of the scarcer breed, the male parent;**

- **to produce a uniform first-cross lamb crop which simplifies management, feeding and marketing; and,**

- **to make use of the "hybrid vigour" phenomenon by which crossbred progeny will outperform their parent breeds, particularly in aspects of low and moderate heritability such as hardiness, fertility and milk production.**

It is unfortunate, but true, that although considerable individual merit is visible to the eye in these first-cross animals, the breeding worth of their progeny is variable and unless properly planned, is generally lower than the cross-bred parents and the pure-bred grand-parents. The phenomenon of hybrid vigour is not passed on to the progeny by first-cross parents and this

means that, unless a new breed is to be established - as in the case of the Dorper and the Corriedale - all the second generation progeny of a crossbreeding programme should be slaughtered and the programme designed to keep hybrid vigour to a maximum.

(i) *Terminal crossbreeding*

Basically, in the major sheep producing countries, the foundation ewes are run in the more remote or harder areas and mated to rams of a different breed. The female progeny of this cross are all sold to a farmer in a more favourable farming situation who uses a ram of a third breed on these crossbred ewes to produce the final lamb for fattening.

This system works well where the sheep population is large and where large numbers of farmers are willing to purchase the crossbred animals for further breeding and/or finishing.

These farmers appreciate the value of the hybrid vigour - which is expressed in uniformity of the progeny and an enhanced growth rate - as well as the improved carcasses obtained from better rams crossed with the foundation stock. This market is therefore a regular one.

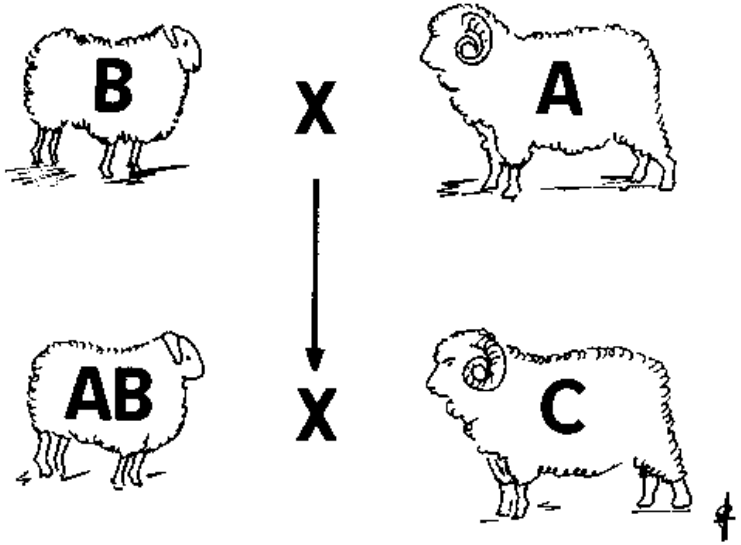


Figure 3.1 Terminal crossbreeding.

In Rhodesia at this stage of our development, most flocks are too small to make this approach a feasible proposition and since hybrid vigour is not in itself a heritable characteristic, most people follow a policy of straight breeding. Nevertheless, should more than one flock be run, there is nothing to prevent a farmer from pure-breeding with his "first" flock and running a good ram of another breed with his "second" flock, all the progeny of which are sold.

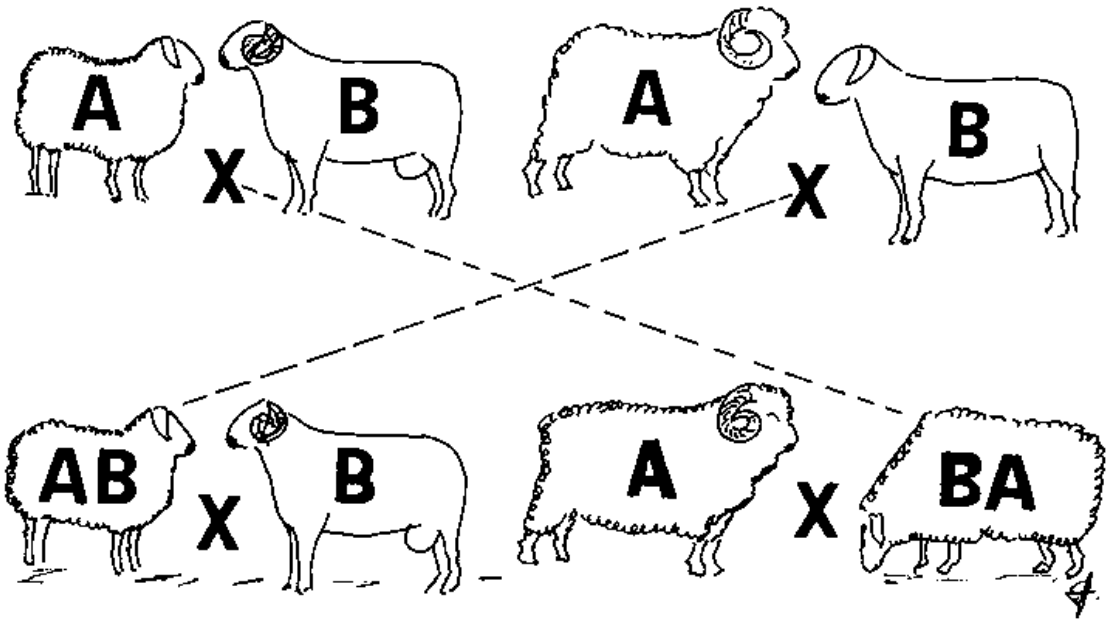


Figure 3.2 Rotational crossbreeding.

(ii) *Rotational crossbreeding*

The other possible means of making use of hybrid vigour is by criss-crossing. This involves running two breeds of rams, and mating the progeny of the breed "A" rams to the breed "B" rams and vice versa.

This technique involves indication - by ear notch, stig, tag or other suitable

mark - of the breed of every ewe's sire on the farm, and could be worked satisfactorily where purely mutton breeds are being run. It could however, cause problems with woolled sheep, should breeds having markedly different wool characteristics be regularly mixed.

(b) Grading up

It will be appreciated from the previous paragraphs that several management difficulties would arise from crossbreeding, especially where all the different stages of the cross are run on the one farm. As a result, real cross-breeding often takes place, in practice, only during the initial stages of grading up.

As the name implies, grading up involves the improvement of the flock over successive generations by the continued use of good rams from a selected breed. Ultimately, after five or six generations, this becomes a form of pure breeding in that the ewes are now basically the same breed as the rams and further improvement will have to come from selection within the breed.

Grading up is a simple and practical breeding system that has been followed in many flocks in Rhodesia. Where a reliable supply of good rams of a breed that is adaptable to local conditions is available, grading up, if coupled with sound within-flock ewe selection, is a good system to adopt.

(c) Pure breeding

Under this system, grade or purebred ewes are run with purebred rams. In its

more sophisticated stages, purebreeding may involve "inbreeding" and "linebreeding". Both of these techniques involve the mating of closely related families (lines) or individuals so as to achieve a more rapid progress towards genetic purity.

A. L. Hagedoorn quotes an experienced poultry breeder as saying that if such a close breeding programme is a success it is called "linebreeding", but if problems are encountered they are blamed on "inbreeding". This remark was obviously made "tongue-in-cheek"; it nevertheless contains a lot of truth because, although the breeding of closely related similar animals will lead to a more rapid achievement of uniformity of desirable characteristics, it is also likely to lead to a more rapid uncovering of undesirable traits.

This means that the mating of closely related individuals is undesirable unless in the hands of experienced stud breeders who, firstly, are using the highest quality breeding stock and, secondly, can still afford to cull heavily where necessary.

3. SELECTION AND RECORDING

For commercial lamb or mutton production, the first requirement is to have sound fertile ewes which have good milk production characteristics and a desirable mutton conformation; any system of selection should be founded on these requirements.

In most flocks, selection of replacement ewes is done on a visual basis,

preferably When ewe hoggets are about 18 months of age just prior to first tupping. At this age the young animal has had full opportunity to express its growth potential without the stress of pregnancy and lactation.

Visual selection should, in the first instance, take into account all those factors which affect an animal's ability to walk, feed and reproduce. To this end, particular notice should be taken of the soundness of the hogget's feet and legs, her stance, the soundness of her jaws and the fit of her incisors onto the dental pad. Her appearance should also be truly feminine since this is indicative of a balanced hormonal development and hence reproductive normality.

It is obvious that, on its own, visual selection will never be entirely satisfactory or effective, in much the same way as it can be said that with even the best pudding recipe, the proof is still in the eating. One never really knows just how good a ewe is until her lambs have been seen.

Not even the most devoted and perspicacious flockmaster can keep a detailed record of several lamb crops in his head - he normally tends to remember only the outstanding individuals - good or bad - and this can, at times, lead to some rather unbalanced decisions when it comes to culling and selection. There is a host of examples of such wrong decisions in the animal-breeding world and the only means of prevention is to record, on paper, details of the performance of every breeding animal in the flock.

(a) Identification of sheep

For effective recording, the first step must be the positive identification of every animal in the flock. Hot branding of sheep is not possible, and although paint branding of the wool is used in some countries, it is little favoured in Rhodesia.

Tattoos can be used for the white-eared breeds, but the most common methods of marking used are either ear tagging or ear notching.

(i) *Ear notching*

Sheep can be identified by using the recognized ear notching code (see Fig 3.3), but the number is generally limited to 200. This restricts its use in larger flocks unless in combination with some other method of marking.

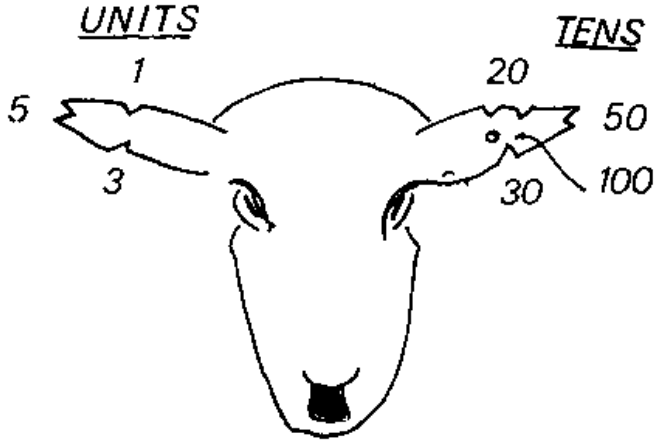


Figure 3.3 Ear notching standard numbering code.

A special notching instrument is used in preference to a knife because it is quicker and less likely to slip. Numbering is done "from the sheep's point of view", that is, with the tens and hundreds in the left ear and the units in the right ear. However, as the sheep is usually viewed from the front when marking and also when reading the marks later - the front view has been presented in Figure 3.3.

(ii) *Ear tagging*

A variety of ear tags is suitable for sheep, ranging from plastic stigs and discs in assorted colours, to lightweight metal tags on which various combinations of numbers and letters can be stamped according to the purpose or

numbering sequences to which the tags are applied.

All types of tags can be shed or torn out of the ear at times, particularly when sheep are run in thorn-bush country. Where a big flock is run, the loss of a tag is a considerable nuisance, especially where the sheep concerned cannot be readily re-identified. To reduce the possibility of such problems, some sheepmen put an identical tag in each ear. Field experience seems to indicate that under most circumstances the metal tags are more satisfactory and more permanent.

(iii) *Numbering system*

Before animals are marked, it is essential to decide on a planned numbering system that will fit in with the present purpose of marking and yet be applicable to the implementation of more detailed recording systems in the future.

Probably the most versatile and most practical system is one that indicates first, the year of birth, and then the number of the lamb. In other words, the first lamb born in 1973 would be numbered 3-1, or 3001 and the three hundred and eighty fourth lamb born would be numbered 3-384 or 3384. Then the first lamb born in 1974 would be numbered 4-1 or 4001 and so on.

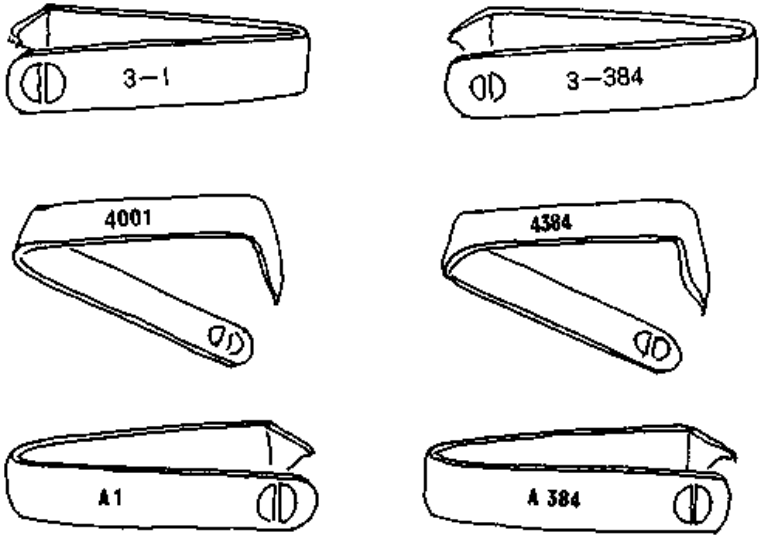


Figure 3.4 Ear tags showing suitable numbering systems.

The number indicating the year of birth can be indicated in various ways. Sometimes it is simply a prefix number, or letter, on the tag as previously described, but probably a better plan is to use an ear notch to indicate the year of birth. This will greatly restrict the range of possible numbers to search through if a lost tag has to be replaced.

(b) Lamb record book

Once all ewes are identified, all lambs should be marked in a similar fashion

as soon as possible after birth, when their number, sex, date of birth and dam number may be recorded in a pocket-sized notebook. The sire's number may also be noted if single-ram flocks are run.

The next recording exercise will be at about three or four months of age when all lambs should be weighed. Where a six-week lambing period is followed it is preferable to weigh the lamb crop twice, the first when the earlier-born lambs are about four months of age, and the second when the later-born lambs have reached this age. This will enable a livemass to be recorded for each lamb within two weeks of its reaching 100 or 120 days of age. This mass must be entered into the lamb record book, together with the date of weighing.

Conformation is best assessed when ewe hoggets are selected for replacement and this can then be noted on the ewe record card.

The only other entry into the lamb record book that would normally be of interest would be details of the disposal of the lamb i.e. what it realized at slaughter, whether it was retained as a replacement ewe hogget, and so on.

An example of such a field record book is given in Figure 3.5.

(c) Ewe record card

Each ewe in the breeding flock should have her individual production card, or page in a book. On this, at the time she is drafted into the breeding flock, are

noted details of her number, birthdate, sire and dam, and her own weaning performance extracted from the lamb record book. Subsequently, the details of each lamb born to her are recorded by extraction from the lamb record book as soon as the lamb crop has been weaned.

Figure 3.6 is an example of a suitable ewe record card which provides space for all the basic information, as well as details of fleece or colour which might be applicable to specific breeds.

Figure 3.5 Lamb record book

					Weaned			
Lamb no.	Sex	Born	Dam	Sire	Mass	Date	Disposal	Remarks
3-1	M	20.9.71	9-214	A	23,4	4.2.72	Butcher $11,10	
3-2	F	20	1-11	A	22,0	4.2.72	Replacement	
3-3	F	25	0-120	A	22,4	4.2.72	Died 24.6.72	Twins
3-4	F	25	0-120	A	23,0	4.2.72	Replacement	Twins
3-5	M	30.9	0-	B	26,8	4.2.72	Butcher $10,5	

			202					
3-6	M	2.10	8-42	B	18,0	4.2.72	Butcher $8	Dam to be culled

Figure 3.6 Example of a ewe record card

Number 8-42		
Born.....30.9.68.....	Wng. mass group.....2	Fleece.....
Sire.....B.....	Conformation.....B	.....
Dam.....5-128.....		.....
Date first mated 4/70.....		

Details of Progeny

Birth date	Lamb no.	Sex	Sire	Mass	Weaning date	Weaning group	Lambing interval	Disposal	Remarks
2/9/70	0-27	F	Z	20,5	5/1/71	3			
5/11/71	1-210	M	Z	22,5	20/2/72	2	14 m		
22/10/72	2-130	M	**B**	19,2	15/2/73	4	11 1/2 m		
2/10/73	3-6	M	B	18,0	4/2/74	4	11 1/4 m	$8	Cull

Number: 8-42									

The reverse of the card can be used for livemass records of the ewe.

It is apparent that, after two or three years in the breeding flock, a glance at this card will give a very good picture of the ewe's breeding merit and her ability as a producer of fast-growing lambs.

The "Weaning group" column can be completed by dividing the whole lamb crop by sex and then sub-dividing each sex group into four on a basis of weaning mass; e.g. Group 1 means the lamb is in the top 25 per cent of this year's lamb crop. This "weaning group" is important because actual weaning masses recorded will vary markedly according to season. On the other hand, because the weaning group is relative to the average weaning mass in its year, it provides an assessment of lamb performance that overrides seasonal differences. This means that in spite of differing weaner masses recorded from year to year, a ewe which consistently produces lambs in groups 1 or 2 is above average in her production potential and is, therefore, a good source of replacement stock in the flock. Conversely, a ewe which regularly produces lambs in groups 3 or 4 should be marked for early culling.

RECORDS MUST BE USED

There is no point in keeping records of details that are of no value in breeding

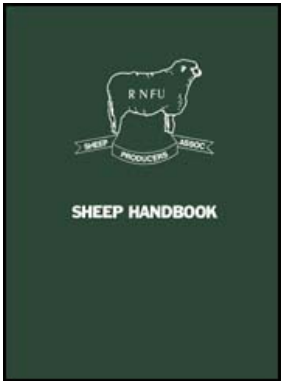
and selection. By the same token, it is only when records are used that they warrant the time and effort spent in keeping them.

4. SHEEP PERFORMANCE TESTING

In addition to a lamb's genetic make-up, many factors affect its growth from birth to weaning. These may include its birthmass, sex, season of birth, the age of the dam, whether it was a twin or a single, and so on. A normal farm recording system does not permit allowance to be made for all of these factors and, to a certain extent, may accordingly invalidate conclusions from the unadjusted records, particularly in marginal cases.

In several other countries where records of flock productivity have been kept for many years, standard adjustments for these various factors have been calculated, based on thousands of individual records. Such adjustments are essential if a valid assessment of a lamb's performance is to be obtained.

In Rhodesia, insufficient local data is available at this stage to test the validity of the standard adjustment factors used in other countries. When farmer interest warrants it and the necessary resources are made available, a sheep performance testing scheme will be set up, similar in scope to the existing Beef Performance Testing Scheme.

Sheep Handbook

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Chapter 4. Management

Top

D. J. DONKIN

Management is the term used to describe all the techniques used by the farmer to manipulate the various factors that affect sheep productivity. Good management is the one aspect of sheep production that can increase financial returns with a minimum of expense. Increased returns can also be obtained by breeding better strains or by feeding more efficiently, but neither of these methods can be fully justified unless accompanied, or even preceded, by a high standard of flock management.

Since the most important single aspect of profitability is the fecundity of the flock - that is, its ability to increase - many aspects of management are aimed at controlling the animal's breeding cycle so as to obtain the maximum number of viable lambs. Several factors that can be controlled by management affect the fecundity of the flock:

(a) age at first breeding
(b) intervals between breeding
(c) number of lambs produced per breeding
(d) length of the ewe's breeding life.

It is obvious that any circumstances which restrict the ability of the animals to produce viable lambs, together with any circumstances which reduce the lamb's survival rate, will also decrease the overall productivity of the flock.

Following fecundity, the next most important aspect of flock profitability is the growth rate of the lambs. As this is strongly influenced by nutritional as well as genetic factors, management must be concentrated on achieving the most favourable circumstances for rapid growth, not only by the selection methods outlined in Chapter 3, but also by ensuring optimal nutritional conditions.

Management can be considered under a number of different headings and so some sequence of development of the subject is necessary. Nevertheless, it should be borne in mind that all aspects are important and priorities for attention are determined more by individual farm circumstances than by the order in which the following sections have been set out.

1. BACKGROUND PHYSIOLOGY

(a) Reproduction in the ewe

Some knowledge of the basic facts of the reproductive cycle is necessary before going on to discuss the various management techniques which direct the flock's breeding pattern.

Pregnancy, or the gestation period, lasts between 144 and 152 days in sheep - five months for all practical purposes.

In the mature ewe the oestrus or "heat" period may last for three to 84 hours, but the range is most commonly between 24 and 36 hours. The duration of oestrus is affected mainly by the plane of nutrition of the ewe and the proximity of the ram. Normally, ovulation takes place towards the end of the heat period and this is when conception can occur if the ram has been active.

The length of the oestrus cycle is more constant and is generally 16 or 17 days and seldom outside the range of 14 to 19 days. Apparently longer intervals between heats are mainly due to the intervention of "silent heats", when the ewe ovulates but does not show outward manifestations of oestrus or a desire to mate.

The period of the year at which oestrus cycles occur has been evolved by natural selection, so that the young are born at the time of the year that will give them their best chance of survival. Those breeds which have evolved in high northern latitudes tend to have a restricted breeding season which is normally associated with declining day length in autumn and which results in spring lambs. Breeds such as the Merino, which originated from nearer the

equator, have a much more extended breeding season; sheep such as the Sabi, that are indigenous to the tropics, have no very defined breeding season although indications of slight increases of oestrus activity occur in autumn and spring.

Table 4.1, drawn up by Le Roux using Dorper type sheep at Matopos Research Station in 1967, gives a very good illustration of the situation as it probably exists in most parts of Rhodesia. It is apparent that, without supplementary feed, not all of the autumn-lambing ewes would come on heat during the breeding season in December/January.

Table 4.1
Percentage of ewes exhibiting oestrus in 1966

Lambing season	Nov./Dec.	Nov./Dec.	May/June
Supplements	Nil	Cottonseed cake	Cottonseed cake
Lamb age at weaning (days)	150	150	140
January	35	100	--
February	75	100	--
March	85	100	--
April	100	100	--

May	100	100	--
June	--	--	22
July	--	--	72
August	--	--	83
September	--	--	61
October	--	--	50
November	--	--	56
December	35	60	100

Puberty in ewes is reached between four and five months of age in the hair breeds of sheep, provided they have attained a sufficient mass of 16 to 20 kg, and between six and seven months in the wool breeds, provided they have attained a livemass of 23 to 27 kg. Generally, the oestrus period is shorter in young ewes than it is in mature ewes, and fertility is lower.

It is preferable to delay the first mating of ewe lambs until they are at least 12 months old and weighing 30 kg and over. Most ewes in Rhodesia are not mated until they are 15-18 months (two-tooth). Ewes can continue to breed effectively up to eight years of age, but Le Roux recommends that in general they should not be kept longer than six years of age because milk production will be declining, and old ewes are more prone to diseases and certain

injuries.

Ewes generally breed no more than once a year during their breeding life. More frequent breeding is limited both by feed supplies and by managerial considerations.

Early embryonic life is extremely critical and undernutrition, heat stress of the ewe, mineral deficiencies and disease may be contributory factors to embryonic loss.

The foetal growth rate is slow during the first 60 days and Le Roux (1967) has indicated that 72 per cent of the final birthmass is put on during the last 45 days of pregnancy. This is illustrated in Fig. 6.2.

(b) Reproduction in the ram

In the ram, puberty is attained slightly later than in the ewe and at a somewhat higher body-mass. Hair breeds reach puberty at or before about six months of age (20 kg) and the wool lambs at about seven months (32 kg). Young rams have semen of equivalent "fertility" to older rams, but total sperm production is lower. Normally, young rams are not used until at least 12 months old and then only if they are well grown. In most flocks, rams are not considered mature enough for full use until they are 18 to 24 months of age, or "two to four tooth".

Rams are far less affected by breeding season than ewes, and most active,

fertile rams in Rhodesia will work effectively at any time of the year. However high ambient temperatures - in excess of 35°C (95°F) - may depress fertility, particularly in wool breeds.

Undernutrition through a restricted quantity of food, or of the protein and/or energy level of the diet, is usually associated with a reduced semen quality - especially in lowered sperm numbers - and reduced libido or sex drive. Conversely, a high level of nutrition usually improves semen production, but certain research workers claim that it tends to reduce sex drive.

Flock rams are seldom kept beyond seven years of age, because as they get older, semen quality declines and there is increased prone-ness to scrotal abnormalities.

2. NUMBERS AND CARE OF RAMS

(a) Ram: ewe ratio

Over a tupping season of normal length (45 days) a mature, active ram can be given at least 50 to 60 ewes. Frequently this figure can be increased by making use of such aids as teazer rams, handmating, removal of mated ewes, separation of young and mature ewes and so on.

However, the number of rams per hundred ewes must be increased under more extensive conditions. Thick bush or rugged terrain reduce the chance of a few rams coming into contact with all ewes showing oestrus and these

conditions should be avoided during the breeding season if possible. The same holds true of very large paddocks or very large flocks where groups of rams will follow a few on-heat ewes and leave large numbers of other ewes unattended. Also, sperm viability can be reduced if mating occurs under very hot conditions; this can be alleviated by shearing the rams before the tupping season and by mating only at night. Nevertheless, to ensure that all ewes are covered it is usually advisable to have rather more rams than less.

In effect, the same state of affairs exists when ewes are in poor condition. Ewes suffering nutritional stress tend to exhibit oestrus at irregular intervals and the duration of oestrus may be greatly reduced, with minimal outward signs of heat. Under such conditions, many ewes may be missed and thus fail to lamb down if the coverage by rams is not adequate.

As mentioned earlier, young (first tup) maiden ewes have a shorter oestrus period and furthermore they often seem to lack the "experience" of mature ewes which have been observed to seek out the ram themselves when they come on heat. It follows from this that if there is a high proportion of first tupping ewes in the flock, a higher proportion of rams should be provided. Where the overall size of the flock warrants it, it is good practice to mate young ewes and mature ewes separately; this usually ensures a higher lambing rate amongst the young ewes. Furthermore, splitting the breeding flock also permits the sorting of rams according to age, thus avoiding some of the fighting between old and young rams.

Research observations and records in several countries have indicated that an active mature ram is an extremely hard worker during the mating season; to ensure his sustained effectiveness he must be in good condition when he first joins the ewes, and provision must be made to feed him at an adequate level during the season.

Certain other management techniques can be adopted to ensure greater spread of effectiveness among flock rams.

(b) Teazer rams

A simple operation by a veterinarian can convert an active fertile ram into a "teazer" which, while retaining all his masculine characteristics and libido (sex drive) is unable to get an ewe to conceive. There are two main uses for teazers, the first being a relatively straightforward one of simply identifying ewes which are on heat so that they can be introduced to the ram under systems of handmating. To facilitate this identification, the teazer ram is often fitted with a mating harness or "raddle" - a crayon block attached to the brisket of the ram by means of a suitable harness - which marks the on-heat ewes he has mounted. Alternatively, a special raddling or slow-drying paint may be applied to the ram's brisket.

A more sophisticated use of a teazer ram is to put him with the ewe flock two weeks before the mating season. The presence of a ram acts as a physiological stimulus to the ewes and most of them will come on heat some

17 to 24 days later. This means that when the flock rams are put in, all the ewes are coming into oestrus together; the rams' energies and attentions are spread to much better effect, and they don't waste their time chasing the odd individual ewe that is in oestrus.

(c) Fitness tests

Many stud breeders have their rams' semen tested as routine before the start of the mating season. This is of particular importance in single-sire flocks where an infertile ram can render 50 or more ewes unproductive for a season. However, even in larger farm flocks, some assessment of the rams' fitness to work should be made prior to tupping. This is most commonly done by simply handling the testes of each ram in turn and checking that they are normal in all respects. Both testes should have descended into the scrotum; they should be of normal size and texture - neither spongy nor soft - and without any hardening of the point at the bottom of the testes which is sometimes a sign of epididymitis. To prevent epididymitis all rams should be inoculated, preferably as lambs, with the vaccine Rev. 1.

(d) Check libido of individual rams

The libido or sex drive of a ram is of great importance. It has no connection with fertility but without the desire to mate even the most healthy and fertile ram is useless. The farmer can check the libido of individual rams by using a raddle or marking harness with different colours. At least all new young rams

brought into the flock each year should be tested in this way. Stud breeders should be particularly aware of the phenomenon because lack of libido appears to have some hereditary basis.

(e) "Summer sterility"

Daily temperatures in excess of 35°C (95°F) can cause temporary infertility in rams. Mating in the hottest months (September to November) should therefore be avoided, and shade and shelter should be available for breeding animals at all times.

At the warmer time of the year better lambing percentages are sometimes obtained by joining the rams with the ewes at night only.

(f) Avoidance of unnecessary stress

Shearing, where necessary, inoculation and the dosing of rams should be completed at least six weeks before mating. Similarly, vaccinations against blue tongue and Rift Valley Fever should be carried out at least eight weeks before the start of the breeding season.

(g) Suitable mating practices

The rams may be divided into two sets or "teams" for joining with the ewes alternately at weekly intervals. The off-duty group can be fed-up in the meantime.

When spring mating - for autumn lambing - is practised and where teazer rams have not previously been used, the mating season is started with only one per cent of rams with the ewe flock; the number of rams is gradually increased as the season progresses. This practice avoids much unnecessary injury to rams which would otherwise spend a lot of their time fighting if only a few ewes are in oestrus to occupy their attentions early in the season.

3. SIZE OF THE BREEDING FLOCK

Experience in South Africa indicates that, for best results, the ewe flock should not exceed 300 at mating time. This is not normally a problem in Rhodesia where night kraaling is often practised. Furthermore, flock size is often lower than this figure, owing to both the limited grazing nearby and to the ability of the shepherd.

4. LAMBING SEASON

One of the major management decisions a flock owner must take is the lambing season he will adopt. This decision is affected by several factors including nutritional conditions at different times of the year, natural peaks of oestrus in the breed, other seasonal farm activities, market demand, climatic conditions, parasite problems and the incidence of grass seeds.

(a) Factors affecting lambing season

(i) *Nutritional conditions*

On poor veld, without any supplement, most ewes will take the ram during November to January as soon as the flushing effect of improved nutritional conditions - i.e. summer grazing - permit conception. However, by making available satisfactory feed supplies, most dry empty ewes can be induced to show oestrus at almost any time of the year. The cost of supplying such feed must also be considered.

(ii) *Natural peaks of oestrus*

Where nutritional conditions are uniform among breeds from the higher latitudes - and to a lesser extent their derivatives, e.g. Dorper and Wiltiper - the association between declining day length and the onset of oestrus should be exploited to achieve high lambing rates over a restricted period.

(iii) *Other farm activities*

Except where sheep form the main farm enterprise, other farm activities may take priority at certain times of the year As the ewe flock needs particular attention during the lambing period, this should be planned for a time when this attention can be readily spared for the sheep flock.

(iv) *Market demands*

Marketing, as such, will be covered in a separate chapter, but a farmer must obviously tailor his production pattern to achieve the greatest profit under his own particular circumstances. A local butcher may want a constant year-

round supply of say, six lambs a week, but this does not imply that the ram should be left with the ewes all the year round. Individual lambs from any flock vary in their growth rate and under grazing conditions no more than two lambing seasons a year would be necessary. However this is generally impracticable with a big flock and is also too limited in scope. Since the C.S.C. price differential in favour of lambs sold in spring and early summer was removed, farmers have been able to market their lambs whenever it suited them best.

(v) *Climate*

It is normally undesirable for lambs to be born when conditions are wet and cold. Similarly, the very hot dry months are least suitable for tupping. Generally, however, the climate in most parts of the Rhodesian highveld is very equable and has little effect on most of the sheep reared in this country.

(vi) *Parasites*

Internal parasites are probably the major sheep problem in Rhodesia. Infestations are generally most serious during the peak of summer when warm, humid conditions are most favourable for their spread and development. Autumn lambing is to be preferred where dosing and general management routines are not of a high order.

(vii) *Grass-seed incidence*

Grasses in many parts of Rhodesia produce seeds that are distributed by adhering to the coats of passing animals. Some of these grass seeds are adapted to penetrate the ground by twisting under conditions of warmth and moisture. Unfortunately for sheep, these seeds react in the same way when caught in the fleece. To avoid the serious growth set-backs associated with grass seeds, it may be necessary to time the lambing season so that most slaughter lambs will have been sold by the time the main grass-seed menace is expected.

(b) Spring lambing

The young of most animal species are naturally born in spring. Although the differences when compared with autumn lambing are relatively slight, the advantages are still sufficient for spring lambing to be recommended for flocks in Rhodesia wherever other circumstances permit.

The main advantages and disadvantages are listed below:

Advantages

(i) The ewe is able to attain its full milk production potential on summer grass. Ideally, the lamb should be born about three to four weeks before the spring grass flush so that it is large enough to profit from the increased milk flow that follows on spring pasture.

(ii) Ewes are more fertile at the time of autumn mating, and lambing

percentages are higher.

(iii) Winter supplementary feeding requirement is minimal. More and larger lambs are the two main factors affecting income from a sheep enterprise.

Disadvantages

(i) Parasitic challenge will be at its peak in summer.
(ii) Most veld grasses seed in February and early March and can affect lamb growth.
(iii) Ewes may be in low condition following weaning and would need a feed supplement at tupping.
(iv) Early rains may result in cool wet conditions during lambing.

(c) Autumn lambing

Advantages

(i) Grazing provides a good level of nutrition during pregnancy thus ensuring larger, sturdier and hence, more viable lambs.

(ii) Parasitic challenge is less at this time of the year.

(iii) Wool sheep may be shorn in spring without the risk of upsetting pregnant ewes.

(iv) Lambs will have been weaned onto good grazing and will cut their first two incisor teeth while on good spring grazing in the following year.

Disadvantages

(i) Tupping is done when the natural oestrus peak is lower, and the subsequent lambing percentages are also lower.

(ii) Supplementary feeding of lactating ewes and their lambs is more expensive in winter.

(iii) Unless ewes are well-fed, the declining milk flow results in slower lamb growth.

(iv) Ewe lambs attain breeding age when natural conception rates are lower.

(d) Lambing more than once a year

For the outstanding flock manager who has achieved near peak production in

the flock with once-a-year lambing, more frequent lambing will increase lamb production and may also increase overall profit. Nevertheless, we have good evidence in this country to indicate that increased profit does not necessarily follow.

Various systems may be used to increase lambing frequency:

(i) Continuous lambing: Ewes are exposed to the rams throughout the year. This is not entirely satisfactory because, in addition to the two main but rather broad lambing seasons, lambs are liable to be born at any time. Furthermore, the stimulus of the presence of the ram among the ewes is reduced if he is always present.

(ii) Lambing every eight months: This must not be too rigid because lambing and mating at unsuitable times of the year should be avoided.

(iii) Lamb on a 7-7-10-month schedule: Like the previous system, this aims to achieve three lambs every two years.

In any more-intensive breeding system, early weaning of lambs will be necessary; few ewes will come on heat during lactation unless artificially stimulated by the use of hormone preparations.

Probably the biggest drawback to the adoption of more frequent lambing systems - apart from the expense of extra feeding - is in the fact that not all

ewes are likely to adhere to he planned breeding programme. Unless these animals are culled or allowed to skip, separate flocks for pregnant ewes and lactating ewes will be necessary.

5. FLUSHING EWES

The traditional European practice of bringing ewes into a state of improving body conditions just prior to the breeding season has received considerable attention from research workers during the past two decades. By tradition, ewes were allowed to drop in condition after their lambs were weaned, usually by running them on poor grazing; the ewes were then "flushed" by improving their condition through better feeding a few weeks before tupping. The purpose was to achieve a greater lamb crop in the next season. The various methods of achieving this, such as by moving the ewes to fresh green pasture or by some additional concentrate feeding, have all been used with varying success.

Work by Allen and Lamming in 1961 suggests that it is more important for ewes to be in good condition at mating; in other words, the post-weaning decline in condition is unnecessary. They suggested that the effect of flushing was a greater release of gonadotrophic hormones into the ewe's bloodstream, causing more eggs to be released at ovulation. This was later confirmed and fully investigated by Gordon in 1963 who demonstrated that injections of Pregnant Mare Serum (PMS) led to multiple ovulations. At the same time, a good deal of the advantage was lost through early abortions, re-absorptions,

and higher lamb mortality following multiple births. PMS injections are today widely used in some countries, Russia being the most notable example.

Flushing is not usually effective when a feed supplement is fed to ewes in good thrifty body condition, although it can be accomplished by moving them to a new pasture.

However, under most conditions in Rhodesia, multiple lambs, or even twins are not always desirable. Lambs are greatly dependent on the ewe's milk supply and while most of our veld in summer is adequate to support the milk yield necessary for one lamb, it is commonly observed that when ewes raise twins, one is usually a runt. It seems logical to conclude then, that unless nutritional conditions can be considerably improved - for example by creep feeding the lambs - there is little purpose in flushing ewes, either by feeding or by PMS injection. The primary objective of the farmer should be to maintain his ewes in an efficient, moderate to good, body condition.

6. CARE AT LAMBING

(a) Preparation

Lambing time has always been acknowledged as the busiest time of the sheep farmer's year. The actual number of lambs born is the end result of a whole year's flock management and feeding. But without adequate attention and supervision of the ewes over the six or eight weeks of lambing, as many as one lamb in five may not survive. That such losses may occur is not

characteristic of Rhodesia alone, for similar losses are reported from surveys in countries as diverse as New Zealand, Australia, South Africa and Britain. In all cases these lamb losses can be greatly reduced by personal care and attention to the lambing flock and, since the number of lambs raised has a direct bearing on the profitability of the sheep enterprise, the time necessary to reduce lamb losses at birth is time well spent.

Successful lambing can be traced right back to care of the ewe flock from tupping onwards. Ideally, and depending on her condition, a pregnant ewe should maintain her body mass with perhaps only a slight gain during the first 3 1/2 months of pregnancy, but she should gain between five and eight kilograms during the final six weeks. In most cases, this sort of growth pattern will ensure a sturdy viable lamb and a good initial milk supply.

During the month prior to lambing the ewes should be under close surveillance. Overgrown hooves should be trimmed and wool ewes should be crutched (the wool between the tail and the udder is trimmed away). Inoculation against pulpy kidney during the last fortnight will confer an immunity on the lamb during its first few weeks of life.

A very useful management technique for large sheep enterprises is the raddle-marking of ewes by the use of raddle harnesses fitted with different colours for different weeks (or fortnights) of the tupping season. This enables the ewe flock to be divided into early, average and late lambers within the six-week season. As lambing time approaches the early lambers can be sorted out

for special care; the later-lambing ewes are not brought into the maternity area until their time approaches. This permits a far closer supervision of lambing ewes than would be possible when all are run in one flock together.

The practice known as "drifting" in Australia has much to recommend it. A series of six or seven small camps is constructed at a suitable site and the ewes near lambing are put in the first one. Thereafter, every day - or twice a day if necessary - the ewes which have not yet lambed are moved on or "drifted" to the next camp, leaving behind the ewes with their new lambs. These ewes and their lambs remain in the camp until the lambs are strong and active enough to leave for pasture grazing. "Problem" ewes can be drifted into individual small pens nearer to the homestead.

Signs of impending lambing

As lambing approaches a slackening of the pelvic ligaments occurs at the base of the tail, the vulva becomes relaxed and usually darkens, the udder becomes firm and hard and the teats fill at the base.

(b) Lambing

The onset of lambing commences with a relaxation and opening of the cervix - the normally tightly closed entrance to the uterus or womb. This is followed by gentle contractions of the womb and the ewe appears to be restless and uneasy, although as yet there is no straining. During this time the lamb stretches its limbs in preparation for its birth.

When the cervix is fully open the womb and vaginal passage are continuous. The womb contractions increase in intensity and force the lamb into the passage; these contractions continue until the lamb is expelled. When the lamb enters the passage the foetal membranes rupture and the escaping fluids (the "waters") act as a lubricant. Finally the umbilical cord breaks and the lamb is born. After a short rest the womb contractions recommence, to expel the foetal membranes (the afterbirth).

At least 70 per cent of births are normal, that is, forwards with the head resting on extended forelegs; more rarely the lamb is presented backwards with its hind legs extended. Assistance is not needed at most births, other than a limited amount of traction which may occasionally be necessary to help a young, small or exhausted ewe, usually when the lamb is too large as a result of injudicious cross-breeding. If this is the case, pull the lamb gently, firmly and steadily downwards in an arc towards the ewe's hind feet.

Attempts at forced delivery by pulling will inevitably fail if the lamb is not correctly positioned, e.g. the head is misplaced, or the legs are not fully extended, or twins have got mixed up at the entrance to the passage. Correction of faulty positions must always be done after the lamb has been pushed back into the womb. The hand and arm should be thoroughly washed and then lubricated with soap and water - or other lubricant - before insertion. Wherever possible, veterinary or other experienced assistance should be sought until the farmer is himself familiar with the problem "in the flesh".

Whenever a ewe has been assisted, a 5 cc injection of penicillin or tetracycline should be given and an antiseptic pessary inserted into the womb as a precaution against infection.

(c) "Problem" ewes

A number of ewes always need more intensive care and attention than the rest of the flock at every lambing season. These include ewes exhausted after a long difficult birth, ewes with weak lambs or one weak twin, ewes unwilling to suckle their lambs and ewes selected to foster twins and orphans.

For ease of supervision it is always preferable to centralize the control of these ewes near to hand. A series of small pens (1m x 1,3 m) is necessary for the individual holding of each ewe and her offspring. Unless particular disinfection methods are employed, the danger of disease makes the use of permanent yards inadvisable. Temporary pens of wire can be set up on clean grazing each year and moved on from time to time if necessary. Each pen should be equipped with a water trough and clean grass bedding. As most ewes will only be in the pen for the 24 hours following lambing, extra food, beyond the bedding, is seldom supplied. Only those ewes retained longer by mothering-up difficulties, or the need to supply special treatment for lambs, are fed. Sheep cubes or cottonseed meal are probably the most convenient supplement.

(d) Attention to the lamb

Investigations in Australia indicate that the greatest mortality of lambs occurs within the first three days after birth, mostly within 24 hours. Ninety per cent of all lamb mortalities arise from starvation after birth, difficult births and small, weak lambs.

If the ewe is too weak or exhausted to lick her new-born lamb it is important to ensure that at least the mucus is wiped from the lamb's nose so that it can breathe freely.

If a lamb cannot feed because one or both of the ewe's teats are blocked, clean off the waxy "seal" and squeeze the teat until milk is expelled. Cleaning the udders of all ewes before lambing is a good standard practice.

The newborn lamb has sufficient reserves of energy to survive for several hours under normal conditions; to stay alive after this, the lamb must suck as soon after birth as possible, before body temperature starts to decline. To this end it is important to see that the ewe and lamb "mother-up" and that the ewe will stand for suckling. Problem ewes in this respect should be confined with the lamb until a normal relationship is established. Sometimes a very weak lamb will have to be held up to the udder to suck for the first two or three feeds.

It is particularly important for the lamb to get the first milk, or colostrum, from its dam. Colostrum has a vital two-fold function: to clear the alimentary canal and get it "moving" and to pass on the mother's disease resistance and

immunities to the lamb.

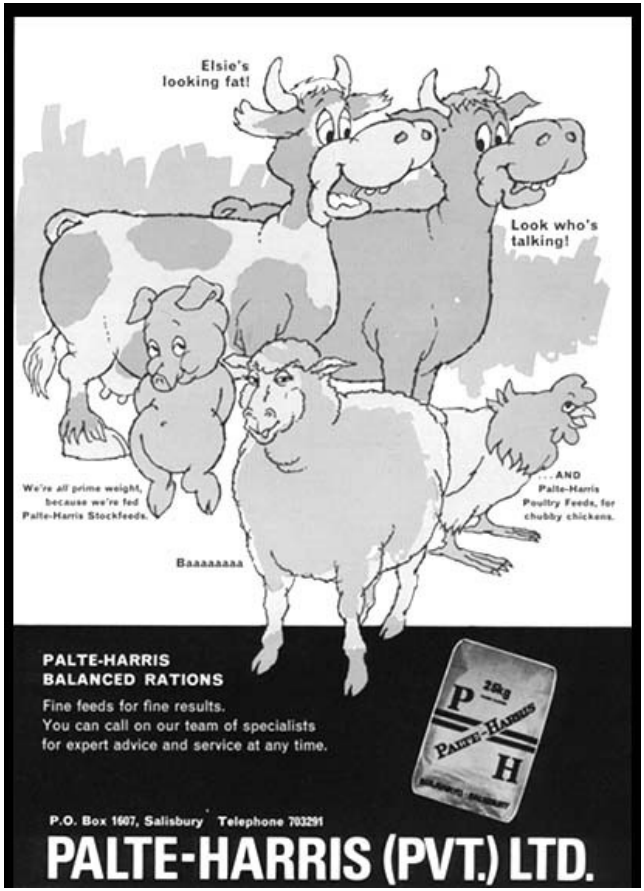
Exposure is also a frequent cause of lamb losses; in Rhodesia torrential rainstorms often carry out the *coup de grace* on weak spring-born lambs. Cold winds, as such, do not appear to cause many lamb deaths in Rhodesia, because very few parts of the country provide absolutely no shelter from driving winds. A new-born lamb is very small and can easily find some shelter behind a tussock of grass or a stone 100 to 200 mm high. Rain can be more chilling than a cold dry wind, and if cold rains are imminent at lambing time it is advisable to keep ewes and very young lambs under a roof for the first two or three days after birth.

(e) Orphan lambs

Orphan lambs usually cause more trouble to rear than they are worth, and unless a suitable foster mother can be found at short notice they are disposed of as a routine on most properties, particularly where large flocks are run.

If a foster mother is found, one technique is to wet the lamb - as well as her own lamb if she still has one - all over with salt water or, better still, some of the ewe's own placental fluids. Once the lamb has been licked clean - she will usually accept it. If the ewe's own lamb has died another effective "trick" is to skin it and then tie the skin over the orphan. Other techniques such as putting some strong-smelling substance in the ewe's nose - to blunt her sense of smell and hence her recognition of the lamb - can also be applied. In all

cases it is advisable to pen the ewe in close proximity with the lamb and to keep them there until the lamb has been fully adopted.



In general terms the more lambs that can be reared the more profit there will

be in sheep production; if the expense of rearing orphan or surplus lambs can be kept down, this could add to the overall returns. To rear lambs artificially is always more expensive than rearing them on their dams. However, in the light of recent overseas developments in increasing the prolificacy of sheep, renewed attention has been paid to the artificial rearing of lambs. Even the best-milking ewes seldom rear more than twin lambs effectively, and where the quality of grazing during lactation is not particularly good only a single lamb can be reared well. Where the number of such "surplus" lambs is large it is obviously not possible to foster them all and a full artificial rearing programme should be established.

In all cases the lamb should stay with its dam long enough to obtain its share of colostrum, that is. until it is between six and 48 hours old. Where the dam has died the lamb should be given the opportunity to suck from another newly lambed ewe.

Once separated from the ewe, the lambs should be placed in clean well-ventilated surroundings. Clean straw bedding is desirable as is the presence of up to six other lambs, particularly in cooler weather. Floor space should be in the order of 0,5 m^2 (5 sq. ft.) per new lamb increasing to 1,0 m^2 (10 sq. ft.) for lambs weighing over 30 kg.

(f) Feeds used in artificial rearing

Although nutrition as a whole is the subject of a separate chapter, it is more

relevant to deal here with the specialized subject of feeding non-suckled lambs.

(i) *Milk*

Table 4.2 indicates the different compositions of the milk of the sheep and three other mammals, the cow, the goat and the human. Most farmers are aware that cattle milk quality can vary quite considerably from the average, and the same applies to other species. Nevertheless, the table gives a good indication of the difference between species.

Table 4.2 Percentage composition of milk of different species (Hugo 1966)

	Sheep	Goat	Cow	Human
Water	83,2	87,2	87,1	87,4
Fat	6,2	4,1	3,8	3,8
Lactose	4,3	4,2	4,8	7,0
Casein	4,3	2,9	2,9	0,9
Other proteins	1,1	0,8	0,7	0,7
Ash	0,9	0,8	0,7	0,2

It will be noted that sheep's milk is considerably richer than that of the other species and this must be borne in mind when formulating milk substitutes for lambs. Obviously, mixtures used for calf rearing will prove unsatisfactory, since the lamb will be either underfed if restricted to a reasonable amount, or become pot-bellied and scour if fed to appetite. Consequently, it is necessary to fortify the substitute, particularly by increasing its fat content.

In Britain, commercial milk replacers are based on skim-milk powder fortified with added fat - a mixture of coconut oil and tallow, preferably homogenized - to give a final powder containing 30 per cent fat and 24 per cent crude protein. The milk-replacer powder is then mixed with water to produce a liquid having a solids content of about 20 per cent.

(ii) *Concentrates*

From three weeks old, the lamb is increasingly able to make use of solid food - grass or concentrates. Its need for concentrates is similar to that of calves, except that the lamb is much more susceptible to copper poisoning. In the formulation of lamb diets it is recommended that, where possible, the copper content of the final diet should be about 5 ppm of dry matter. As some feeds, such as cottonseed cake or groundnut cake, often contain copper in quantities that are excessive for a lamb, it may be necessary to check the copper content of all proposed feeds.

A straight dairy meal/maize meal mixture containing about 15 per cent crude

protein would probably be most satisfactory and convenient. The inclusion of 10 per cent milled roughage as recommended for calf rearing would probably reduce digestive troubles.

Hand-fed lambs should be introduced to the concentrate by putting a little at the bottom of the milk pail during the first week. Concentrate should be available at all times and, from two to three weeks of age, intake should become significant.

Once the lambs have attained about 12 kg livemass and are consuming more than 200 g concentrate per day they may be weaned from the milk substitute and reared on concentrate plus roughage until six or seven weeks old. Clean, fresh water should be available at all times. From this age they may go straight into the feedlot, but if they are to be retained for breeding and are put out on pasture or veld, a concentrate supplement should be supplied, at least until they are big enough to hold their own with other weaned lambs of four to five months of age.

7. WEANING

Lambs in Rhodesia are commonly weaned between four and five months of age. The milk production of the ewe reaches its peak in the fourth week of lactation, followed by a steady decline, see Figure 4.1; by the end of the fourth month, milk production is only approximately 25 per cent of peak output. At this stage the ewe's milk is only contributing 10 to 20 per cent of

the lamb's total feed intake. By five months many ewes go dry and "self weaning" follows anyway.

Ewes usually benefit from a rest before the next mating.

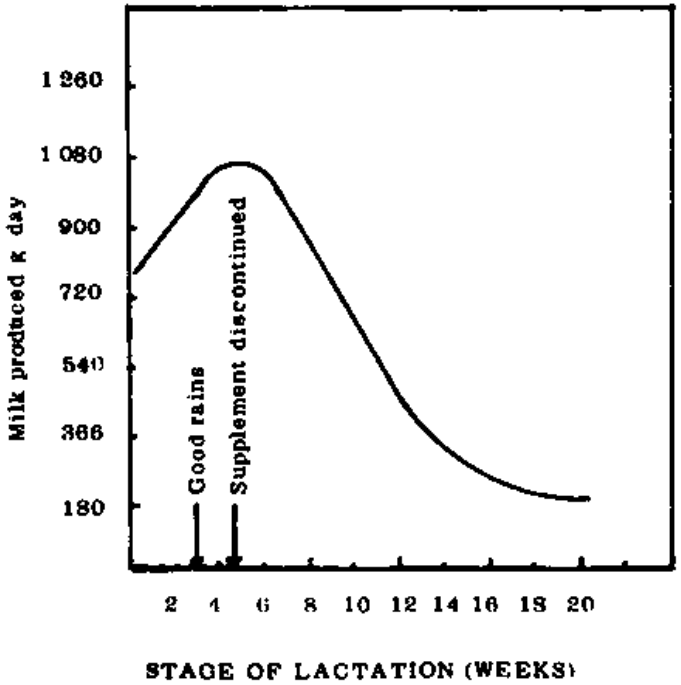


Figure 4.1 Milk flow of spring-lambing ewes fed a protein supplement. (after Le Roux 1970)

It is good practice to wean earlier during droughts or adverse conditions and so relieve the strain on ewes. A lamb is cheaper to maintain or pen-feed than a ewe and the dry ewe is better able to survive conditions of nutritional stress.

After weaning, lambs should have access to the best possible grazing and, if a creep was supplied during the suckling period, should continue to receive the same concentrate thereafter. Lambs to be penned for finishing should - initially anyway - continue on the old concentrate ration, at least until they have settled into their new surroundings.

At the same time it is advisable to restrict the grazing or feeding of the ewes to help reduce any remaining milk flow.

A sound practice followed by some farmers is to trim the feet of all ewes four or five days after weaning and, at the same time, to inspect the udders for mastitis, blind teats, over-tight udders and other defects. Culling or appropriate treatment can then be carried out.

8. TAIL DOCKING

The removal of a sheep's tail is an essential practice where woolled sheep are run. In the case of ewes in particular, the soiling of the wool in the britch area with urine and dung creates an ideal egg-laying site for blow-flies; if, in addition, the animal has a long tail the soiling is considerably aggravated.

One school of thought still likes to see the tail completely removed, but recent observations indicate that, with ewes, it is probably best to leave just enough to cover the tip of the vulva. It is a good idea to dock the tails of heavily woolled sheep at different lengths for males and females; this facilitates speedy identification of sexes when sorting a large flock.

In the non-woolled breeds, tail docking is intended mainly "to improve the appearance of the animal" and is a necessary requirement in certain breed standards. However, apart from these aesthetic grounds there seems little other purpose in the operation.

It has now been shown that the docking of fat-tailed breeds does not result in a more even distribution of fat over the animal's body. It is probably best to leave the tail intact in these breeds as it simplifies the trimming of the carcase at slaughter. The only possible advantage of partially docking fat-tailed ewe lambs is when crossbreeding is to be practised, since it is said that the swinging fat tail impedes rams at mating - except, of course, fat-tailed rams which appear to be well able to cope with the task.

Methods of tail docking vary, but all are equally effective if carried out efficiently and suitable precautions are taken against disease. The use of a fly repellant is important in this respect.

(a) Knife method

A suitable knife is not a folding pocket knife, but a sharp straight-handled

knife that can be sterilized in boiling water. The tail and surrounding area of the animal should be washed. The skin of the tail is pushed up above the joint in the vertebrae that has been selected as the cutting site and the tail is cut off boldly, in one firm movement; the skin is then allowed to slip back over the exposed portion. Bleeding is slight and soon stops if the lamb is allowed to walk away. Some farmers use a hot iron to cauterize the wound,

(b) Hot iron

An assistant holds the lamb in such a position that its tail lies on a block of wood. The operator pushes the skin above the cutting point and then severs the tail at the right place using a spade or "badza" blade heated to a dull red colour.

(c) Burdizzo and knife

The tail is crushed between the jaws of a Burdizzo, cutting off the blood supply, and then cut off between the jaws with a sharp sterilized knife before the jaws are released. Wound powder or screw-worm remedy may also be applied. This method appears fairly suitable for partly docking fat-tail lambs at an early age.

(d) Elastrator

This method must be applied before the lamb is 48 hours old, while the bone is still soft. The rubber ring is put on at the desired place and left for a couple

of days, after which both the ring and tail remnant are removed with a knife and disposed of. No bleeding should occur.

The practice of using elastrator rings which are left in position until the dead and shrivelled tail falls off is to be discouraged, not only for its unsightliness but also because of the risk of infections that can be harboured in the decaying tissue.

9. CASTRATION

Castration, as an animal husbandry practice, is probably just about as old as the domestication of animals. Castration has several effects upon an animal in addition to the obvious one of rendering it sexually sterile; most are the result of a modification of the secondary sex characteristics.

The first obvious effect is that sex drive and aggressiveness are greatly reduced or even terminated. Carcase characteristics are altered; the development of the forequarters is reduced and the amount of fat in the castrate is greater and more evenly distributed than in the entire male.

When a mature male animal is slaughtered the meat is often tougher, darker in colour and of a stronger taste than the meat of castrates or females. The age at which an animal is slaughtered, relative to its age at sexual maturity, influences the effects of castration. As these differences between castrated and entire ram lambs do not show up in young sheep, entire ram lambs have been acceptable for the top lamb grades in Rhodesia since 1971.

When growth rate and efficiency are compared, the advantage of entire ram lambs becomes apparent. Up to eight months of age the advantage may range between three and 11 per cent. Entire male lambs also tend to show greater muscling and less fat covering than their castrated brothers. Marbling - the dispersal of fat through the muscle - declines progressively as the entire ram advances in age.

Despite all these factors in favour of entire male lambs, the practice of castration is likely to continue in most commercial flocks, purely for managerial convenience. Well-grown ram lambs have been known to become interested in the other sex as early as four months of age. This means that if odd unplanned matings are to be avoided, uncastrated male and female lambs must be run separately after weaning. Normally, this is practical only when lambs are intensively pen-finished or when sheep are run on a very large scale and rams and ewes can be drafted into different flocks.

Where castration is to be practised, it is best done at an early age; many flock owners do this once a week during the lambing season. Three alternative methods may be used:

(a) Knife

This is the oldest of the three methods and has the advantage that at the end of the operation, two testicles are to hand as tangible proof that the operation will be 100 per cent effective. It is partly for this reason that this is still the

main method used by many experienced sheepmen.

A very sharp knife that can stand sterilization by boiling must be employed Two buckets of disinfectant are necessary; one for washing the knife and the other for swabbing down the empty scrotum after the operation. The lamb is placed in a sitting position upon an empty drum or plank set at a convenient working height; the catcher holds both of the lamb's right legs in his right hand and both left legs in his left hand.

The operator holds the end of the scrotum or "purse" in his free hand and with a firm movement of the knife, cuts off the lower end of the scrotum. The knife is then replaced in its bucket and, using the free hand to press against the body wall, the first testicle is grasped (it might be necessary to use the knife again to slit the white outer membrane) and drawn firmly from the scrotum. The same procedure is followed for the second testicle, and the scrotal sac is then tugged lightly but firmly to ensure that the remaining contents are withdrawn into the body. The whole empty scrotum is then swabbed down and finally dusted with a suitable wound powder. After the operation the lamb is put gently back on its feet and allowed to return to its mother. The testicles and purse end should be collected in a separate container to minimize the attraction of flies.

A variation of this method is to use an "emasculator" to crush (and thus seal off) the cord of the testicle, instead of merely drawing it out. However, this slows proceedings and is not a general practice for large numbers of lambs.

As the use of the knife causes a little bleeding it is well to carry out the operations early in the cool of the morning, and also to ensure that the lambs have been standing for at least half an hour before handling. The operation is best done when lambs are about three weeks of age,

(b) Burdizzo

This method is most effective when lambs are much older, at least three months of age, and it involves crushing the spermatic cord through the scrotal skin by the use of special pincers of patented design. The external surface of the scrotum is not damaged, but the internal blood supply is cut off with the severing of the spermatic cord, thus causing the testicles to wither away.

The technique is to draw the testicles down to the end of the scrotum. The cord of the first testicle is then drawn to the side of the scrotum and "caught" between the jaws of the Burdizzo which is then locked and held for about 20 seconds. The same procedure is then adopted for the second testicle, but on the other side of the scrotum. Care must be taken to ensure that the bruise marks of the two separate "bites" of the instrument do not merge or overlap, because this could cause the whole of the lower scrotum to die and eventually drop off, and thus provide an easy entry for screw-worm or bacterial infection. The operator should also ensure that the jaws of the instrument are not too close to the body as there is a danger of catching and injuring the animal's penis inside the body wall.

Use of the Burdizzo method of castration ensures minimum opportunity for secondary disease infection.

(c) Elastrator

This is a relatively new method, favoured particularly where labour is scarce and expensive. It is quick and no sterilization or disinfection is required. A special applicator is used to fit a tight rubber ring around the top of the scrotum and above the testicles, thus cutting off the blood supply. The lower half of the scrotum shrivels away and, if left, will usually drop off after about 10 or 12 days.

The rubber ring must be applied when the lamb is very young, preferably two to three days old while the skin of the scrotum is still very soft; the younger the animal, the more effectively will the wound be healed.

The technique is to draw the testicles down into the lower end of the scrotum with one hand - they are not always easy to locate when the lamb is so young - and to apply the elastrator ring above them.

In some parts of the world the elastrator is out of favour owing to the incidence of tetanus infection in the lambs after the scrotum has sloughed away; nevertheless, many thousands of lambs are castrated each year using this method, and when correctly used it is completely successful.

However, alternative methods of castration may be necessary where tetanus

is a problem, although protection of the lambs by an anti-tetanus injection should really be routine practice for both sexes in these areas.

(d) Cryptorchids or "rigs"

Every so often one comes across a ram lamb in which one or both testicles have been retained; i.e. they have not "dropped" and thus none of the three methods described can be used. As it is futile to operate on one testicle only, the lamb should be marked in some way or future attention or early slaughter.

Regular hoof trimming is important.

Photo Rhodesian Farmer

10. HOOF TRIMMING

Very often sheep develop overgrown hooves when grazing soft pastures or

when for any other reason they have soft conditions underfoot. Overgrown hooves greatly hinder a sheep's walking ability and in the case of rams can severely restrict serviceability. Under conditions where hooves tend to grow faster than they are worn down by walking, foot trimming is essential and should be a regular management practice.

The wall of the hoof should be trimmed level with the sole using either a sharp, stout short-bladed knife or secateurs.

11. PLANNING THE BREEDING FLOCK

On many Rhodesian farms, particularly where the sheep enterprise is not the main one, there is always the danger that the flock will "just grow" like Topsy. Once it exceeds the grass-production capacity of the area, in addition to shortage of forage, the incidence of disease and mortality will become uncontrollable and profitability will decline. This has happened, and is still happening in many parts of the country, and indicates that a planned approach to sheep production is just as important as planning for any other form of production.

(i) *Carrying capacity*

The first thing that must be established is the amount of grazing available for sheep in the allocated area. While it is true that sheep and cattle do not have the same grazing habits and preferences, ft is not true to assume that sheep can be ignored within the overall carrying capacity of the farm. Generally, it

must be assumed that five mature sheep will consume as much grass per day as one mature ox or cow.

Furthermore, where sheep are kraaled in a permanent central site at night - which is still the most common practice in Rhodesia - the size of the flock will be limited by the amount of available grazing within a circle whose radius is a comfortable daily walking distance. This is seldom more than 1,5 to 2 kilometres.

(ii) *Small-stock units*

For the purpose of this exercise sheep will be rated as small stock units (SSU) to differentiate from the term Livestock Units (LU) used for cattle. Therefore, it is assumed for general purposes in Rhodesia that five SSU require the same volume of grazing as one LU. One un-weaned lamb can be rated as 0,5 SSU while a weaned lamb (up to two-tooth) can be rated as 0,67 SSU.

(iii) *Mortality*

In determining flock composition, allowance must be made for the mortality levels usually experienced in the flock. Likely figures are those quoted in a South African survey (Louw, 1971):

adult sheep	**4 per cent**
lambs - birth to weaning	**10 per cent**

weaners - up to two-tooth 2 per cent

(iv) *Ewe replacement rate*

Le Roux (1971) working at Matopos has concluded that under average circumstances in Rhodesia most ewes will be retained in the breeding flock for only four seasons. This is a result of the marked decline in milk production and fertility that usually occurs after six years of age. Accordingly, 25 per cent of the ewe flock will have to be replaced each year, and at each lambing time the ewes in the flock will have an age distribution in approximately equal numbers of two, three, four and five year olds.

(v) *Selection pressure*

Assuming a 100 per cent lambing in a 100-ewe breeding flock, and that half of them are females, it will be necessary to retain one of every two ewe lambs for replacements. A further proportion - about another eight per cent - will have to be retained to the two-tooth stage to permit final selection at first mating.

(vi) *Marketing and slaughter age*

The marketing policy determines how many lambs will remain on the available grazing after weaning. Lambs that are pen-finished immediately following weaning will make no further demands on the available grazing,

whereas lambs that are finished on grass following weaning must be taken into account in any assessment of flock grazing requirements.

(vii) *Rams*

Generally, two rams are run per hundred ewes and these should also be included in the SSU total. While rams are usually bigger than ewes, they are normally rated as only one SSU each. This is because they usually receive some supplementary feed in addition to grazing. Where this is not the case due allowance must be made, and the rams up-rated to 1,2 or 1,3 SSU according to livemass.

(a) Calculation of flock composition

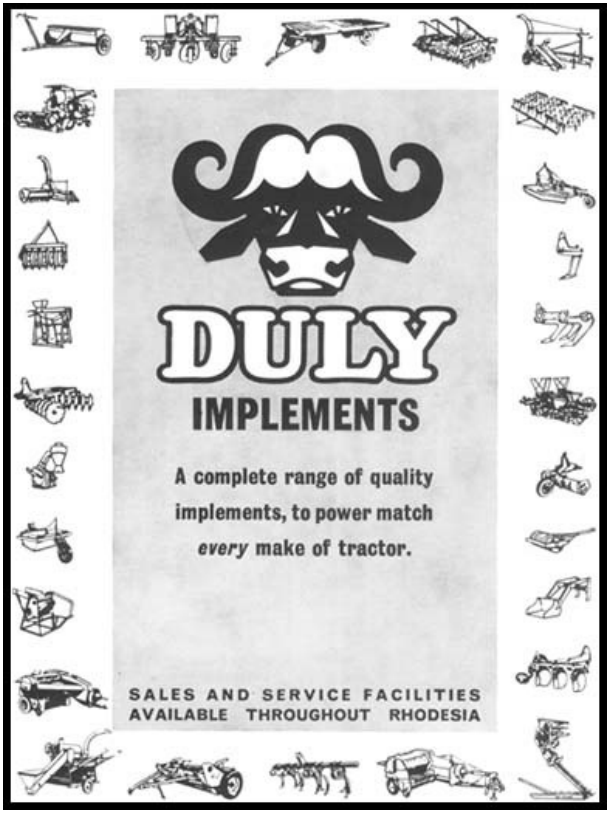
Once all the controlling factors are known the theoretical composition of the flock can be calculated. Naturally, because we are dealing with living animals rather than empirical units, the actual flock will usually vary to a small extent within this calculated framework.

Example

The farm has available summer grazing for 500 SSU. It also has ample winter forage provided by stover and vleis; a spring lambing percentage of 100 per cent*; ewes are culled and replaced at the rate of 25 per cent per annum; lambs are fattened after weaning on grazing and stover with supplements and are sold in October; two rams are run per 100 breeding ewes. Cull ewes are

run on stover with supplements until ready for sale. Lamb mortality before weaning is 20 per cent.

*** Note Lambing percentage is defined as the number of lambs born per 100 ewes put to the ram.**



Stage 1: Calculation of flock of 100 breeding ewes

(a) in mid-summer - all lambs at foot;

(b) in autumn - tupping; lambs weaned:

(a)

Head	Class	SSU
100	Breeding ewes	100
2	Rams	2
80	Lambs at foot	40
--	Cull ewes	--
30	Yearling ewes	20
212		162
		SSU

Only ewes with viable lambs should be retained for breeding.

Photo Rhodesian Farmer.

(b)

Head	Class	SSU
75	Breeding ewes	75
2	Rams	2
80	Weaners	53
31	Culls	31

21	Cull ewes	21
25	Replacement ewes	25
203		176

Stage 2: Calculation of flock composition in example.

It will be noted that there are more SSU in the flock at tupping than after lambing, but since the summer situation is the critical one in our example summer flock numbers will be used in the calculation.

The farm can carry 500 SSU in summer.

A 100-ewe flock comprises 162 SSU. Therefore, a 500 SSU flock will have

$$\frac{500}{162} \times 100 \text{ ewes} = 308{,}6 \text{ ewes}$$

In round figures then, the summer flock will be made up as follows:

Head	Class	SSU
308	Breeding ewes	308
6	Rams	6
*247	Lambs at foot	123

**92	Yearling ewes	62
653	Totals	499

$$\frac{\text{* 80 lambs x 308,6}}{100} = 246{,}88 \text{ round off to } 247$$

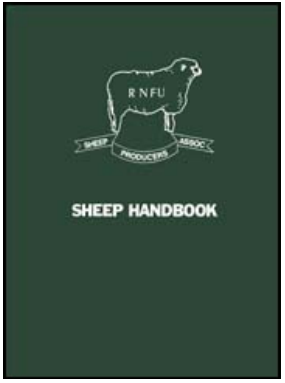
$$\frac{\text{** 30 yearling ewes x 308,6}}{100} = 92{,}58 \text{ round off to } 92$$

The SSU column provides a check that our calculations are correct.

The expected annual sales can be calculated from the first, and the final flock composition as follows:

Cull ewes: 21 x 3,086	=	65
Surplus two-tooth: 5 x 3,086	=	15
Fat lambs males: 40 x 3,086	=	123
Fat lambs females: 10 x 3,086	=	31

Depending on the controlling factors used, this method of calculation can be used to determine the flock composition and annual sales for any production system.



Sheep Handbook

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Chapter 5. Sheep Management Calendars

Top

D. J. DONKIN

A condensed summary of management practices

These calendars list the major breeding and management decisions faced by sheep producers during the year; for maximum effectiveness they should be planned to fit in with veld or pasture growth-patterns.

The suggested dates are average ones and the individual sheep producer will probably modify the calendar to suit his conditions. For greater detail, refer to the relevant chapter in this book.

1 Spring lambing on the Mashonaland highveld

July-August

Care of pregnant ewes

1. Ensure best available grazing; unless ewes are very "down in condition" following weaning, no supplement should be necessary.

2. Where ewes are very thin, or grazing very sparse, a supplement of 50 to 100 g maize and/or cottonseed cake may be necessary.

3. Dose against roundworm. Vaccinate against pulpy kidney about two weeks before lambing.

4. Shear pregnant ewes (wool breeds) early.

Care of rams and followers

1. Dose and inoculate as above.

2. Ensure rams get adequate exercise. Only supplement if necessary. Do not allow them to become excessively fat.

September-October-November

Care of pregnant ewes

1. Ensure best available grazing.

2. Give each ewe a supplement of 340 g cottonseed cake per day.

3. Provide a daily energy supplement of one litre molasses per ten ewes or, if grazing is poor, 200 or 300 g of maize grain per day.

4. Dose. Handle pregnant ewes with care.

Care at lambing

1. Provide quiet shady maternity camp, shelter and sufficient small pens for "mothering up".

2. Do not aid lambing ewes unless they are in trouble.

3. Do not return ewes and their lambs to the main flock until the lambs are suckling strongly.

Care of lambs

1. At birth, disinfect lamb's umbilicus as a precaution against "navel ill".

2. Ensure every day that each lamb has a mother or foster mother.

3. Dock and mark lambs within four days of birth.

4. Castrate within three days if using the elastrator, or within three weeks if using the knife. Burdizzo castration is carried out at three months of age.

Care of lactating ewes and lambs

1. Continue to feed protein (and perhaps maize) supplement until two weeks after the first good rains have ensured the spring grass flush.

2. Ewes and lambs should always have the best of the available grazing.

Graze flocks on topland and water them from troughs in summer.

Photo Rhodesian Farmer.

General

1. **Graze away from vleis, wet areas and open water.**
2. **Dose all mature sheep.**
3. **Cull all barren ewes to butcher when fat.**
4. **Shear wool rams and followers early in September.**

December-January-February

Care of ewes and lambs

1. **Provide best topland grazing.**
2. **Dose lambs for tapeworm, early in December.**
3. **Wean first lambs towards the end of February.**
4. **Vaccinate young ram lambs against epididymitis (REV 1 vaccine).**

General

1. Dose all mature sheep against roundworms every three weeks. In moist hot summers an extra wireworm dose may be necessary in January.

2. Vaccinate against blue tongue in mid-December.

3. Vaccinate against pulpy kidney at three months of age.

March-April

Lambs

1. Complete weaning by mid-March.

2. Lambs should be allowed no setback. Provide a protein supplement if lambs are not continuing to grow on grazing alone.

3. Inoculate against pulpy kidney at weaning or at least three weeks before pen feeding starts, and again two weeks later.

4. Pen lambs for finishing when first maize grain is reaped. Feed nine parts snapcorn: one part 64 per cent C.P. concentrate + one per cent limestone *ad lib* after a one-week "breaking-in" period.

Care of rams

1. Ensure that you have enough rams for your flock. Purchase more if necessary, at least two months before tupping.

2. Rams should be in vigorous thrifty condition at all times but, particularly during the breeding season, they should be brought on to a higher plane of feeding several weeks before the breeding season by supplying 1,5 kg per day of a one cottonseed cake: 12 corn and cobmeal mixture.

3. Trim hooves if necessary.

4. Trim around eyes, testicles and penis of wool breeds if necessary.

5. Have rams checked for epididymitis.

General

1. Continue dosing at intervals of three weeks - including those lambs on grazing.

2. Vaccinate against quarter evil if necessary in your area - ask your vet.

3. Send grass-fattened cull stock for slaughter.

4. Cull all ewes which have worn teeth and physical defects. Also cull young below-standard ewe replacements.

May-June

Care of the breeding flock

1. Teazing the ewes with a vasectomized ram for two weeks before the breeding season will often speed up breeding.

2. Put the breeding rams to the ewes five months before you wish to have your first lambs.

3. Continue feeding the rams throughout the tupping period.

4. Use a raddle or marking harness as a check on breeding progress.

5. Remove rams after six weeks' tupping.

General

1. Run replacement ewe lambs separately but do not neglect them.

2 Autumn lambing on the Mashonaland highveld

December-January-February

General

1. **Restrict grazing to topland.**
2. **Dose all sheep regularly against roundworms.**

March-April

Care of pregnant ewes

1. **Ensure these ewes have the best of the late summer grazing.**
2. **Dose regularly. Handle pregnant ewes with care.**
3. **Vaccinate against pulpy kidney in late March.**
4. **One month before first lambing, supply daily one litre molasses per ten ewes.**
5. **Ensure that excess wool is trimmed away from the udders of wool sheep.**

6. If on stargrass pasture, provide ewes with a phosphate/iodized salt lick.

Care at lambing

1. Provide a quiet maternity camp and sufficient small pens for "mothering up".

2. Do not aid lambing ewes unless they are in trouble.

3. Do not return ewes and their lambs to the main flock until the lamb is suckling strongly.

Care of lambs

1. At birth, disinfect the lamb's umbilicus as a precaution against "navel ill".

2. Ensure every day that each lamb has a mother or foster mother,

3. Dock and mark lambs within four days of birth.

4. Castrate within three days if using the elastrator or within three weeks if using the knife. Burdizzo castration is carried out at three

months of age.

Care of lactating ewes and lambs

1. Ewes and lambs should always have the pick of available grazing and forage.

2. Start feeding ewes as soon as the veld or pasture shows signs of deteriorating. When an ample bulk of grazing is available, or if stover is grazed, feed up to 550 g cottonseed cake daily. Where amount of grazing is limited, feed 700 g of a two maize: one 64 per cent CP concentrate daily.

3. Provide a creep for lambs if growth is below standard. Feed nine maize: one cottonseed cake mixture *ad lib* from birth, or otherwise after a 10 day "breaking-in" period.

General

1. Cull and fatten for slaughter all ewes which did not lamb.

2. Vaccinate young rams against epididymitis.

May-June-July

Care of ewes and lambs

1. Provide ewes with the pick of available grazing and forage, particularly first access to well-harvested maize lands.

N.B. It is important to ensure that these lands are well gleaned. Introduce sheep for only one hour per day at first, gradually extending the period,

2. Dose lambs for tapeworms in June.

3. Continue concentrate feeding, but reduce level by one third in mid-June.

General

1. Dose all sheep for roundworms in July.

2. Keep rams thrifty with good quality roughage and a small concentrate ration.

3. Check that shearing equipment is in good order.

August-September

Care of rams

1. Ensure that you have enough rams for your flock. Purchase more if necessary at least two months before tupping.

2. Rams should be in vigorous thrifty condition at all times, but particularly during the breeding season. They should be brought on to a higher plane of feeding several weeks before breeding by supplying 1,5 kg per day of a one cottonseed cake: six corn and cob-meal mixture.

3. Check for epididymitis.

Care of ewes and lambs

1. Dose all lambs for tapeworm and vaccinate against pulpy kidney.

2. Stop concentrate feeding of ewes.

3. Wean all lambs. Run with some dry ewes as "nursemaids".

General

1. Dose all sheep once for liver fluke and once for roundworms.

2. Cull old ewes which have worn teeth, defective udders etc. Cull sub-standard replacement ewes.

3. Shear all wool sheep.

4. Vaccinate ram lambs against epididymitis.

October-November

Care of breeding flock

1. Teazing the ewes with a vasectomized ram for two weeks before the breeding season will often speed up breeding.

2. Flush the ewes, either by putting them on to fresh green grazing if available, or by supplementing with 200 g of a one maize: one cottonseed cake mixture.

3. Put the breeding rams to the ewes five months before you wish to have your first lambs.

4. Continue feeding rams throughout the tupping period. If weather is very hot, consider removing the rams and feeding them by day and

returning them to the ewe flock each night.

5. Use a raddle or marking harness as a check on breeding progress.

6. Remove rams after six weeks tupping.

General

1. Dose all sheep against roundworms.

2. Vaccinate against quarter evil and anthrax if necessary - ask your vet.

3. Vaccinate against blue tongue three weeks before mating.

3 Spring lambing. Midlands and Matabeleland highveld (after P. Le Roux (1970))

Dipping of sheep will be necessary, particularly in summer, in those areas where ticks are a problem.

Where foot-rot is a problem, prevention by the regular use of a footbath (10 g copper sulphate per litre of water) is essential during the months from October to March.

July-August

1. Dose all sheep against roundworms.

2. Vaccinate all sheep against pulpy kidney.

September-mid October

1. Start supplementary feeding of ewes - 340 g cottonseed cake daily.

2. Dose all sheep. Handle pregnant ewes with care.

October-November

1. First lambs are born. Dock and mark at three to four days old.

Castrate lambs at three weeks.

2. Watch for and treat blowfly attacks.

3. Continue feeding ewes until at least two weeks after the first good rains (25 mm).

4. Dose all mature sheep against roundworms.

5. Avoid grazing near vleis and open dams.

6. Vaccinate all sheep for blue tongue after lambing.

December-January

1. Dose all lambs against tapeworm in early December.

2. Dose all mature sheep monthly against roundworms.

3. Vaccinate ram lambs against epididymitis.

February-March

1. Wean lambs between end of February and mid-March. Ensure weaned lambs get good grazing. If grazing is poor, feed lambs 200 to 300 g cottonseed cake daily.

2. Continue monthly dosing of all sheep.

3. Vaccinate lambs against pulpy kidney in February and repeat in March.

4. Vaccinate against quarter evil and anthrax in March if necessary - ask your vet.

April-May-June

1. Dose all sheep against roundworms.

2. Bring rams to a higher plane of feeding.

3. Send all grass-fattened cull-stock to slaughter.

4. Send all finished lambs to slaughter. Pen-fatten the balance of those not required for replacements.

5. In mid-May, introduce rams to the ewe flock. Remove them six weeks later at the end of June.

6. Commence feeding replacement ewe lambs in June - 200 to 300 g cottonseed cake daily should suffice.


Sheep Handbook

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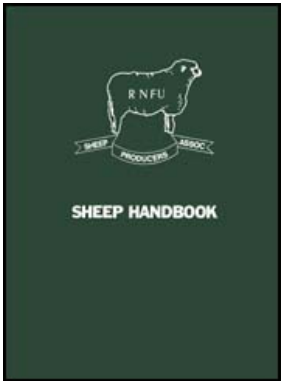

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Feed represents the largest single production cost item in all types of animal production, whether that production be from grazing, where the cost, interest and capital redemption of the pastoral land must be taken into account, or from specially grown crops where the growing cost must be charged to the animal enterprise. Efficiency in the feeding of sheep is therefore essential, and an understanding of feed evaluation and utilization in sheep is necessary for the farmer to make full use of the technical information provided by our country's research workers.

1. THE SHEEP'S DIGESTIVE SYSTEM

Animals have been described as "limbs and body tissue functioning round a 'pipe' " (de la Harpe 1969).

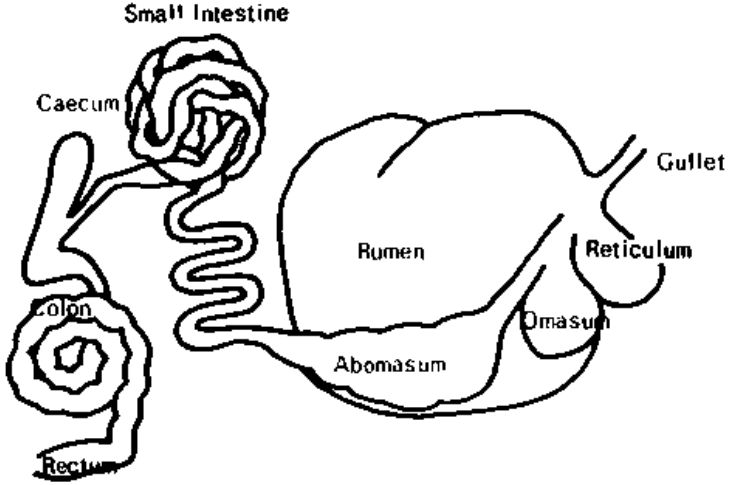


Fig. 6.1. The Alimentary Tract of the sheep

Although an over-simplification, that this is essentially true is clear from the diagram in Fig. 6.1. The essential difference between simple-stomached animals (such as pigs, horses and dogs) and ruminants (which include sheep, goats and cattle) is in the three stomach compartments before the abomasum or true stomach. The significance of these compartments - the rumen, reticulum, and omasum - is their population of micro-organisms which have the ability to digest cellulose. It is this characteristic that enables ruminants to obtain most of their feed requirements from grazing and forage.

(i) Development of the ruminant digestive system

The newly born lamb consumes only milk and as this is digested in the abomasum in the same way by all young mammals, the lamb has no need for the rumen, reticulum and omasum. When the young lamb sucks from its dam, a groove is formed by a conditioned reflex (the *oesophageal groove),* so that the milk by-passes the first three stomach compartments and enters the abomasum.

At this early stage the rumen, reticulum and omasum are relatively undeveloped. With normal access to grazing or dry feeds, by the time the lamb is eight weeks of age the proportions of the various parts of the alimentary tract are the same as in adult sheep.

***Table 6.1. The Capacity and Relative Proportions of the Alimentary Tract of an Adult Sheep* (de la Harpe, 1969)**

Organ		Capacity litres	%
Stomach	Rumen	23	53
	Reticulum	2	5
	Omasum	1	2
	Abomasum	3	7

Total stomach		29	67
	Small intestine	9	20
	Caecum	1	2
	Large intestine (colon)	5	11
		44	100

Table 6.1 gives the capacities of the different organs of the alimentary tract of a mature sheep. It should be noted that this is the *total* capacity of each organ when filled, and does not represent its functional capacity. It is known, for example, that the rumen functions best when it is half full.

(ii) Digestion in the rumen and reticulum

This can be divided into two phases, mechanical and chemical.

(a) Mechanical phase. When an adult ruminant eats, the feed is chewed quickly, mixed with saliva and swallowed. Once in the rumen it is mixed by means of rhythmic contractions of the rumen wall so that the coarse particles rise to the top and the finer particles settle to the bottom. When the animal has eaten its fill, the coarse particles are regurgitated back to the mouth as a *cud* which is then thoroughly chewed and mixed with more saliva and swallowed again.

When all feed particles are small, they can be better mixed with saliva, they present a greater surface area to microbial attack and they can be moved more easily along the alimentary tract.

(b) Chemical phase. In all animals food is broken down into its constituent parts by means of chemical juices known as enzymes. Some of these are found in the saliva, and others are secreted by the millions of microorganisms in the rumen, to bring about fermentation.

In the rumen large amounts of volatile fatty acids are released during digestion, particularly acetic acid in the digestion of roughage, and these are absorbed through the rumen wall. (*Note.* The correct pH (acidity) of the rumen fluid is maintained by the flow of saliva which is alkaline. Depending on the nature of the diet, an adult sheep may produce and swallow as much as 15 litres of saliva per day.) Further by-products of this fermentation include certain gases (methane and carbon dioxide), and heat is also released.

During ruminal digestion, plant proteins, as well as non-protein nitrogen (examples include urea and biuret), are broken down to ammonia which is absorbed by the micro-organisms which convert it into their own cell protein. When these micro-organisms pass out of the rumen they are, in turn, digested in the abomasum and in this way microbial protein becomes available to the ruminant host.

This ability of ruminal micro-organisms to convert low-quality protein and

non-protein nitrogen into microbial protein that can be used by the ruminant has considerable economic significance.

Any surplus ammonia produced in the rumen may be absorbed directly through the rumen wall into the blood stream. This ammonia is detoxified in the liver to form urea which may then follow one of three possible courses:

- **pass back to the rumen via the saliva;**
- **pass directly through the rumen wall; or**
- **pass to the kidneys to be excreted in the urine.**

In the first two instances the urea can be reused and this is quite important when natural protein levels in the diet are low.

A further major advantage that a ruminant has, is the ability of the ruminal micro-organisms to synthesize certain vitamins, notably Vitamin K and vitamins of the B complex. In ruminants, only vitamins A, D and E need normally be supplied in the diet.

(iii) Omasum

Following microbial fermentation in the reticulo-rumen, the finer rumen contents and fluids pass into the omasum, the wall of which has a number of fine folds which present a large surface area for the absorption of the fluids and soluble rumen contents.

(iv) Abomasum

Digestion in the abomasum or *true stomach* and further on in the alimentary tract, occurs in the same way as in the case of a non-ruminant. This digestive process is completely different from the microbial digestion that takes place in the reticulo-rumen. The contents of the abomasum are highly acid and here enzymes secreted by glands in the stomach further break down the feed and the dead ruminal microbes. The products are then absorbed into the bloodstream through the stomach wall but mainly through the walls of the small intestine.

The abomasum is emptied gradually by rhythmic contractions of the wall which force the contents into the small intestine.

(v) Small intestine

The first part of the small intestine is known as the duodenum where some final stages of digestion take place. The function of the rest of the small intestine is mainly absorption.

In the case of the sheep, the small intestine *(small* in diameter) is the longest portion of the alimentary tract, being 18 metres (60 ft.) in length. Its surface area is increased by thousands of *villi* (velvet-like protuberances) which make the greatest possible area available for the absorption of nutrients.

(vi) Caecum

Rhythmic muscular contractions *(peristalsis)* of the small intestinal wall push the remaining undigested matter into the caecum or *blind gut* as it is sometimes called. While in grass-eating non-ruminants such as the horse and the rabbit, the caecum is well developed as a site for microbial digestion of roughage, its main function in the ruminant is one of absorption of volatile fatty acids.

(vii) Large intestine

The large intestine or colon differs from the small intestine in that it has a larger diameter, is shorter (4,5 metres in the sheep), has no villi and does not secrete digestive juices. Its function is mainly one of moisture absorption so that the final undigested remnants of the feed, the faeces, lose most of their moisture before moving into the rectum to be voided from the body.

In general terms, the sheep, like all ruminants when compared with a simple stomached animal, is relatively inefficient in utilizing easily digested feed. However, sheep, goats and cattle utilize highly fibrous feeds and compounds containing non-protein nitrogen far more efficiently. They are thus assured of a permanent place as domestic livestock because they need not compete for food with the world's expanding human population.

2. FACTORS AFFECTING FEED REQUIREMENTS

Sheep may be divided into various groups having different nutritional requirements based on the following four factors.

(i) The stage in the animal's production cycle

At different times of the year a ewe has different feed requirements depending on whether she is in early or late pregnancy or is lactating. A lactating ewe for example, should receive proportionately more feed if she is suckling twins, while a young ewe requires sufficient feed for her own growth, in addition to that required during pregnancy or lactation. A non-working mature ram has only to take in enough feed to maintain his body condition, whereas during the tupping season when he is more active and productive, his requirements are correspondingly higher. Such variations in feed requirement depend upon productivity level and should always be borne in mind.

(ii) Sex

Rams are potentially bigger and grow faster than ewes, while wethers are intermediate. On the other hand, as bearers of offspring, ewes are the most productive.

(iii) Age and stage of maturity

A lamb may cut its permanent teeth at 15 to 18 months of age. It accordingly requires different types of feeds to sustain growth and production when compared, say, to a mature ewe that has a bigger rumen and sound teeth and can therefore eat a greater proportion of roughage.

The nearer an animal approaches its mature size the greater the proportion of

fat in its body, and animals fed beyond their mature mass requirement will become excessively obese. This not only reduces their productivity, but is also expensive in terms of feed.

(iv) Body mass

Big animals require more feed for maintenance but, having a bigger abdominal capacity, they can obtain their requirements from a more bulky ration than could a small animal. At the same time, small rapidly growing lambs will make more efficient use of more concentrated feeds than will mature sheep.

3. FEED REQUIREMENTS

The plants and other feeds with which sheep are fed comprise a number of compounds which serve as nutrients. These may be divided into the following broad groups:

(i) water - measured as moisture (%), or inversely as the dry matter (DM);

(ii) carbohydrates - energy producing feeds which are measured by terms such as *total digestible nutrients* (TDN) or *metabolizable energy* (ME);

(iii) fats and oils - concentrated energy sources which are either recorded separately or included with the carbohydrates in TDN and

ME;

(iv) protein - expressed as *crude protein* (CP) or *digestible protein* (DP);

(v) minerals - minerals of major importance such as salt, calcium, and phosphorus are measured on the basis of percentage. Minor *(trace)* minerals are often measured in *parts per million* (ppm);

(vi) vitamins - measured in *international units* (IU).

(i) Water

Water is an important constituent of plants and animals. Melons contain more than 90 per cent water, lush green grass 80 per cent, silage 75 per cent, dried hay about 10-15 per cent, and most concentrates 10 per cent or less. A thin sheep consists of about 60 per cent water and a fat sheep about 46 per cent.

Water is available to sheep either as free water - that is, water consumed voluntarily - or as moisture contained in succulent feed; a third source is water released from chemical reactions in the muscles during oxidation (known as *metabolic water*). In practice the main concern is the free water provided for drinking and its relationship to feed intake and the environment.

Factors affecting water intake

The following factors affect the amount of water drunk by sheep:

- ***The amount of dry matter intake*** **Water intake increases with feed intake.**

- ***The nature of the feed*** **High levels of protein or non-protein nitrogen in feeds are associated with higher water intake.**

- ***Level of salt intake*** **An excessive intake of minerals, particularly salt, will significantly increase water consumption. Sheep can tolerate water containing one per cent salt over long periods, but not water containing 1,5 per cent or more. Sheep can apparently use *brak* water containing up to 1,3 per cent salt, but total water consumption is doubled.**

- ***Air temperature*** **Sharp increases in water requirements may be expected when environmental temperatures rise above 20°C (70°F) (see Table 6.2).**

- ***Water temperature*** **The temperature of the water has a marked effect on water intake during periods of extreme heat or cold. In very hot weather, water located in the shade is more acceptable to sheep.**

Table 6.2 Estimating Water Intake of Sheep (adapted after ARC 1965)

Class of sheep	**Air temperature** °C(F°)	**Daily water intake** (litres/kg DM consumed)
Growing and fattening lambs and wethers	up to 15° (59°)	2,0
	15-20° (59-70°)	2,5
	over 20° (over 70°)	3,0
Conversion factors for other classes of sheep		
Ewes, pregnant	1 month	multiply by 1,00
	2 months	multiply by 1.35
	3 months	multiply by 1,50
	4 months	multiply by 1.80
	5 months	multiply by 2.20

Ewes, lactating	1st 8 weeks	multiply by 1.50
	final 8 weeks	multiply by 1,25

As examples of the use of Table 6.2 **(i) A fattening lamb at an air temperature of 17°C and consuming 1,5 kg dry feed per day will require 3,75 litres. (ii) A late pregnant ewe at an air temperature of 21 °C and consuming 2,0 kg of dry feed per day will require 13,2 litres.**

• *Physiological state of the animal* Water intake is affected by the purpose for which the animal uses the feed. Requirements vary for growth, the later stages of pregnancy and during lactation (see Table 6.2.).

• *Water supply* Sheep producers should ensure adequate supplies of clean, good quality water for their flocks. In Rhodesia, a piped water supply is always preferable because it facilitates control of liver fluke. Sheep will not consume adequate amounts of stagnant or bad-smelling water and such a restriction will, in turn, cause reduced feed intake and productivity.

• *Succulent feeds* Excessive water in feeds may also be a problem. Silage generally has a low dry-matter content and, without a feed supplement is not eaten in sufficient quantity to meet the nutrient requirements of the more productive classes of sheep.

Succulent pasture and veld grasses in early spring also contain excessive amounts of water; despite the palatability and, on a dry-matter basis, high quality of these feeds sheep often lose condition unless they receive additional feed.

(ii) Carbohydrates

These include the sugars, starches and cellulose found in most feeds. They are built from carbon, hydrogen and oxygen, and are energy and heat producing; surpluses are stored in the animal body as fat.

Major sources of energy for sheep are pasture and veld grazing, crop residues and conserved roughages such as hay. Cereal grains such as maize and sorghums in their various forms are major supplementary sources of feed energy in this country.

The National Research Council (NRC) (1968) states that energy deficiency is the most common of all deficiencies in sheep, mainly because sheep are often underfed. Even where there is apparently ample bulk of forage, intake may be inadequate because of low palatability, low digestibility, or because of a deficiency of some other nutrient which affects appetite, particularly protein. In this last case, provision of a suitable supplement will improve forage intake. It should be remembered that the energy required for maintenance of sheep is estimated to be 24 to 77 per cent higher for grazing animals than for

stall-fed animals.

Only that portion of the diet which is actually absorbed or digested from the alimentary tract is available to the animal. The evaluation of feeds according to their net energy, or total digestible nutrients or metabolizable energy, is thus much more important in determining feeding levels than merely noting total consumption.

Terms for expressing the energy value of feeds

From an energy point of view, a feed may be regarded as a fuel, and the *gross energy* (GE) of a feed is just that - the heat of combustion of a feed expressed as Mega-calories/kg total feed.

However, not all the gross energy in a feed is available for use and other means are used to describe the productive-energy value of a feed.

***Starch equivalent* (SE) This is one of the oldest systems and derived from the classical experiments of Kellner in 1912. It has been in use in Britain and parts of Europe for the past 50 years, and uses pure starch as a basis for comparison.**

The starch equivalent of a feed may be defined as "the number of kilograms of starch that would promote in an adult steer the storage of the same quantity of fat as 100 kilograms of the feed under consideration".

Total digestible nutrients **(TDN) This assessment of nutritive value of a feed is used in the USA and has also found wide acceptance in southern Africa. Based on numerous feeding experiments the TDN value of feed is calculated as follows:**

TDN per 100 kg feed =

% apparently digested protein
+ % apparently digested nitrogen-free extract
+ % apparently digested crude fibre + 2,25% apparently digested crude fat

Metabolizable energy **(ME) This assessment is finding increasing use in nutritional research, particularly in Britain and Rhodesia. It enables research workers to make far more precise predictions of an animal's response to a given ration.**

A measurement of nutritional value which is simpler to determine is *apparently digestible energy.* This is more conveniently, though often incorrectly, called *digestible energy* (DE). The DE of a feed is its gross energy, less the heat of combustion of the faeces.

However, this has certain limitations because the undigested energy left in the faeces is not the only escape route for energy that has not been utilized by the animal. The gases from fermentation (methane) represent an energy loss

as do the combustible components of urine. These gases are not accounted for in DE. It was to correct these limitations that the use of *metabolizable energy* has recently found wide acceptance. The metabolizable energy of a feed is defined as:

$$\text{ME (kcal)} = \text{GE} - \left\{\begin{matrix}\text{Heat of} \\ \text{combustion of} \\ \text{faeces}\end{matrix} + \begin{matrix}\text{Heat of} \\ \text{combustion of} \\ \text{fermentation gases}\end{matrix} + \begin{matrix}\text{Heat of} \\ \text{combustion} \\ \text{of the urine}\end{matrix}\right\}$$

K. L. Blaxter and his co-workers have developed the use of the ME concept into a new feeding system (Agricultural Research Council (ARC) 1965) which does away with the weaknesses in the SE and TDN systems in which it is assumed that the energy supplied in a feed has a purely additive value.

In the new system the ME contents of the constituents of the animals' diet are added up and then corrected for the effect of feeding *level.* See Appendix, Table A4.

From this amount, that required for maintenance is deducted. The balance is the ME available for production and, using knowledge of the efficiency of utilization of metabolizable energy for different functions, the productive performance of the animal may be predicted.

The use of the metabolizable energy system takes into account nearly all the major factors known to affect the utilization of feed energy and is sufficiently flexible to incorporate any further factors which may come to light.

The chief drawback of the system from the practical point of view is that what it makes up in accuracy it loses in simplicity of calculation, such as is the case with the SE and TDN systems.

The TDN system is fairly accurate when considering requirements for maintenance and for milk production, and when considering a restricted range of rations. However, fairly large errors can accrue when considering growth and fattening, particularly when feeds of widely different digestibility (e.g. roughages and concentrates) and of different protein content are used.

For the practical sheep farmer it is probably only important that he is aware of the existence of these inaccuracies, and also has some conception of what is meant by the term metabolizable energy. He will seldom have to compound precisely accurate rations, since most recommendations based on Rhodesian research have wide applicability and refer to feeds that are readily available under most farming circumstances. Nevertheless, tables of ME requirements for sheep have been provided in the Appendix.

(iii) Fats and oils

Oils (expressed in analysis results as *ether extract or fats)* are present in most plants in varying quantities - less than one per cent in grasses to over 40 per cent in whole groundnuts. Oils at normal temperatures are liquid while fats are solidified; the latter term is frequently used in a general sense to include both groups. Although similar to carbohydrates in composition, fats

have a greater proportion of carbon and, since this is the element which supplies the energy value, fats contain more than twice as much energy as carbohydrates per unit of mass.

However, the digestive system can deal with only limited quantities of oils and overfeeding with oily feedstuffs can cause severe digestive upsets in ruminant animals.

(iv) Proteins

Proteins are complex substances based, as are the carbohydrates, essentially on carbon, hydrogen and oxygen, but with the significant addition of nitrogen. Proteins are found in all living cells and are intimately connected with all the biochemical activities that constitute life in a cell. In consequence, an adequate quantity of protein is an essential part of the diet of all living and productive animals.

In ruminants such as sheep, nitrogen-containing compounds must be present in the rumen fluid if the bacteria responsible for the fermentation and digestion of cellulose are to grow and function satisfactorily. In other words, with insufficient nitrogen in the diet, the sheep will not be able to make full use of available forage. On these grounds a general suggestion has been made that all diets for ruminants should contain at least the equivalent of nine per cent crude protein in the dry matter. A lower protein percentage will result in reduced feed intake.

With the exception of very young lambs in which the reflex closing of the oesophageal groove is still operative during suckling or drinking, the *quality* of protein supplied to a sheep is of little importance due to the nature of protein digestion in ruminants.

Feeds such as cottonseed cake or groundnut cake contain high levels of protein (35 to 55 per cent) and make excellent protein supplements for sheep. Properly harvested and cured legume hays (such as lucerne and cow-pea hay) are intermediate in protein content (12 to 16 per cent) and may form the basis of complete diets for sheep. Physical limits to consumption will however, restrict growth rates, particularly in young lambs. Cereal grains are relatively low in protein (8 to 11 per cent) and usually require a protein supplement when used in finishing rations.

Non-protein nitrogen

Urea and related products such as biuret are not natural proteins, but their nitrogen can nevertheless be utilized in the rumen if sufficient energy is available to provide a basis for synthesis of microbial protein which is then available to the animal. However, it is important to realize that pure urea is a poison if fed alone; it should be mixed in a suitable combination with sufficient readily available energy.

(a) *Urea* Certain "rules" apply if urea is to be fed successfully to sheep.

Urea should not make up more than one-third of the total nitrogen in the

ration. (Urea contains 46 per cent nitrogen compared to natural protein which contains about 16 per cent nitrogen.) Urea may be used at the rate of one per cent in a complete high-energy diet or, depending on the mixture, up to three per cent by mass of the concentrate portion of a diet. Urea may also be added to silage at the rate of between one-half and one per cent when material is ensiled.

Urea should be fed in such a way that small quantities are consumed at regular intervals. It should not be used in creep or other rations, for young lambs, but only in *ad lib* high-energy diets. For sheep on veld grazing, urea should only be used if supplied in a balanced lick in which the salt content and its hardness prevent excessive intakes, even though the lick is available at all times.

Before the full benefits of urea feeding become apparent a period of adaptation is necessary for the build-up in the rumen of a sufficiently large population of urea-utilizing bacteria. This period may be between 10 and 20 days.

(b) *Biuret* This is a condensation product of urea. It has a certain advantage in sheep feeding, namely that it is much less rapidly broken down to ammonia in the rumen than is urea, and there is therefore little danger of toxicity. This means that it may be used with fewer precautions in supplements for sheep on grazing. However, the other stipulations for the efficient utilization of urea, such as the availability of sufficient feed energy and the need for a period of

adaptation, apply equally to biuret. Biuret is also considerably more expensive than urea - although still much cheaper than natural protein as a source of feed nitrogen. Owing to currency restrictions it is available in Rhodesia in only limited amounts.

(v) Minerals

Minerals constitute about three per cent of the animal body and over 80 per cent are in the skeleton and other hard tissues. Nevertheless, the remaining 20 per cent play an important part in many chemical reactions in the body and are as important as any other nutrients in the nutrition of sheep.

Mineral requirements listed by the NRC (1968) and the ARC (1965) assume that the diet is otherwise balanced and that it is free from substances which reduce the utilization of the respective mineral. In other words, it is not a sound practice to consider one mineral in isolation, since other minerals or toxic substance may seriously affect availability. At the same time, excesses of certain minerals may be clinically or sub-clinically toxic on their own.

Four factors affect the mineral content of plants.

- **the genus, species, or strain of plant;**
- **the soil type on which it grows;**
- **the seasonal or climatic conditions during growth;**
- **the stage of maturity of the plant.**

Plants are the main source of minerals for farm animals, but other important sources are the water supply and the mineral supplements provided by the farmer.

Generally, deficiencies of other than major minerals (calcium, phosphorus and salt) are often only local problems.

When clinical signs of deficiencies are observed, they may often be confused with other diseases. Proper diagnosis is not easy and may involve serological tests, or chemical examination of tissues and the feed.

(a) *Salt* The exact salt requirements of sheep are not known, but it is known that salt stimulates appetite and has many regulatory functions in the body. In many areas the natural grazing, water-supplies, and *brak* areas in the soil where animals lick provide adequate salt, but it is known that animals deprived of salt develop unnatural cravings and may resort to chewing wood and eating soil. It is sometimes believed that salt-deficient animals will also eat poisonous plants which are normally unpalatable. Inadequate salt in the diet results in decreased feed intake and less efficient utilization of feed.

Under such circumstances, it is desirable that sheep should have free access to salt. Consumption may vary between 200 grams and 350 grams per month. Loose salt is preferable to salt blocks because there have been instances of sheep biting at blocks rather than licking them and in this way have damaged their teeth.

In mixed feeds and complete diets, it is common practice to add 0.5 per cent salt. Salt may also be included at the rate of 10 to 15 per cent in mixtures and so limit the intake of supplementary feeds. In these cases it is important that an adequate water supply is available.

Salt can be used as a management tool to improve veld or pasture utilization by the judicious siting of salt licks to improve uniformity of grazing.

(b) *Calcium* Calcium and phosphorus, as the main constituent minerals of bones and teeth, are the two major minerals in the animal body. Consequently, due attention should be given to these minerals in diets of growing, pregnant or lactating sheep.

Calcium deficiency symptoms are slow to develop, especially when growing animals are consuming amounts that are only slightly below their requirements. The reason is that the bones act as calcium reservoirs from which a certain amount of resorption can take place. Nevertheless, the long-term effects may be serious and care should be taken where possible to

ensure an adequate calcium intake.

Most veld grasses, pastures, legume hays and crop residues in Rhodesia contain adequate levels of calcium, while grains and other concentrates generally contain low levels of this element. Owing to the low proportions of roughage and high levels of concentrates, fattening rations for lambs often require the addition of extra calcium.

Limestone flour is the cheapest and best source of calcium for supplementation.

(c) *Phosphorus* Whereas sheep on grazing usually obtain sufficient calcium for their requirements, this is not always the case with phosphorus, particularly where the grasses have matured. Although the phosporus in bones may be mobilized for use, this is not always sufficient and some form of phosphorus supplementation might be necessary. Fortunately in Rhodesia, the most common protein supplement is cottonseed cake which is relatively rich in phosphorus, and it is seldom that any other source of phosphorus need be supplied. Bonemeal or dicalcium phosphate, monosodium phosphate or monocalcium phosphate would be the supplement of choice if needed.

Calcium: phosphorus ratio **It is important to retain a balance between the calcium and phosphorus in the diet. A good example of effects of imbalance occurs in the pen-feeding of lambs on high-concentrate diets which are rich in phosphate and poor in calcium. Without a calcium supplement, severe cases**

of urinary calculi (bladder and kidney stones) may develop.

Table 6.3 Suggested Ca: P Ratios for Sheep (ARC 1965)

Class of Sheep	Ca: P
Adults - maintenance	1,1:1
30 kg - growing lamb	2,0: 1
Ewes lactating	1,5:1

(d) *Iodine* This mineral is not generally deficient in Rhodesia, but deficiencies - often induced - have been observed in several areas under certain conditions.

Virtually all iodine used in the body is *processed* through the thyroid gland, where it is incorporated in the growth hormone, thyroxine. When a deficiency of iodine exists, the thyroid gland enlarges into a characteristic goitre. Other symptoms include the birth of weak, dead or wool-less lambs. If the goitrous condition is not serious some lambs might survive.

Under certain conditions, some plants contain compounds that interfere with the utilization of iodine and are called *goitrogens.* These feed plants include the Brassicas (kale, cabbage and rape) and also soya-beans and groundnuts.

However, the main culprit in Rhodesia is Star Grass when grown as a highly fertilized pasture. Under certain climatic conditions, considerable amounts of prussic acid precursors are produced and these have a goitrogenic effect. In this latter case, the goitrogenic activity is prevented by supplying the sheep with a lick of iodized salt (0,06 per cent potassium iodide incorporated with common salt). It should be noted, however, that iodized salt should not be incorporated in protein supplement blocks, because the artificially high consumption of iodine under these conditions may be harmful.

(e) *Copper* This mineral is not normally deficient in Rhodesia. Sheep have a greater ability to store it in the liver than other animals, and as there is a narrow margin between sufficiency and toxic excess, its use in mineral supplements should be treated with caution.

Pen-fed diets or normal pasture and veld grasses should contain 5 mg copper per kilogram dry matter (5 ppm) to meet the requirements of sheep. On the other hand, feeds containing 30 mg copper per kg DM have proved toxic.

A recent problem that has occured both in Britain and the United States, and which has been confirmed in practice in Rhodesia, is that of copper toxicity amongst housed or pen-reared sheep or lambs. Under such conditions of confinement, copper toxicity has been observed even when the amount of copper in the diet was not abnormally high. On these grounds, it is recommended that mineral supplements containing copper should not be fed to penned sheep.

When copper poisoning occurs, the inclusion of ammonium molybdate and sodium sulphate reduces further absorption of copper, but this must be done with care and following the advice of a nutritionist.

(f) *Cobalt* The main function of cobalt in sheep is to promote synthesis of Vitamin B12 in the rumen; it also appears to be associated with the synthesis of certain other B-group vitamins.

Cobalt is required at very low levels and there is no evidence of any deficiency in Rhodesia. Cobalt can be conveniently supplemented by dosing each sheep with a cobalt *bullet* or pellet that lodges in the reticulum where it dissolves slowly, providing a constant source of cobalt.

(g) *Sulphur* This is essential to all sheep for the synthesis of important sulphur-containing amino acids in microbial proteins. It is particularly important in wool sheep whose fleece contains a high proportion of sulphur-containing protein.

A satisfactory level of sulphur in the total diet of a wool-bearing, regularly lambing ewe appears to be about 0,08 to 0,1 per cent (about 1,0 to 1,4 g per head daily).

Most common feeds contain sufficient sulphur, but mature grasses may sometimes be deficient. A sulphur supplement can also be an advantage when urea is the main source of supplemental nitrogen in the diet.

(h) *Fluorine* This trace mineral is not naturally a problem in this country, but excessive amounts can be ingested by sheep if rock phosphate or superphosphate fertilizer are provided as a phosphorus supplement without prior de-fluorination.

(i) *Selenium* Recent work at Henderson Research Station has revealed cases of selenium deficiency, again in planted pastures. Selenium is needed in minute traces (0,1 ppm), but where it is deficient it results in a degeneration of the muscles known as muscular dystrophy. Vitamin E is closely inter-related with selenium in its effects and, indeed, it is equally effective in preventing muscular dystrophy in lambs.

Typical selenium deficiency symptoms.

Photo Rhodesian Farmer

Large areas of the world, particularly in the USA, are relatively unproductive owing to selenium toxicity, and this indicates how sensitive animals may be

to overdoses. Treatment for selenium deficiency should only be carried out after veterinary diagnosis. The ARC (1965) recommends treatment with Vitamin E.

(vi) Vitamins

Mature sheep require dietary sources of the fat-soluble vitamins A, D, E and K, but do not need sources of the B-complex vitamins which are usually synthesized in adequate amounts in the rumen.

Normally, veld and pasture grazing provide adequate quantities of all the fat-soluble vitamins, with the exception of dry or frosted winter grass which is usually deficient in Vitamin A or its precursor, carotene.

(a) *Vitamin A* This vitamin accumulates in the liver and four to six months of deficiency is necessary before the liver reserve is depleted.

Vitamin A is manufactured synthetically and can be obtained from retailers in pure form. It does not exist as such in plants, but is often present as the precursor, carotene. Generally, green feeds are an excellent source of carotene, as are also such yellow-coloured feeds as tomatoes, carrots, pumpkins and yellow maize.

The commonest early symptom of a Vitamin A deficiency is a reduced ability to see in dim light *(night blindness).* Vitamin A is also concerned in maintaining all the mucous membranes in a healthy condition; in its absence

they become hardened and less resistant to other diseases. Severe cases of Vitamin A deficiency may result in lambs being born weak or dead.

Fortunately, the deficiency is not common in sheep since adequate supplies are provided by green grazing. Where sheep are penned and fed a complete diet which does not contain green hay or yellow maize, it is advisable to check on, and correct, the Vitamin A supply.

(b) *Vitamin D* Vitamin D is intimately bound up with the metabolism of the minerals calcium and phosphorus, and severe deficiencies can result in rickets. Fortunately, Vitamin D is synthesized by the effect of sunlight on certain skin secretions and, in view of our sunny climate, is unlikely to be a problem in sheep in Rhodesia.

(c) *Vitamin E* Discussed under the paragraph on selenium, this vitamin has very similar and associated effects in sheep. *White muscle disease* or muscular dystrophy occurs only in young, milk-fed lambs.

The vitamin occurs in most feeds and supplies can be stored in the liver. Since it is readily oxidized, old grass, hay or ground feeds may be poor sources of Vitamin E.

(d) *Vitamin K* This vitamin is important for the clotting of blood. It is readily obtained by sheep from all leafy feeds, fresh or dry and its supply is no problem in Rhodesia.

4. FEEDING

A major consideration in animal nutrition is in the definition of just what productive function the animal is expected to perform. The ewe's productive year can be divided broadly into pregnancy, lactation and the dry period. A look at the feeding standards in Tables A1 to A8 indicate that a more practical division would be:

- **early pregnancy;**
- **last six weeks of pregnancy;**
- **first eight weeks of lactation; and,**
- **late lactation.**

(i) Dry ewes and ewes during the first 3 1/2 months of pregnancy

Figure 6.2 indicates the mass changes of the foetus (or foetuses) in the pregnant ewe; it is apparent that until the 3 1/2-month stage it makes very little demand on the ewe's productive capacity. Like dry ewes, these ewes during early pregnancy have relatively low feed requirements, in fact, little more than is necessary for maintenance.

A slight livemass gain of about 250 g (1/2 lb.) per week is satisfactory. This is normally supplied by moderate to good quality grazing alone, particularly if the ewes are not too "down in condition" at weaning.

Where a supplement is needed, it should normally be at a very low level and preferably grown on the farm for economy's sake. Depending on the quality of the grazing, 400 grams of a legume hay should be satisfactory, although an extra supplement of 50 to 100 grams of maize grain may be necessary if the grazing is inadequate.

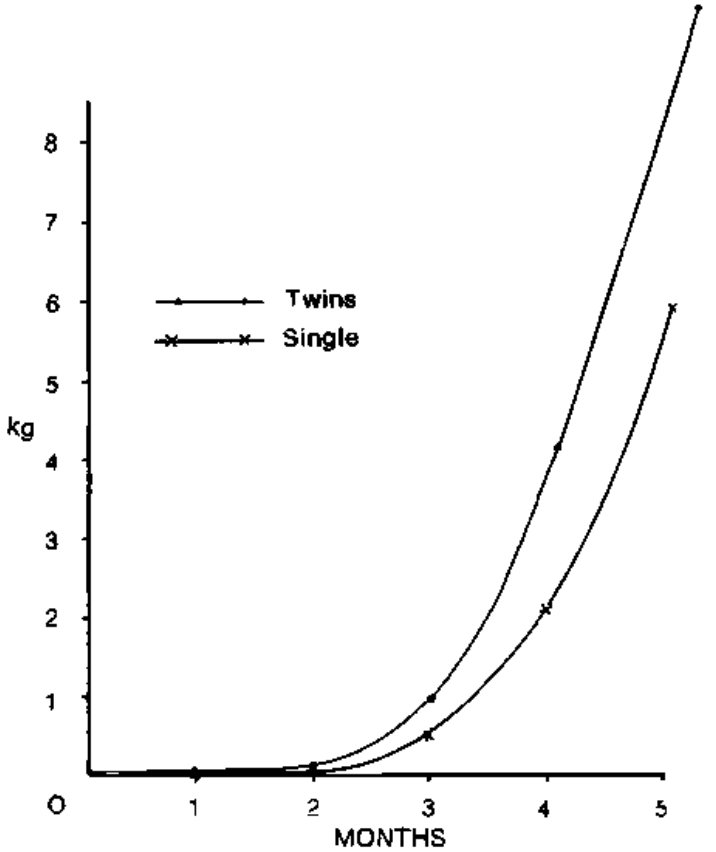


Figure 6.2 Foetal growth in the pregnant ewe (Wallace 1948)

The question of flushing ewes just prior to tupping has been discussed in

detail under Management (in Chapter 4, Section 5).

(ii) Ewes during the last six weeks of pregnancy

Ewes bearing singles should gain between 5,5 and 8,5 kilograms (at least 10 per cent of livemass) during pregnancy (Le Roux 1970). Ewes which bear twins should gain up to 50 per cent more. At least three quarters of this gain is made during the last six weeks before lambing, so that *maintenance of bodymass* during this period is totally inadequate if sturdy viable lambs are to be produced.

Feeding should not be taken to extremes during late pregnancy, particularly of small or young ewes, because oversize lambs can cause birth difficulties.

The birthmass of a lamb is closely correlated to its ability to survive, particularly during the critical first 36 hours. Differences in the birthmass of lambs can account for over one third of the differences in lamb weaning mass. This is primarily due to the increased demand for milk from a large lamb which stimulates the ewe to maximum production.

In the case of young ewes pregnant for the first time, the level of nutrition during this stage of pregnancy has an important effect on udder development and hence, subsequent milk production. All ewes, like high-producing dairy

cows, require a good body condition at the start of the lactation. This means that the animal has sufficient reserves to maintain a high level of milk production, even though the feed supply is itself seldom sufficiently nutritious for maximum milk production.

Pregnancy toxaemia

Pregnancy toxaemia, a non-infectious nutritional disease of sheep, is associated with the last six weeks of pregnancy. All ewes may be subject to this condition, especially those carrying twin lambs. There has been much research into this subject in various parts of the world. Reid (1960), ascribes the condition to either a deficiency of readily available energy nutrients (glucose) or to an inhibition of glucose utilization by an excess of adrenal hormones (hormones which are usually secreted under conditions of stress). This distinction explains why the disease can be found in ewes suffering from prolonged undernutrition as well as in ewes in good condition. The excess adrenal hormones can be produced by a prolonged inadequacy of feed or equally by an unusual stress, caused perhaps by a sudden move to an unfamiliar environment, or disease, or a minor injury. If the ewes are already undernourished when stress occurs, they will succumb more easily - and to a milder degree of stress - than if they were well nourished.

Even on good lush pastures, pregnancy toxaemia has been known to occur, probably caused by the inability of the ewes to consume sufficient succulent forage to provide for their immediate energy needs.

The disease is aptly described as *domsiekte* in South Africa and this indicates its main symptoms - a blind, aimless, semi-consciousness. Ewes stagger when they are forced to walk and if they go down they are usually disinclined to get up again. These symptoms may continue, getting progressively worse, for three or four days before the ewe finally dies.

In its early stages, the disease can usually be halted by drenching the affected animals with molasses, giving about a cupful every three or four hours. In Australia, a twice-daily drench of 100 ml glycerine mixed with 100 ml water has been reported effective in some cases, although ewes suffering from plain undernutrition, and not sudden stress, do not respond.

Good feed should be readily available to affected ewes immediately their appetite returns so as to prevent the possibility of a relapse.

The essentials for the prevention of pregnancy toxaemia lie in adequate nutrition of the ewes throughout pregnancy. Where grazing is of poor or declining quality, supplementary feeding must be started in good time; in Rhodesia, this is usually when lambs are dropped in spring. Le Roux (1970) recommends that under reasonable grazing conditions during the last six weeks of pregnancy, a supplement of 340 grams per day of cottonseed cake (40 per cent OP) should be fed to each ewe of 50 kilograms livemass. Larger ewes will require proportionately more.

An energy supplement as a precaution against pregnancy toxaemia is often

provided in the form of a liquid molasses lick, which is supplied at the rate of one litre to ten ewes. A dispenser at which the sheep lick a revolving wheelbarrow wheel (rubber) prevents undue wastage and reduces contamination of wool with molasses. Where grazing is in short supply 200 or 300 grams of maize grain can also be a satisfactory energy supplement. However, maize grain is not recommended under normal conditions because sheep receiving this as a supplement have been observed to reduce their grazing intake to a far greater extent than the mere dry-matter content of the supplement.

Where ewes have been tupped to lamb in autumn, nutritional conditions during the summer pregnancy are usually good; unless the rains cut off early in the season it is not usually necessary to provide a protein supplement during the last six weeks of pregnancy. In all cases, however, the condition of the ewes should be watched with care and a molasses or protein supplement should be supplied if there is any change in the quality of the grazing, or if any signs of impending pregnancy toxaemia appear.

(iii) Lactating ewes

The feed requirements of a ewe while she is suckling a lamb are greater than at any other stage of her productive cycle, and the level of milk production depends to a large extent on the amount and quality of feed available. Any deficiency in this respect will be reflected in the reduced growth of the nursing lamb.

Pre-weaning growth is potentially the fastest and most efficient in the whole of a lamb's life and farmers should endeavour to take full advantage of this so as to increase the profitability of their production of fat lambs. Where creep feeding is not practised, a lamb's growth rate is a direct reflection of its dam's milk supply. (In one study, ewe milk production ranged from 0,7 kg to 3 kg under the same conditions, so selection of ewes for their milk production is obviously also important).

Ewes with twin lambs usually produce 30 to 50 per cent more milk than ewes suckling singles. This is mainly due to the stimulating effect of the increased demand by twin lambs. For maximum rate and efficiency of lamb gains, ewes suckling twin lambs should be separated from the rest of the flock and given preferential treatment.

The reasoning behind lambing in spring is that the ewes will have the advantage of grazing during their lactation period. However, this means that the ewes will be pregnant over the end of winter; not only must they receive a supplement during the latter part of pregnancy, but this supplement must be continued - perhaps even at an enhanced level, depending on their condition - until the spring grass flush after the main rains has set in.

Except for the most highly productive sheep, it is not usual to provide lactating ewes with any supplement once the summer growth of grass is well established. The ewes may lose some condition and mass during the peak of lactation, but this is usually compensated for towards the end of lactation

when milk production has declined while the available grazing is still sufficiently good for the animals to regain condition.

A completely different situation applies where autumn lambing is practised, particularly where - as is usually the case in Rhodesia - an artificial irrigated winter pasture such as oats or ryegrass is not available. A simple calculation will demonstrate that it is quite impossible for a lactating ewe to obtain sufficient nutrients from mature winter veld grass or from maize stover; a substantial supplement is necessary if the lambs are to grow well.

Le Roux (1971) recommends that a protein supplement such as cottonseed cake only, or its equivalent in a protein lick, should be provided for ewes grazing on veld, since the inclusion of a high proportion of maize grain is likely to reduce grazing intake. Using the NRC recommendations, this means that lactating ewes should receive up to 550 grams of cottonseed cake (40 per cent CP) per day in winter during early lactation, reducing to 400 grams or less towards the end of winter.

It will be appreciated that such a level of feeding is extremely expensive, and although more economical types of feed mixtures may be devised under some circumstances, the high cost is still the main objection against autumn lambing.

Creep feeding

To make maximum use of the lamb's early growth potential, it is usually

economical to provide a concentrate supplement for the lambs in a creep. Young lambs will start to nibble at grazing from two to three weeks of age and, as the ewes' milk production declines, and their requirements increase, they must obtain more and more of their feed from other sources.

Creep feeding is of particular value if lambs are to be finished in the feedlot; they will be accustomed to concentrate feeding from an early age and will show little set-back after weaning. It has been observed that once all lambs are familiar with the creep, each lamb's consumption of concentrates is inversely proportional to its dam's milk production. This has an undoubted advantage in the production of an even lamb crop, particularly when the ewes are of variable quality or when there is a large number of twins. Nevertheless, it will completely nullify the effects of any selection for ewe milk production where the weaning mass of the lamb is the criterion used for selection.

A creep feeder ensures even lamb growth, but masks the effects of ewes that are poor milkers.

Photo J. F. Naudé.

The creep should be made available to the lambs as soon after birth as possible. For early creep feeding, coarsely ground maize alone may be used as the ewe's milk will supply ample protein, but later, an inclusion of 10 to 12 per cent cottonseed meal in the creep concentrate will be desirable, especially if the lambs do not have access to green grazing. Five per cent molasses added to the grain will increase palatability and enhance intake. A change in ingredients or appetizers might be necessary should the lambs "go off" the creep mixture. After the lambs are five or six weeks old, there is little point in milling the maize grain, although some of the other cereal grains such as the millets (munga/nyouti) and rapoko, being very small and hard, should preferably be cracked.

The creep should be situated near a water point and salt licks so that lambs will use them. A creep area is made by fencing off part of the feed troughs in such a way that the openings are big enough for the lambs to pass in and out, but too low and too narrow for mature ewes.

5. FEEDING YOUNG STOCK RETAINED FOR BREEDING

Although there is no immediate cash return from this class as is the case with

fattened lambs, young breeding stock must not at any time suffer from neglect. They should be kept growing steadily but without the intensive fattening associated with high-energy feeding.

Maximum ruminal development is desirable but it must always be remembered that the rumen in these animals is still small; any roughage fed should be of the highest possible quality, or suitably fortified with a limited amount of concentrate. Excessively coarse or excessively succulent roughages will restrict the animal's intake of digestible nutrients below the optimum level.

6. FEEDING RAMS

Rams should be kept in a vigorous, healthy condition throughout the year if they are to function efficiently during the breeding season. Good green grazing is usually quite satisfactory during the summer, and a supplement of a kilogram or so of good legume hay is ideal for the winter.

Shortly before, and during the breeding season, the provision of a concentrate supplement containing both energy and protein is a sound practice; most conscientious rams will find themselves far too busy to spend much time grazing. A supplement of 1,5 kg per day of a 1:12 cottonseed cake: corn and cobmeal mixture should prove satisfactory.

In larger sheep enterprises, a separate ram flock can be run during the non-breeding season, but in the smaller flocks of 100 ewes or less, what to do

with the one or two rams when they are not running with the ewes is often a considerable problem. Ideally, a small fenced pasture near the farmstead should be provided and as they are gregarious animals, the rams should always have at least one or two other sheep for company. Young ram lambs, wethers or old cull ewes can all serve this purpose.

7. PEN FINISHING LAMBS

Few lambs in Rhodesia are ready for slaughter at the usual weaning age of four to five months. This means that lambs must either be grown out and finished on grass - which is usually easier if they are autumn born and weaned on to spring grazing - or they must be finished-off by a period of intensive feeding in the pen.

There is no one best ration for finishing lambs, but recent research in Rhodesia has developed a simple method of pen finishing that is both economical and highly effective.

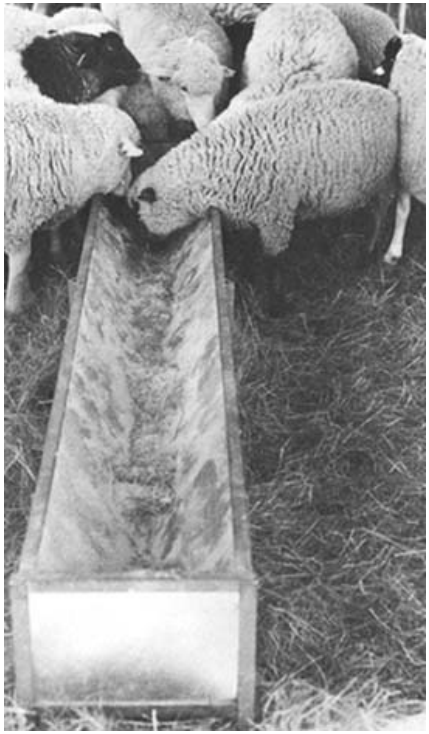
The presence of deep litter does not reduce the lamb's intake of high-energy feed.

Photo J. F. Naudé.

Pens can be simply constructed allowing between one and two square metres floor space per lamb and 100 to 250 mm running trough-space per head depending on the method of feeding. A supply of clean, cool water is essential. When roofing is provided it should preferably cover at least half the floor area of the pen and be built high enough (at least two metres) to allow an unrestricted flow of air.

***Ad lib* diets of the high-energy type have proved satisfactory, provided they contain 13 to 15 per cent crude protein (to promote maximum feed intake)**

between 10 and 20 per cent roughage and sufficient calcium to prevent the development of urinary calculi (one per cent limestone flour in the concentrate). In addition to the roughage in the feed mixture, an extra supply of roughage either as deep-litter bedding, or as hay in a rack or hay box will help minimize digestive disturbances. The provision of a salt lick can also be advantageous.



This vee-shaped teed trough as used at Grassland Research Station discourages lambs from climbing into the trough.

Photo J. F. Naude.

Carcase grading in Rhodesia is based on a visual appraisal of the degree of fleshing and fat cover, and the size at which this is sufficient varies according to breed. For our more common breeds (Dorper and Wiltiper) the best live mass at which to slaughter lambs is between 34 and 39 kg giving a carcass of between 15 and 18 kg. To estimate whether a sheep is fat enough for slaughter, the hand should be placed on the back in the region of the loin and then over the floating ribs to feel the degree of cover. The width of the brisket is also quite a good visual indicator.

8. TROUBLESHOOTING

This intensive method of lamb finishing is far removed from natural grazing and is not without its problems. Attention to the following points will ensure that these are minimal:

- **Vaccinate all lambs three times against *Enterotoxaemia;* a month before penning, two weeks before and finally as they go into the pen.**

- **Restrict the amount of standard concentrate supplied to each lamb to a low level for the first two weeks until the lambs are used to it. Roughage should be available *ad lib.***

- **If acidosis is noticed - lambs off their feed, grinding their teeth, dung pellets soft and smelly - separate the sick lambs and dose with 60 ml (two tablespoonsful) milk of magnesia followed by 5 cc of a penicillin or tetracycline injection.**

- **After 10 days in the pen, dose all lambs with a broad-spectrum roundworm remedy. Dose against tapeworm if the segments are apparent in the dung.**

9. GENERAL FEEDING HINTS

(i) Keep all stock healthy by routine dosing against internal parasites and preventive inoculations against disease. This aspect is covered in detail in the veterinary section.

(ii) Water should be available every day, preferably piped to a water trough.

(iii) Sheep do not like long grass and, wherever possible, pastures should be kept fairly short either by using planted runner grasses, by grazing cattle, or by the use of a mower ahead of the grazing sheep.

(iv) All changes from one feed to another should be gradual. For example, sheep going on to a lush green vlei after a September burning should be restricted to no more than an hour's grazing a day until they are used to it. Similarly, a new ration or mixture should be supplied in small quantities only, or else 'diluted' with roughage at first until it is taken by all animals.

High Energy Feeding of Lambs

Summary

The essentials of this system of pen feeding can be summarised as follows:

Space: **Allow 0,5 to 1,5 square metres of floor space per lamb. This should preferably be roofed and the structure should permit a free flow of air. For *ad lib* feeding 50 to 100 mm feed trough space per head is adequate. The water trough should be sited away from the feed trough to minimise fouling. Water troughs should be cleaned out frequently. A water-trough space of 20 mm per head is adequate.**

Finishing livemass: **This varies with the breed. As a guide, Dorpers and Wiltipers finish at between 34 and 36 kg (75 to 80 lb.); Mutton Merinos, Suffolks and their respective crosses finish at between 40 to 45 kg (88 to 100 lb.).**

Feed: **An *ad lib* energy mixture - mainly maize grain - is recommended, containing 13 to 15 per cent crude protein, one per cent limestone flour and 10 to 20 per cent roughage, milled through a 9,5 mm (3/8 in.) screen. Long hay or bedding should be available.**

At Grasslands Research Station the mixture used contains 79 per cent maize meal, ten per cent milled stargrass hay, one per cent limestone flour and ten per cent of a commercial 64 per cent protein concentrate. The lambs consume up to 1,5 kg of this mixture per head per day.

Expected lamb gains: **If the lambs are eating well there is no need to weigh them to check progress. However, for the purpose of making slaughter**

bookings or predicting delivery dates, lambs that are eating well can be expected to gain between 200 and 250 grams (1/2 lb.) per day.

Management

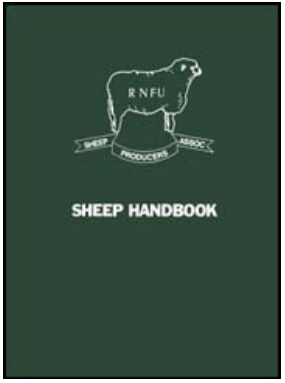
(i) Vaccinate against Pulpy Kidney four and two weeks before the lambs are put into the pen. However, if the new Onderstepoort vaccine was used at six weeks of age, no further vaccination should be necessary.

(ii) Dose the lambs with a broad-spectrum roundworm remedy ten days after penning. Dose against tapeworm if this is a problem.

(iii) Phase the lambs on to the high energy diet by providing milled hay *ad lib* and feeding only a limited amount (say 250 g) of the concentrate mixture initially. Increase feeding progressively to full *ad lib* levels over about ten days. Adaptation to *ad lib* diet is greatly facilitated if the lambs have had access to the mixture in a creep for two or three weeks before penning.

(iv) If acidosis develops - lambs go off their feed; grind their teeth; dung pellets are soft and smelly - separate the sick lambs and dose with 60 ml (two tablespoons) milk of magnesia. Alternatively two teaspoonsful of bicarbonate of soda dissolved in cold water can be given, but this may have to be repeated after four hours.

February, 1975



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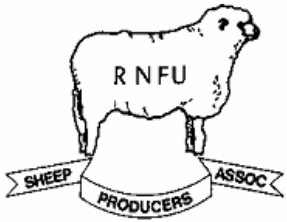

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