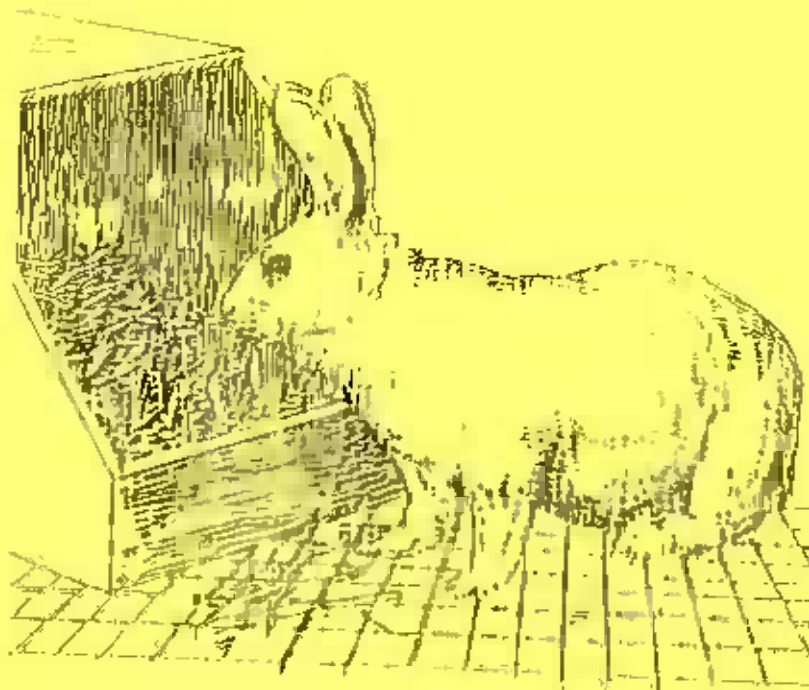


RABBIT TECHNOLOGY

FOR WARM CLIMATES



CHAPTER 1

AN INTRODUCTION TO RABBIT PRODUCTION

1.1. Introduction

The importance of the domestic rabbit as a supplier of meat for human consumption is widely recognised throughout the world. In Europe and the United States large scale commercial rabbit farming has been practised for many years and standards of husbandry raised.

There are also successful rabbit farms in the tropics and sub-tropics. The size of these varies from the large commercial rabbitries to small backyard rabbitries.

Apart from being a good source of meat, rabbits provide useful skins, manure and, with some breeds wool.

In this Chapter, we will look at:

- a) The reasons why people keep rabbits (1.2).
- b) The disadvantages of keeping rabbits (1.3).
- c) The different ways in which rabbits are kept. (1.4).
- d) The development of rabbit keeping (1.5).

1.2. **The Reasons for Keeping Rabbits**

Most of the countries in the tropics and sub-tropics need to produce more meat in order to supply their rising population with animal protein. The rabbit has several points in its favour as a meat producer.

1.2.1. **Feeding** Rabbits can be fed on a great variety of locally available foods- Weeds, some green leaves and kitchen vegetable scraps can be given to rabbits at almost no cost. By-products, like waste beer malt, are another cheap food. Commercial rabbitries buy more expensive concentrate rations for their rabbits.

1.2.2 **Rapid rate of production** Rabbits can breed and grow quickly. This means that a rabbitry can expand quickly and take advantage of a plentiful food supply.

Even the backyard rabbit keeper can provide a constant supply of meat for his family.

1.2.3 **Useful by-products** Rabbits skins can be used for several purposes (mats, rugs and clothes). The manure is a valuable organic fertilizer for use in the vegetable garden.

1.2.4 **Herd Size** The number of rabbits in the herd can easily be matched to the rabbit keeper's resources. Even six does and one buck will provide a useful supply of meat for the family.

1.2.5 **The small size of rabbits** means that they can be easily handled and cared for by women and children. It also means that the carcass is small enough to be used at once, without having to store any part of it.

1.2.6 **Housing** can be built from pieces of wood and bamboo. No special materials or equipment needs to be bought for the backyard rabbitry.

1.2.7 **Acceptability** There are few religions or beliefs which do not allow the eating of rabbit meat.

1.3 **The Disadvantages of Keeping Rabbits.**

There are very few disadvantages of rabbit keeping.

1.3.1 **The small size of rabbits** means that they are more easily stolen or attacked by predators. They need to be protected from these by fences and other barriers.

1.3.2 **Labour** Large numbers of rabbits require a lot of labour, particularly if they are kept in individual hutches. Each hutch has to be cleaned out daily. Each rabbit needs to be fed and watered two times daily.

1.3.3. **Climate** Rabbits need protection against extremes of climate. They are especially sensitive to heat and must always have access to shade.

1.4. **Rabbit Production Systems**

The way in which people keep rabbits differ from country to country, but there are three main systems of production:

1.4.1 **The backyard rabbitry** is rabbit keeping on a small, family scale. A few does and one or two bucks may be kept in a home-built rabbitry just next to the house. The rabbits are fed on greens, weeds and vegetable kitchen waste.

In order to obtain a good profit, you must consider matters such as sources and prices of rabbit feed, management techniques and markets. It would be unwise for someone to start up commercial rabbit farming, even on a small scale unless he had researched the project well and made good preparations.

New rabbit farmers should be advised to start small and to build up gradually. In such a way they gain valuable experience without taking too great a risk.

Production from this type of rabbitry is low, but it provides enough meat to supplement the family's diet. It is a very useful way of keeping rabbits, especially in the poorer parts of the community, and provides a valuable supply of meat. Backyard rabbit production should be encouraged and improved.

Improvement is often limited by the following constraints;

- a) What materials are available for low cost housing ?
- b) What cheap feeding stuffs are available for feeding the animals throughout the year ?

As a result of improvements, some backyard rabbit keepers may be able to have some surplus rabbits which they can sell to their neighbours or at local markets.

1.4.2 **The small commercial rabbitry** may have from ten to fifty breeding does in a purpose built rabbitry. The aim of this type of rabbit production is to sell rabbit meat for a profit. The rabbits are usually fed on concentrates as well as bulky foods.

1.4.3. **The large commercial rabbitry** This type of rabbitry is more common in Europe and America. There are some examples of large rabbit units in the tropics. As well as the meat they provide, they serve a useful purpose in the multiplication of breeding stock for distribution, the investigation of some of the problems concerning rabbit keeping in hot countries, and in the training of local people in improved rabbit husbandry techniques.

REVISION QUESTIONS

1. Give two reasons for keeping rabbits.
2. Apart from meat, what else do rabbits produce?
3. What are the two main systems of rabbit production?
4. What are the advantages of the backyard rabbitry compared with the commercial rabbitry?

STUDY PROJECTS

- a) Find out who keeps rabbits in your area. Make arrangements to visit these people and discuss why they keep rabbits. Collect information on the following:
 - a) What kind of rabbitry are rabbits kept in?
 - b) Who looks after the rabbits?
 - c) Do people grow vegetables or other specially for their rabbits during the dry season?
 - d) Do people sell the rabbits' meat, skins or manure? If some is sold, how much.
2. For government workers: See if you can find statistics on the number of rabbits being kept in your area.
3. Find out who, in your area, are the government experts responsible for rabbit production. They might come from the livestock department, research stations and Agricultural Training Institutes.
4. Find out if there is a large commercial rabbitry in your area. If so, make arrangements to visit it.

CHAPTER 2

BREEDS, BREEDING AND KEEPING BREEDING RECORDS

2.1. Introduction

There are many breeds of rabbits in the world and they have different qualities.

Careful selection of rabbits for breeding can lead to improvements in the herd.

This is one of the most important ways in which rabbit keepers can increase production.

In this chapter we will look at:

- a) The different breeds of rabbit (2.2).
- b) How you can improve the production of your herd by carefully selecting and breeding rabbits (2.3).
- c) The characteristics of good quality rabbits (2.4).
- d) Keeping records of rabbits' performance (2.5).

2.2. Breeds of Rabbit For commercial purposes, the most important differences between rabbits are their size, breeding ability and suitability to the climate. Examples of several different breeds of rabbits are given below. Some of these might be used for improving local rabbit herds.

2.2.1. New Zealand White This breed is commonly used in the production of meat. They are large rabbits, with meaty haunches and wide, deep shoulders. An adult buck weighs 4 -5 kg, and an adult doe weighs 4.5 - 5.5 kg. They have white fur.

2.2.2. Californian These are fairly large rabbits used often in the production of meat. They are well fleshed on the back and haunches.

An adult Californian rabbit weighs 3.6 - 4.8 kg. This breed has a white body with black on the nose, ears, feet and tail.

2.2.3. **Giant Blanc** These are very large rabbits and are sometimes mated with Californian rabbits or New Zealand White rabbits to produce a large hybrid which is good for meat production. An adult Giant Blanc buck weighs 6.3 - 7.3 kg and an adult doe weighs 6.8 - 7.8 kg. They have white fur.

2.2.4. **Flemish Giant** These are also very large rabbits which are used for meat production. An adult Flemish Giant has a very wide back and weighs 5 - 6.5 kg.

2.2.5 **Beveren** These rabbits are large, with well developed, meaty backs and haunches. They are useful in meat production. An adult Bevern weighs 3.-3.6 kg.

2.2.6 **Chinchilla Giganta** These rabbits are fairly large. They mature early and have a good meat to bone ratio. An adult Chinchilla weighs about 5 kg. Light Grey.

2.2.7 **Argente Champagne** These are medium sized rabbits weighing about 4 kg. They are kept mainly for their fur which is light or dark grey.

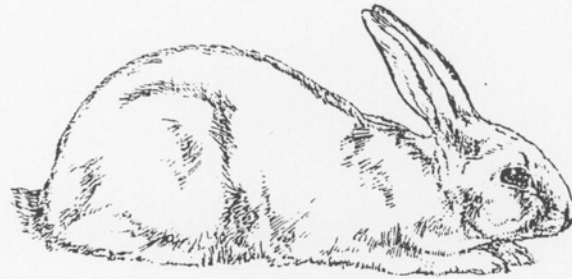
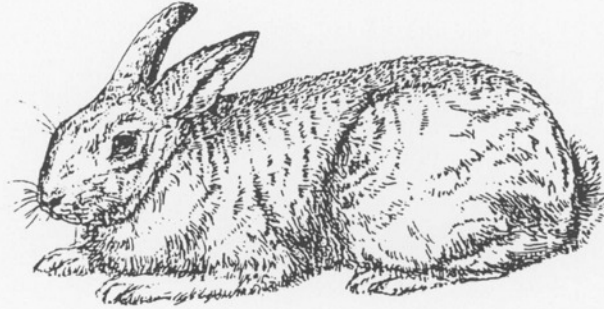
2.2.8 **Dutch** The Dutch rabbit is a small, compact, early maturing rabbit. It has very good mothering qualities and has been used in meat production for this reason. An adult Dutch rabbit weighs about 2.3. Kg. They have a black and white coat.

2.2.9 **Havana** These are also fairly small, compact rabbits, but they produce well developed, meaty joints. An adult Havana weighs 2.7 - 3 kg.

2.2.10 **New Zealand Red** These rabbits are of medium size, with good mothering qualities and a good meat to bone ratio. An adult rabbit weighs 2.7 - 3.6 kg. They have reddish-brown fur.

2.2.11 **Angora** This breed of rabbit is kept for its fur, which is usually white. They are small rabbits, weighing only 2.5 - 3 kg.

2.2.6 - Chinchilla



2.2.5 - Beveren

2.3. **Increasing Production through Selection and Breeding.**

It is important to pay attention to the quality of animals used for breeding. By carefully selecting good rabbits to breed from, their good qualities will be passed on to their young, and will eventually increase the production of the herd.

Breeding improvements can be brought about in a number of ways:

2.3.1 **Culling** (killing and replacing) By culling does which are less productive than the average doe.

2.3.2. **Selecting does** Young does must be carefully selected to replace those which are old or which have been culled.

Choose does which have good commercial characters (see section 2.4). It is important to keep good records (see section 2.5) so that the rabbit keeper can easily find out which does have the best commercial characters.

A doe selected for breeding must also have at least 8 teats, so that she can feed 8 baby rabbits. She should be in good physical condition, good health and growing well. She should not be fat. The best time to select new breeding does is when they weigh about 2 kg.

2.3.3. **Selecting bucks** Careful selection of breeding bucks is even more important because each buck will mate with several does, so his qualities will be passed on to the litters.

Choose bucks whose relatives all have good commercial characteristics (see section 2.4.). These can be found from the breeding records (see section 2.5.). A buck selected for breeding must have 2 well developed testicles. If there is any damage to the testicles, the buck should not be used for breeding. The buck should be in good physical condition, good health and growing well. He should not be fat.

The best time to select breeding bucks from your own stock is when they weigh about 2 kg. It is often useful to buy a good breeding buck from another breeder. This will bring in some new characteristics and will help to avoid any in-breeding. Again, it is very important to study the breeding records of the buck and his relatives to make sure that they all have good commercial characteristics (see section 2.4.).

2.3.4. **Cross breeding** The mating of a buck of one breed with a doe of another is known as cross breeding. The crossbred animals resulting from these matings often show an improvement over their parents in certain commercial characters. These animals are sometimes referred to as hybrids, and the improvements as a form of 'hybrid vigour'.

For example they may grow faster and have larger litters than their parents. If a hybrid doe is to be used for breeding, she should preferably be mated to a pure bred buck of

good quality. Mating hybrids to hybrids is not recommended because you cannot be sure which of the hybrid characteristics will be passed on to the young.

Backyard keepers normally have rabbits of 'mixed breeding'. They are generally of low quality with regard to commercial characteristics, little improvement is possible by selection from within the herd.

If bucks of a breed such as New Zealand White are made available for crossing with local breeds this will improve the quality of the rabbit population.

2.4. **Characteristics of Rabbits.**

Rabbits have many different characteristics. Those who breed them for showing are interested in the shape and size of the body and in the colour and type of fur. The producer of rabbit meat is concerned with a different set of standards - those which are likely to result in the production of the maximum amount of meat from his animals at the lowest cost. These are known as commercial characteristics and are as follows:-

- (1) Number of young rabbits born per litter.
- (2) Number of young rabbits reared per litter.
- (3) Number of litters per doe per year.
- (4) Number of young rabbits reared per doe per year.
- (5) Weaning weight.
- (6) Live weight gain.
- (7) Food conversion.
- (8) Killing out percentage.
- (9) Conformation (Body).

Numbers (1) - (5) above are concerned with the doe, with her reproductive capacity and ability as a mother to rear her young. The live weight gain (6) refers to the rate of growth of the young rabbits from weaning to slaughter. This depends very much on the standard of feeding, but if a group of young animals are fed the same, it is possible to pick out the ones which grow the fastest.

This is related to the ability of the animal to convert the food it eats into body weight, known as its food conversion (7). The killing out percentage (8) refers to the weight of the prepared carcass compared to the live weight of that rabbit just before slaughter. This tells us how much of the carcass is useful. It is usually 50% - 55% : the higher the percentage the better. It is related to the conformation (9) (“meatiness”) of the rabbit. In the table below realistic standards of achievement for both backyard and commercial producers are given for each of the characters mentioned.

Commercial Characteristics	Backyard Producer	Commercial Producer
Young born per litter	4 - 6	6 - 8
Young reared per litter	3 - 4	5 - 7
No. Of litters per doe per year	3 - 4	4 - 6
No. Of young reared/doe/year	9 - 16	20 - 42
Weaning weight per litter at 8 weeks	2 - 5 kg	5 - 10 kg
Live weight gain (number of weeks to reach 2 kg body weight)	12 -18 weeks	8 - 12 weeks
Killing out percentage	50%	50 - 55%
Conformation <input type="checkbox"/>	Fair	Fair - Good <input type="checkbox"/>

2.5. Keeping Breeding Records

There is no doubt that the keeping of certain records can help towards better management of a rabbit enterprise. In general this applies to the commercial producer and to the more progressive backyard keepers.

One purpose of keeping records is to help the breeder to select the best young animals for breeding. For example, by referring to the Doe Breeding Records it will easily be seen which does in the herd are performing best such as number of young reared per year. By selecting a young doe which has come from a dam of good standard in this respect, the breeder is taking a positive step towards improving the herd average.

2.5.1. The Reasons for Keeping Breeding Records are:

(a) To help in day-to-day management. If the date of every mating is recorded, the expected date of kindling will be known for every doe. This is important so that the pregnant does are fed correctly and so that nest boxes and materials can be provided at the correct time.

(b) To help in the selection of young breeding does. Naturally the breeder wishes to select the best young stock. Their appearance may be important, but of equal importance is the breeding history of their parents. This can only be found out by referring to records.

(c) To make sure that a buck is not mated to any of his daughters or any other relative.

(d) To help to check weaknesses in management. The commercial breeder should have an idea what profit he expects to make at the end of the year from his enterprise. If his profit is disappointing, or if he makes a loss, he will be anxious to know how he can improve his results the next year. Without records it will be difficult for him to know where to begin. If he has kept good records on the other hand, he will be in a position to check where things may have gone wrong.

For example, he may find that the average number of litters per doe per year was only 3.2 instead of over 4. This may have been due to low fertility of the buck or of certain does, which can be checked from the individual records. Or it may have been due simply to not mating the does frequently enough. Here is another example: although the number of young rabbits born alive was satisfactory, the number weaned was far too low. This might indicate a fault in nest box management or possibly poor feeding during lactation.

In order to achieve these aims, the following records should be kept:

2.5.2 Rabbitry Record This record is a great help in day to day management.

A glance at the record will enable the attendant to see the stage that each doe has reached regarding its breeding cycle. For example, by looking down the "Date Litter Due" column, he will be able to see which does are due to kindle in the near future. He can then take appropriate action, at the correct time, with regard to feeding and the provision of nest boxes.

Note: “Individual Numbers” - The first and last numbers of each litter may be shown in this column.

“Weaning Weight” - The total weight of the litter is entered in this column. It saves time to weigh the whole litter together in a basket or small cage.

2.5.5 **Buck Breeding Record** Keeping an individual breeding record for each buck is equally important as keeping records of the does. As each buck mates with several does, his characteristics are passed on to numerous litters. These records are kept on cards in the same way as the does’ records.

BUCK BREEDING RECORD

Doe number	Breed
Date of Birth	Sire (father)
Litter number	Dam (mother)

Date mated	Doe	Date kindled	No. born alive	No. born dead	Remarks

Note: If the buck was bought from another breeder, enter that or place in “Origin”. If he is from your own herd, enter his litter number.

2.5.6 **Financial Records** It is necessary for commercial breeders to keep a record of their costs and returns. From these it will be possible to work out the profit (or loss) for the enterprise at the end of the year. The figures obtained from these records can be helpful in making a budget for the year that lies ahead.

Financial records may also be of assistance along with breeding records, in tracing faults in management.

REVISION QUESTIONS:

1. Give the names of three breeds of rabbit which can be used to improve rabbit herds for meat production.
2. Describe two ways in which a farmer can bring about improvements to his herd through breeding.
3. Why is the selection of good bucks so important?
4. What do we mean by “commercial characteristics”?
Give examples.
5. Give two reasons for keeping breeding records.
6. Describe the breeding records that should be kept.
7. What qualities do we look for in a good breeding doe?
8. What do we mean by “hybrid vigour”?

STUDY PROJECTS

- a) General information about the use of the breed.
b) A physical description (weight, colour, etc).
c) Production data (litter numbers, rate of growth, etc.).
2. Find out which imported breeds are available and how successful they have been. Important information will be:
 - a) What increases in production have been achieved by cross-breeding? Which is the most productive cross-breed?

b) Are the imported or cross-bred rabbits suited to the climate? Do they need special management? If they do, how much does this cost?

3. Become familiar with the links between appearance and production in rabbits.

For students: Competitions can be organised in which small teams of students judge rabbits. An expert awards points to the team depending on the accuracy of their judgements.

4. Visit a good commercial rabbitry and ask to see the records which are kept. Ask the owner of the rabbitry to explain how bucks and does are selected for breeding. Find out where good breeding bucks can be bought.

CHAPTER 3

MATING, PREGNANCY AND BIRTH

3.1 Introduction

For a rabbitry to be as productive as possible, it is important to manage reproduction. Many does do not produce as many litters as they could because they are mated too late, and many young rabbits die because they are not cared for properly.

In this chapter we will look at :

- a) The Buck (3.2).
- b) The Doe (3.3).
- c) Mating: when and where this should take place (3.4).
- d) Pregnancy and False Pregnancy (3.5).
- e) Birth (3.6).
- f) Lactation (3.7).
- g) Feeding the Doe and her Litter (3.8).
- h) Fostering (3.9).
- i) Failure to Breed (3.10).

3.2 The Buck

The buck is the male rabbit. A buck is old enough to use for breeding when he is 8 months old, and should continue to be good breeder for at least 2 to 3 years. A young buck, 8 to 12 months old, should only mate one doe every third day. A mature buck, from 12 months old, can successfully mate 4 to 6 does a week.

If a buck is working as hard as this, he may start to lose weight, so give him more food. Never keep 2 adult bucks together because they may fight.

3.3 **The Doe**

The doe is the female rabbit. After mating with the buck she will usually become pregnant. About 31 days later she should give birth to a litter.

3.4 **Mating**

3.4.1 **Frequency of Heat** Does will only become pregnant if they are mated while they are 'on heat'. Adult does are on heat for 12 days then they have 4 days when they are not on heat, then they are on heat again, forming a 16 day cycle.

3.4.2 **Signs of Heat** It is important for a farmer to recognise the signs of heat in a doe, so that he can take the doe to the buck for mating at the correct time.

The signs of heat in a doe are:

- a) The doe may be restless.
- b) The vulva may look red and swollen.
- c) The doe will allow the buck to mate her.

3.4.3. **Age at First Mating** Young does will come on heat for the first time at about 3 - 6 months of age, but they should not be mated until they are more fully grown (mature). After weaning, male and female rabbits must be kept separate to prevent mating.

The age at which rabbits are mature enough to be used for breeding depends on :

- a) Breed: small breeds mature earlier than large breeds.
- b) Nutrition: well fed rabbits mature earlier than poorly fed rabbits.

The table below may be used as a general guide:

Breed	Approximate Weight When Ready For Mating	Approximate Age When Ready For Mating
Small	2.5 kg	4 - 6 Months
Medium	4 kg	6 - 9 Months
Large	5 kg	9 - 12 Months

3.4.4. **Mating** Always take the does to the buck for mating. If a buck is put in the doe's cage, she may fight him to protect her cage. Early morning and in the cool of the evening are the best times for mating.

If the doe is on heat, she will raise her tail and let the buck mate her. After mating, he will fall off.

The buck and doe should be watched to make sure that mating takes place, and the doe then returned to her hutch. They should not be left together, even if mating does not at first occur. It is better to return the doe to her hutch and to bring her back again to the buck later.

If the doe refuses to let the buck mate her, it is possible that she is not on heat. Wait 3 to 4 days, then take her to the buck again.

If the doe persistently refuses to allow the buck to mount her, she can be restrained as shown in fig. 3.4.4. The ears, and a fold of loose skin over the shoulders, are held with one hand and the other hand passes under the doe's body and between her legs. This hand supports her weight and raises her rear quarters to a convenient height for the buck. By placing the thumb and forefinger on either side of the vulva and pushing the skin gently backwards, the doe is induced to raise her tail which allows the buck to mate. Fig. 3.4.4 shows how the doe should appear to the buck in this position.

One successful mating is all that is needed but some people like the buck to mate the doe a second time about 2 hours later. This is not really necessary.

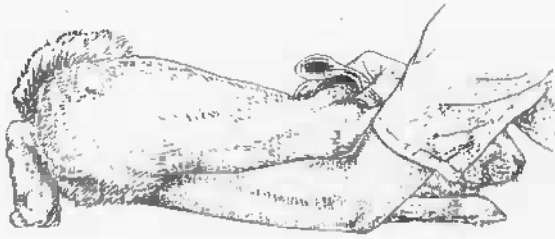
After mating, fill in the record cards so that the date when she is due to give birth is known.

3.4.5 **Frequency of Mating**

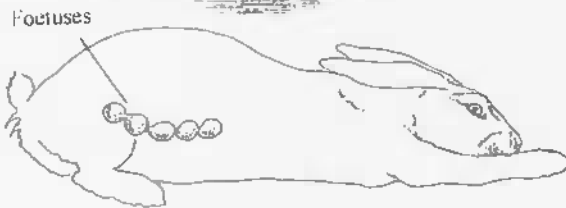
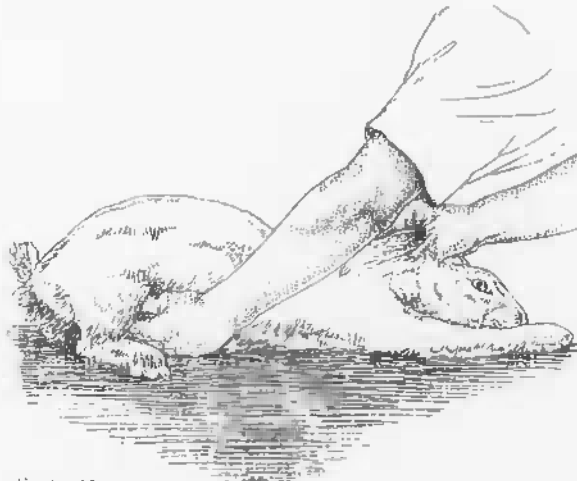
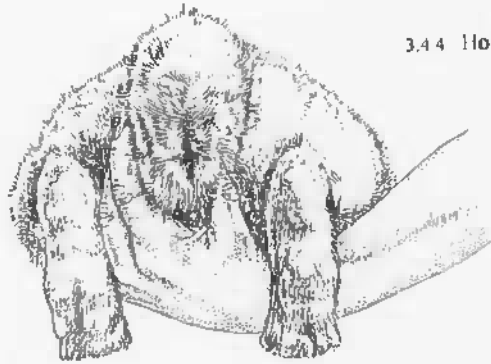
(i) The Doe

This depends on whether the rabbitry is commercial or backyard -

(a) The backyard rabbitry: The farmer should aim for 4 litters per doe per year. He can do this by weaning each litter at 7 weeks old. Mate the doe during the week after weaning. The complete breeding cycle (from one mating to the next) would take about 80 to 87 days.



3.4.4 Holding the Doe for mating



3.5.2 Pregnancy diagnosis (Palpation)

If the doe becomes pregnant at each mating, it would be possible to get 4 litters from her in a year. However, the actual number of litters may be less than this because of unsuccessful matings.

(b) The commercial rabbitry: This farmer usually aims for 5 or 6 litters per doe per year. This can be achieved by - weaning the litter at 5 weeks old, and mating the doe in the week after weaning. The doe can produce almost 5 litters per year this way. Each breeding cycle would take 66 to 73 days.

If a litter dies, the doe can be mated again in 4 or 5 days. The dead baby rabbits and their bedding should be burned and the hutch thoroughly cleaned with disinfectant.

Examine the doe carefully. Is she is ill at all, treat her and wait until she is completely better before mating her again.

If a doe loses the next litter as well, and a reason cannot be found, she should be culled.

(ii) The Buck

Bucks should not be over-used; neither should they be under-used. Either could result in infertility.

A young buck should perform one or two matings per week. A mature buck may be used up to six times a week, but not more than twice in the same day.

3.5 **Pregnancy**

3.5.1 **Duration of Pregnancy** The length of pregnancy in rabbits is from 30 to 32 days.

3.5.2 **Signs of Pregnancy** It is helpful to know for sure whether a doe which has been mated has become pregnant or not.

One method of doing this is to again mate the doe. This is not very reliable because some does will accept the buck even when they are pregnant while others will not mate again even if they are not pregnant.

A more reliable method is known as palpation in which the developing embryos (baby rabbits) can actually be felt by hand. This is a job for an experienced rabbit keeper because the delicate embryos can be easily damaged.

Palpating the doe can be carried out in her hutch or on a table top covered with sacking to prevent the doe slipping. (see 3.5.2) It is best done about 2 weeks after mating when the embryos should be the size of large beads (about 1 - 2 cms diameter) if the doe is pregnant. The embryos can be felt by exerting gentle pressure with the thumb and forefinger on either side of the uterus. The technique demands some knowledge of the doe's anatomy together with considerable practice.

Figure 3.5.2 shows the development of the embryos at different stages of pregnancy. During the last 2 weeks of pregnancy, the doe's belly will become larger and her teats will gradually swell.

3.5.3 Care of the Pregnancy Doe Immediately after mating the doe should be returned to her hutch. If her previous litter has not yet been weaned, she can go back to them and continue to suckle them until a week before her next litter is due. If the doe is on her own during her pregnancy, she can be kept in a smaller, single-size hutch (see section 6.7) for the first three weeks. At least a week before kindling is due, the doe should be in a breeding hutch to get used to the place where she will give birth. At the same time a nest box and suitable soft materials for making a nest, such as grass, hay or straw should be provided.

The day before kindling the doe will pull out some of her fur from her rump, sides and round her teats. She will use this to add to the nest.

3.5.4 Feeding the Pregnant Doe Feeding of the doe should be gradually increased during the last 10-14 days of pregnancy, because the growth of the embryos and the development of the doe's mammary glands will be taking place rapidly during this period. Good feeding at this time is likely to increase birth weight of the young rabbits and the milk yield of the mother.

3.5.5 False Pregnancy If a doe did not get pregnant when she was mated, she may develop a false pregnancy. This may also result if another doe attempted to mate her. She will refuse to mate. 16 to 20 days after the mating, she will start to pull out her fur and try to make a nest. (A pregnant doe usually starts to pull out her fur about 25-28 days after mating). Soon after this, she will come on heat again and can be mated.

3.6 Birth (Kindling)

3.6.1 **Signs that the time of birth is near** The rabbit keeper will know the date when the doe is due to kindle from his records (see section 2.5). The day before kindling the doe will pull fur from her rump, sides and teats to line the nest.

3.6.2 **Kindling** The birth of the young rabbits is known as 'kindling'. It often takes place at night. There are usually no problems, provided the doe has the materials and place to make a nest, and is left undisturbed. It is particularly important to ensure that predators are kept away at this time because, if the doe is upset or frightened, she may easily kill or abandon her young.

As each baby rabbit is born, the mother licks it and allows it to suckle. The babies are born naked and blind and weigh only 30-80 gm, depending on the size of the mother, how she has been fed during pregnancy, and on the number of babies in the litter.

A doe cannot successfully rear more than eight young, because she only has eight teats. Select the strongest eight young rabbits from the litter and leave them with the doe. Take the others away and either foster them or cull them.

The doe's use of the nest box is very important. Sometimes a doe may not make a nest at all and simply gives birth on the floor of the hutch. This may be due to some disturbance or to the fact that she is a bad mother. The babies are likely to die from cold or neglect. If they are placed in the nest box, with some soft material, there is a chance that the doe will take to them. If not, the only alternative is fostering.

Doe's usually give birth without any problems. An experienced rabbit keeper should be called if there are any problems.

Sometimes a doe will kill her young or abandon them for no apparent reason. If she has not done it before, mate her again in 4 or 5 days. If this should happen twice with the same doe, she can be classed as a bad mother and should be culled from the herd.

3.6.3 **Care of the young rabbits** The litter should be inspected every day to make sure that the baby rabbits are well fed and conformable. If the babies are hungry or too hot, they may be restless and start trying to climb out of the nest box. If they are well fed and conformable they will be sleeping quietly.

Sometimes the doe will cover the babies so well with her fur that they may become too hot and therefore restless. In these cases the attendant should regulate the amount of fur in the nest so that the babies are comfortable.

After 10-12 days, the baby rabbits' eyes usually open, and their fur starts to grow. At about 21 days old, the young rabbits will start to come out of the nest box.

3.7 **Lactation**

The mammary glands of the doe develop during pregnancy particularly during the last week. They start to secrete milk just before the birth of the young.

Milk is the only food for the young rabbits during the first two or three weeks of their lives. Their development during this important period depends on the mother's milk supply. This is influenced by how well the doe is fed during the last half of pregnancy and during lactation.

3.8 **Feeding the Doe and her Litter**

3.8.1 **Food** Good quality feed should can be provided during the whole of the rearing period. The mother will give more milk and the babies will grow faster than they could if grass were the only food available.

3.8.2 **Water** A plentiful supply of fresh, clean water is most important for the suckling doe and her litter. In order to produce plenty of milk the doe must get enough to drink. A shortage of water will also reduce the amount of feed she is able to eat which will reduce her milk production. In hot weather a doe and her litter may drink up to 4.5 litres of water in a day.

3.9 Fostering

This is the transfer of baby rabbits to another doe for rearing. It may be attempted for any of the following reasons:

- (i) The mother dies, or abandons the young, soon after birth. The young rabbits would die from starvation unless a foster mother could be found.
- (ii) The litter is too large (more than 8) for the mother to feed all the babies. The extra babies can be transferred to another smaller litter.
- (iii) Two, or more, doe's may kindle at about the same time, having litters of different sizes. Distributing the babies more evenly between the mothers would probably result in better overall growth of the young rabbits.

Fostering does not succeed in every case, but if the following method is used, there is a good chance of success:

- (a) Rabbits to be fostered should be less than one week old, though fostering is occasionally successful at a slightly later stage.
 - (b) The age of the baby rabbits to be fostered should be nearly the same as the foster mother's own litter (less than 3 days difference in age)
 - (c) Fostering is carried out by moving the young rabbits to the foster mother's nest box. She should not be in the hutch at the time. Rub these young rabbits with the nesting material in the foster mother's nest box, to make them smell the same as her own young. Leave them for several hours, then put the doe back in the hutch.
 - (d) Darken the hutch and leave undisturbed until the following day.
- If all attempts at fostering fail, it is better to destroy these extra rabbits than to let them suffer, because they will die without a mother anyway.

3.10 **Failure to Breed**

Occasionally a doe will not become pregnant after mating. There are many causes. The most important are:

3.10.1 **Age** The buck or doe may be too young. A guide to the correct age for first mating is given in section 3.4.3. Also, the buck or the doe may be too old, so it should be culled.

3.10.2 **On Heat** The doe may not be on heat. Try mating her again in about 4 days.

3.10.3 **False Pregnancy** If the doe starts to pull her fur out 16 to 20 days after mating, she has probably developed a false pregnancy.

3.10.4 **Physical Condition** A rabbit which is too fat or too thin is less likely to breed than a normal rabbit. Look closely at the feeding; it may need to be changed.

3.10.5 **Disease or Injury** A rabbit showing any signs of disease or injury should not be used for breeding. It should be treated or culled, depending on the condition. It should only be used for breeding again when it has completely recovered.

3.10.6 **Moulting** Rabbits which are moulting are less likely to breed successfully. Try again when they have finished moulting.

3.10.7 **Sterility** Occasionally a buck or a doe may be permanently sterile. The farmer can use the records to see which rabbit is sterile.

If a buck has failed to make several does pregnant, he is probably sterile.

REVISION QUESTIONS

1. At what age should a young doe first be mated?
2. How many times per week should a buck be used?
3. What are the signs of a doe being on heat and for how long is a doe on heat?
4. How long is the pregnancy of a rabbit?
5. How many litters per doe per year should the backyard rabbit keeper aim for? And how many should the commercial rabbitry aim for?
6. How can the commercial rabbit keeper increase the number of litters per doe per year?
7. What is false pregnancy and what is the cause?
8. Why is the nest box so important? When should it be put in with the doe?
9. How many rabbits can a doe rear successfully?
What should you do with any extra baby rabbits and how should this be done?
10. Give two reasons for failure to breed?

STUDY PROJECTS

1. Visit a rabbitry and ask the rabbit keeper to show you which does are on heat.
This way you will come to recognise the signs of heat.
2. Visit a rabbitry and carefully examine some pregnant does. Learn to recognise the signs of pregnancy. Watch does with their litters and notice how they behave.

CHAPTER 4

REARING RABBITS

4.1 Introduction

Most young rabbits will be used for meat and skins; some will be kept for breeding. Whatever they are used for, the rabbit keeper will benefit if they are well cared for.

In this chapter we will look at:

- (a) Handling rabbits (4.2).
- (b) Feeding young rabbits (4.3).
- (c) Routine attention to young rabbits, sexing, weighing; tattooing and castrating (4.4).
- (d) Management of the young rabbits kept for breeding and for meat (4.5).

4.2 Handling Rabbits

There will be times in any rabbitry when the animals will have to be picked up, e.g.

When a doe is moved to a breeding hutch or when young rabbits are weaned.

When it is necessary to pick up a rabbit the aim should be to cause it no discomfort and to prevent it struggling. So it must be handled gently but firmly. There are three ways to hold a rabbit, according to its size.

4.2.1 **Young Rabbits** Up to the age of about 8-10 weeks, young rabbits may be picked up and carried in one hand by grasping the loin. (Fig.4.2.).

4.2. Handling Rabbits

Medium-sized Rabbits The rabbit may be caught by grasping a loose fold of skin over its shoulders. Then place the other hand under the rump to support it before lifting.

4.2.3 **Large Rabbits** Rabbits weighing over 5kg may be caught in the same manner as above but the other arm should be extended along the side of its body with the hand

under the rump for support. The attendant should hold the rabbit against his own body when lifting, to provide extra support.

On no account should any rabbit be lifted by its ears because it is very painful and can severely damage.

4.3 **Feeding Young Rabbits**

The feeding of adult rabbits is discussed in the next chapter. In this section, we will look at the special needs of young rabbits.

4.3.1 **Suckling** For the first 2 to 3 weeks, the baby rabbits' only food is their mother's milk. It is important that each baby rabbit can suckle and get enough milk. If the doe has too many babies or not enough teats, some of the babies will be hungry and may die.

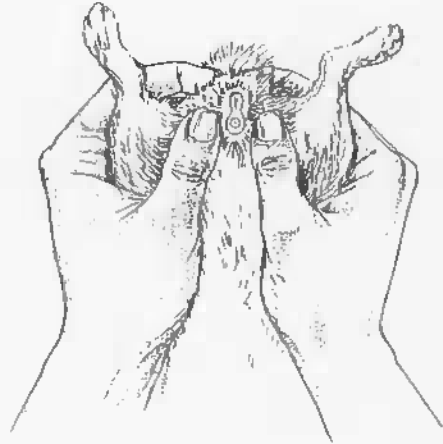
The doe must be given plenty of food and water so that she has enough milk for her litter.

4.3.2 **Solid Food** From 2-3 weeks old, the young rabbits will start to eat grass and concentrates as well as suckling the doe. As they get older, they will eat more solid food and suckle less from the doe. Plenty of fresh food should be available for them from 2-3 weeks old. Rabbits can be killed for meat at two to six months old, at a weight from 1.2 to 3.0kgs, depending on breed.

4.3.3 **Weaning** (when suckling is stopped) At 5-7 weeks old, the litter is separated from the doe. Usually the litter is taken away leaving the doe in the hutch. Sometimes farmers prefer to leave the litter in the hutch and remove the doe so that weaning is less of a shock to the litter.

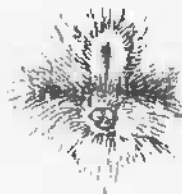
From weaning onwards the young rabbits can be fed on green food, vegetables and concentrates (see Chapter 5).

4.4.1 Sexing rabbits



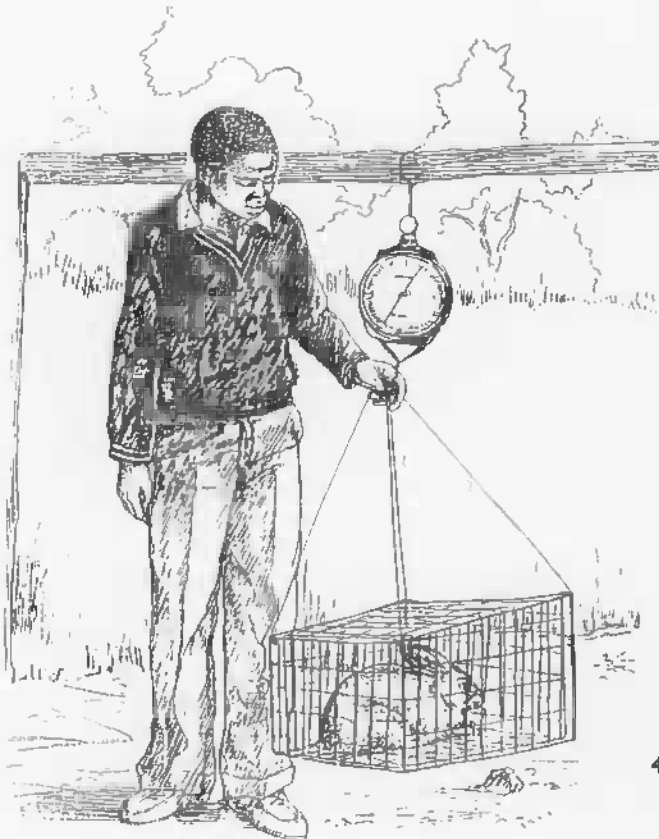
vulva

female



penis

male



4.4.2 Weighing rabbits

4.4 **Routine Attention to Young Rabbits**

At the same time as weaning, several other tasks can be done.

4.4.1 **Determining the sex of young rabbits** This is known as 'sexing' and is usually carried out at the time of weaning when the sexes are fairly easy to distinguish. The young rabbit is balanced on the forearm with the hand under the rump. The thumb and forefinger of the other hand press down gently on either side of the sex organ. In bucks the penis will protrude as a rounded tip, whilst in does the protruding vulva will appear as a slit (see Fig.4.4.1).

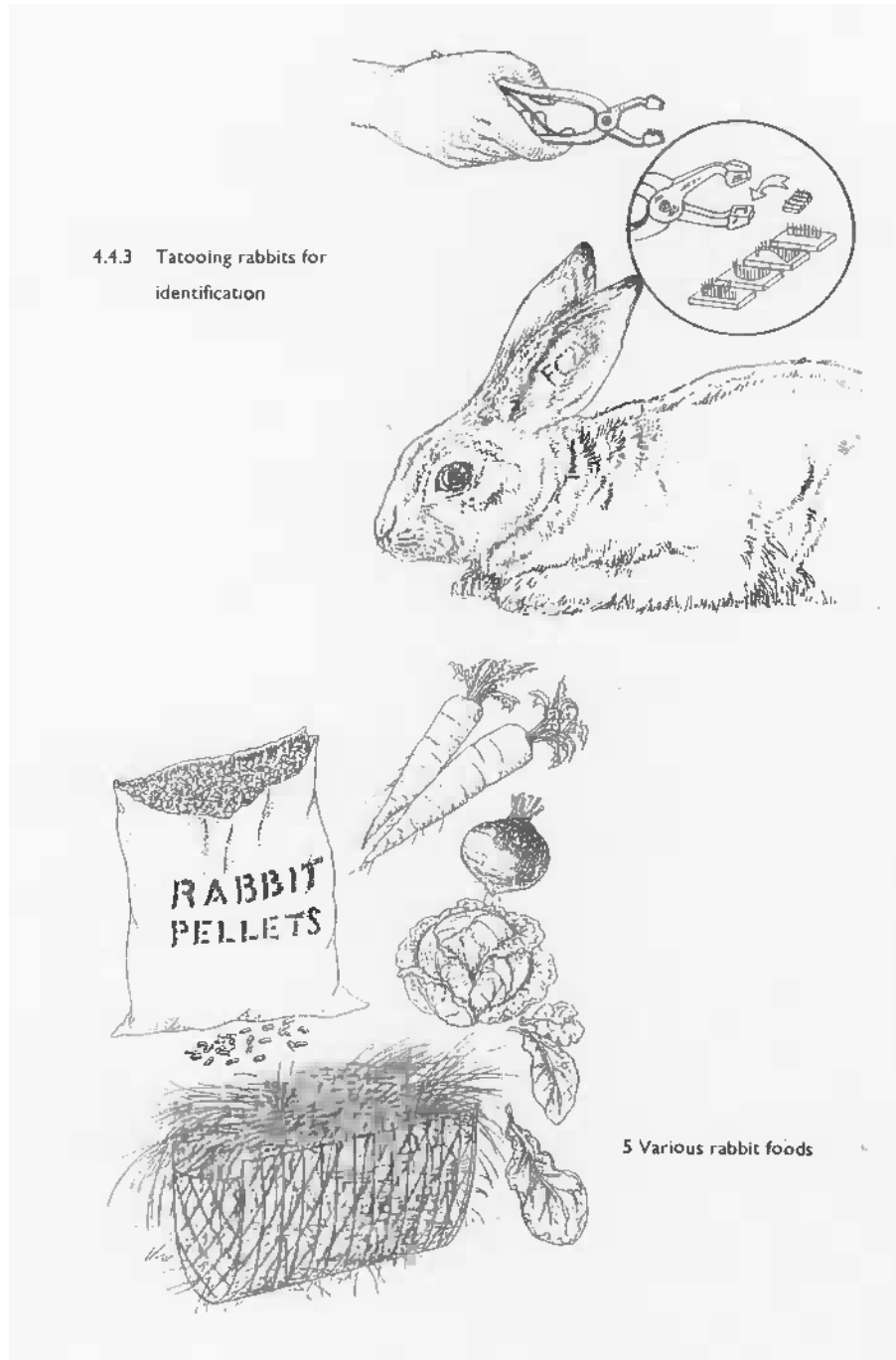
4.4.2 **Weighing young rabbits** The purpose of this is to obtain a record of how well the mother has reared her litter. Such records are very useful later in order to compare the breeding does and decide which are the best mothers from which replacements should be kept (see section 2.5). The weaners can all be weighed together in a basket or small cage (see Fig.4.4.2).

4.4.3 **Tattooing** In order to be able to identify young rabbits after weaning, it is necessary to mark them in some way. The best method is to tattoo a number in ink inside the ear of the rabbit. This can be done by writing the number with a special needle, or by using the equipment shown in Fig 4.4.3.

4.4.4 **Castration** If young male rabbits are kept in the same cage after weaning, they are likely to start fighting. There are two ways of preventing this - separation or castration. In the case of rabbits kept for meat, they may reach slaughter weight before any outbreak of fighting occurs. If not, then separating the rabbits is much better than castrating them.

Castration is only necessary if male rabbits are to be kept together for a long time such as in the case of Angora rabbits kept for the production of wool.

It is not an easy task, and should only be done by an experienced rabbit keeper.



4.5 Management of the Young Rabbits from Weaning Time

4.5.1 **Breeding Does** The young does which the farmer has selected for breeding can be reared as a group in a large hutch. One month before the date of their first mating (see section 3.3) the does should be separated and put into single hutches. This will prevent them from having false pregnancies (see section 3.5). These young does should be fed well so that they grow quickly, but do not overfeed them.

REVISION QUESTIONS

1. What do baby rabbits eat for the first 2-3 months?
2. What do we mean by weaning? When and how is it done?
3. What other tasks are done at the same time as weaning?
4. What is sexing? When and how is it done?
5. How should young breeding does be kept from weaning to the time of their first mating?
6. At what age are rabbits usually slaughtered for meat?
7. At what age will the baby rabbits start to eat solid food?

STUDY PROJECTS

1. Make arrangements to visit a rabbitry and observe the sexing of young rabbits done by an experienced rabbit keeper.
2. Ask an experienced rabbit keeper to show you how to handle rabbits of different sizes.

CHAPTER 5

FEEDING RABBITS

5.1 Introduction

Feeding is a very important factor in the production of rabbits. Rabbits which are enclosed rely on the rabbit keeper for all their food, so the rabbit keeper must know what his rabbits need.

Improvements in food quality (that is to say improvements in the energy of protein content of food) will lead to improvements in rates of growth and production. Increases in the quantity of food may also be of benefit, but if the food is of low quality, then the rabbit will not be able to eat enough to increase its rate of growth or production.

For the rabbit keeper, the problem is usually to find sources of food which are high in quality and low in cost. Roughage feeds are generally very cheap; concentrates are much more costly.

The main objective of the backyard rabbit keeper is usually to produce some meat for his family at little or no cost. The commercial producer, on the other hand, is trying to get as much profit from his rabbits as he can. The way these two types of producer feed their rabbits is therefore likely to be different.

In this chapter, we will discuss the rabbit's requirements for the various types of food and the main types of food under the following headings:

- (a) Bulky feed: that is roughage, like hay and grass (5. 2).
- (b) Concentrates (5. 3).
- (c) Water (5. 4).
- (d) Minerals (5. 5).
- (e) Vitamins (5. 6).
- (f) Changes in diet (5. 7).
- (g) Rations (5. 8).
- (h) Times of feeding (5. 9).
- (i) Freshness, cleanliness and hygiene (5. 10).

Appendix 1. gives some examples of feeds which can be used.

Appendix 2. gives conversion data - weight - volume - distance.

Appendix 3. gives details of the rabbit's nutrient requirements.

Appendix 4. shows how much of each type of food to give to rabbits.

5. 2 **Bulky Feed (Roughage)**

By bulky feed, we mean feeds like grass, vegetables, green leaves and hay. These are feeds of lower quality, but they are important because they contain a lot of fibre. Fibre is an essential part of the rabbit's diet. It helps the rabbit's digestive system to work properly. Fibre is also a useful source of energy (see 5. 2). If there is not enough fibre in the rabbit's diet, it will become ill.

5. 2. 1 **How much to feed** The amount of fibre needed in the diet depends on what the rabbit is doing. If too much is given, the rabbit will be too full to eat the higher quality feed that it needs. Lactating does and young growing rabbits need a lot of high quality feed.

Their rations should contain about 12 - 14% fibre (that is to say for every 100 grams of feed, 12 - 14 grams should be fibre). Adult, non-breeding rabbits can be fed a higher fibre diet with up to about 25% fibre in the ration.

If rabbits are given too much fresh greens, they may get diarrhea and bloated bellies.

5. 2. 2 **When and how to feed bulky foods** Rabbits are clean animals and will not eat dirty contaminated food. If bulky feed is given to them on the floor of their hutch, it will soon become dirty so a lot will be wasted. It is better to put the bulky feed in a hay rack or to tie it to the sides or roof of the hutch. Rabbits also like fresh food, so bulky food should be provided 2 or 3 times daily. Because rabbits are most active in the evening and early morning, it is a good idea to give them plenty of food in the evening. Also fresh bulky food will not wilt so quickly at night, especially if the days are hot.

5. 2. 3 **Examples of bulky feed** Bulky feeds can either be dried, like hay, or fresh, like grass.

(a) **Dry bulky feed** - Hay made from grass or legumes at the flowering stage is good quality roughage. The stalks of dead grass cut during the dry season are almost worthless; rabbits will not eat them unless they are starving.

(b) **Fresh bulky feed** - There is a great variety of these feeds. Some examples are:

- (i) Grasses
- (ii) Green cereals
- (iii) Legumes
- (iv) Roots
- (v) Green vegetables

It is most important that the rabbit keeper knows which plants are poisonous. Rabbits may eat poisonous plants if they are fed to them.

5.3 **Concentrates**

Concentrates are a high quality food, rich in energy and protein. Pregnant does, lactating does and young rabbits need more energy and protein than other adult rabbits. For the best rate of production, these rabbits need a diet rich in energy and protein. So concentrates are often fed in addition to bulky feeds.

5.3.1 **Examples of foods rich in energy**

Maize, sorghum, millet, rice and barley. These could be used in concentrate rations. Dry cassava and dry corn on the cob contain a lot of energy.

5.3.2 **Examples of foods rich in protein** Often used in concentrate rations are soya beans, groundnuts, cotton seed, grassmeal, lucerne meal, fish meal, bone meal, dry waste beer malt, wheat bran, rice bran, cow peas and legumes such as green beans. (Make sure the waste beer malt is dry because wet malt cause bloated bellies).

Some examples of concentrate mixes are given in Appendix 1. If concentrate rations are being mixed at home, it is a good idea to use more than one protein rich food in the ration.

5.4 **Water** Water is essential to all animals. If rabbits are not given enough water, they will not be able to eat properly and so will stop growing and lactating properly and may become ill.

5.4.1 **How much water do rabbits need?** The amount of water needed by a rabbit depends on the climate, the size of the rabbit, what the rabbit is doing and what the rabbit is eating. When it is hot, rabbits need a lot of water. A lactating doe needs more water than when she is not lactating. Rabbits eating dry food need more water than rabbits eating a lot of fresh greens.

5.4.2 **How often should they be given water?** The rabbit's water bowl should never be empty. Rabbits do not like dirty water, so clean their water bowls and give them fresh water at least twice daily.

5.5 **Minerals**

The most important minerals for rabbits are calcium, phosphorous and sodium chloride (salt). Calcium and phosphorus are needed by young growing rabbits to give them strong bones. Calcium is needed by lactating does.

For most rabbits, the diet should contain 0.5-0.7% phosphorus and 0.7-1.0% calcium. Lactating does need up to 1.8% calcium in their diet.

The diet should also contain 0.25-0.5% salt. This can be included in concentrates or provided as a salt lick or mineral block in the hutch.

5.6 **Vitamins**

Vitamins are essential for healthy rabbits. These are found in fresh greens. Usually commercial concentrate rations contain vitamins.

5.8 **Changes in Diet**

Any changes in the rabbit's diet should be done slowly. If the diet is changed too quickly, the rabbits will be ill and will not eat the food. A useful way to change the diet gradually is as follows:

Give $\frac{1}{4}$ new feed with $\frac{3}{4}$ old feed for 3-4 days
then $\frac{1}{2}$ new feed with $\frac{1}{2}$ old feed for 3-4 days
then $\frac{3}{4}$ new feed with $\frac{1}{4}$ old feed for 3-4 days
then all new feed.

5.9 **Rations**

5.9.1 **Bulky rations.** The backyard rabbit keeper is almost certain to rely entirely on bulky feeds for his rabbits. Grass and weeds gathered from around the homestead cost nothing but these are not available during dry seasons or periods of drought. At these times other sources of feed will have to be found. Rabbit keepers living near hospitals, hotels, schools, etc., can sometimes obtain kitchen waste containing scraps of bread and vegetables acceptable to rabbits. Those keepers can sometimes afford to reserve a plot in the vegetable garden for the production of vegetables for the rabbits during the dry season.

Much will depend on the feed, particularly with regard to protein. The use of legumes will help in this respect. Providing a good variety is recommended because it helps to ensure that the rabbits will get enough vitamins and minerals.

5.9.2 **Rations made up partly of bulky feeds and partly of concentrates**

Many rabbit keepers use both bulky feeds and concentrates for their rabbits. There may be several reasons for this:

- (i) An all concentrate ration may be too expensive.
- (ii) It may be difficult to obtain sufficient bulky feeds, especially during dry seasons, so some small producers give their rabbits a small amount of concentrate.

The main reason why the use of bulky feeds is limited in larger rabbitries is because they are time-consuming to gather and to feed and they may therefore be quite costly in terms of labour. This does not apply to the small rabbit keeper.

5.9.3 **Concentrate rations** Some large commercial rabbitries feed their rabbits on a ration of concentrates with no bulky feed. This can cause a lot of problems with rabbit's digestion.

There are two possibilities open to the rabbit keeper who wishes to feed concentrates.

- (i) The ration can be prepared at home from ingredients obtained locally. The feed value of the ingredients should be known. They must ground, if necessary, to form a meal and, then mixed together to give the correct nutrient balance. Minerals and vitamins are needed in such small amounts that they must be carefully mixed in to give an even distribution throughout the feed. This is best done by mixing together the minerals and vitamins with a small amount of one of the other ingredients. This premix is then mixed thoroughly with the remainder of the ration.

The advantage of home-mixing is that the ingredients can be fairly cheap, especially if grown by the owner himself. Certain other ingredients may be by-products of local industry such as baking or brewing, and also available fairly cheaply.

The difficulties concerned with home-mixing are:

- a) Knowing the exact feed values of the ingredients.
- b) Mixing the ingredients accurately and evenly.
- c) Maintaining a standard ration. Changes are often necessary owing to non-availability of certain ingredients, and these changes, if sudden, tend to put the rabbits off their feed.

(ii) Concentrates can be bought ready-mixed, usually in the form of rabbit usually pellets. The only disadvantage of rabbits pellets compared with home-mixed concentrates is their extra cost. However, their several advantages may more than compensate for this extra cost. These advantages are:

- a) Pellets are carefully manufactured according to a formula. The ingredients are analysed and well mixed together so that the product provides the rabbits with all their nutrients in the correct proportions.
- b) Rabbits find pellets very palatable.
- c) Pellets are usually free from dust.
- d) Little wastage occurs in the feeding of pellets if they are provided in an efficient type of feeder.
- e) Pellets are easily handled and the labour involved in feeding is therefore low.

5.10 Times of Feeding

It is a good idea to keep regular feeding times. Rabbits will learn when to expect their food. They will be happier if they are fed regularly at these times.

Rations consisting entirely of concentrates may be given all at once or in two feeds, at 7am and 5pm for example.

If green feeds, or other fresh bulky feeds, are part of the ration, it is advisable to feed most of these in the evening, as they will wilt faster if given during the day,

If the rabbits are being fed ad lib, it is simply a matter of making sure that there is always a feed in front of the rabbits. Concentrates given ad lib should be provided in hoppers.

5.11 Freshness, Cleanliness and Hygiene

All feeds, whether bulky or concentrated, should be fed as fresh as possible. Succulent feeds wilt quickly after cutting or lifting from the ground and should be fed with the minimum of delay. Hay and concentrates can be stored in cool, dry conditions. If there are suitable facilities for storage, hay that has been well made could be kept for up to a year, but concentrates should not be stored for longer than about six weeks.

Feed should be fed in a clean condition and free from dust. Feeders should be cleaned out thoroughly at least once a week, using a mild disinfectant. If home-prepared feeds are being given in the form of a wet mash, the containers should be cleaned thoroughly once a day.

The purpose of cleanliness is to prevent the growth of germs and outbreaks of disease amongst the rabbits.

REVISION QUESTIONS

1. What is bulky feed? Give 3 examples
2. What should the fibre content of rabbits' rations be?
Which rabbits need the least fibre and why?
3. What are concentrates? Which rabbits need the most concentrates and why?
4. Give 4 examples of protein rich foods.
5. Give 2 reasons for including fibre in rabbits' diets?
6. How much water could a lactating doe with a large litter drink on a hot day?
8. Give 2 reasons for feeding a ration of both bulky feed and concentrates.
9. Why is it important to give rabbits fresh and clean food?

STUDY PROJECTS

1. Bulky Feed Find out which local plants are good food for rabbits. Be careful to learn which plants are poisonous or make rabbits ill.
2. Concentrates Make arrangements to visit a rabbit keeper who feeds some concentrates to his rabbits. Discuss home mixing of concentrates. Find out -
 - a) which foods are used to make up the concentrates.
 - b) how much of each food is used.
 - c) how much it costs and where each food comes from.
 - d) what increases in production have been achieved by feeding concentrates.
3. Make arrangements to visit several rabbitries, commercial and backyard. Find out what the rabbit keepers are feeding their rabbits on.

CHAPTER 6

HOUSING FOR RABBITS

6.1 Introduction

Rabbits need to be housed to protect them and prevent them from running away.

There are several ways of housing rabbits depending largely on the money available for construction and the climate.

The backyard rabbit keeper usually cannot afford to spend much on materials for his rabbitry. He often has to make do with what he can find locally - old boxes, offcuts, bamboo, tin cans etc. The small commercial farmer, on the other hand, is interested in making his rabbitry convenient to operate and he may therefore consider the use of wire floors and other labour saving devices, but this will be more expensive.

Climate has an important influence on the design of the rabbitry. Rabbits must be protected from extremes of heat and cold, wind and rain. The more protection needed, the more costly the construction is likely to be.

In this chapter we will look at:

- (a) The comfort of the rabbit (6.2).
- (b) Labour efficiency (6.3).
- (c) Siting the rabbitry (6.4).
- (d) Buildings (6.5).
- (e) Materials for constructing the buildings (6.6).
- (f) Hutches (6.7).
- (g) Equipment, such as feeding bowls and drinkers (6.8).
- (h) Storage facilities (6.9)
- (i) The backyard rabbitry (6.10).

6.2 **The comfort of the rabbit**

The first thing to consider in the design of any system of housing is the comfort of the rabbits. If the animals are not comfortable, they will not do well. What do they need?

6.2.1 Space There must be sufficient room otherwise stress, fighting and injury may result.

6.2.2 Suitable temperature The ideal temperatures range is 10-20°. This is very difficult to maintain all the time. In general rabbits can tolerate cold more easily than heat. However they may suffer as a result of cold draughts or sudden changes in temperature.

6.2.3 Dry conditions The rabbit cannot tolerate wet conditions, so the hutches must be rainproof.

6.2.4 Ventilation Movement of fresh air through the rabbitry is essential, especially in hot weather. This air must be free from smoke and dust.

6.2.5 Security Rabbits are timid creatures, easily frightened by sudden noise and the presence of predators such as foxes, raccoons, snakes, rats, dogs and cats. A rabbitry should be built in a quiet place and if necessary a fence built to keep predators away from the rabbits.

6.2.6 Cleanliness and hygiene Disease is much more likely to occur in dirty conditions. Rabbits themselves are clean and animals and prefer to be kept in clean surroundings.

6.2.7 Food and water Without regular feeding and a plentiful supply of clean water, rabbits will not be contented. In the absence of these, even for short periods, they may suffer stress.

6.3 **Labour efficiency**

Although it is right to put the comfort and well-being of the livestock first, the person who looks after them should not be forgotten. This may not be quite so important in the case

of the backyard rabbitry containing only a few animals. Where larger numbers are kept, convenience becomes a more important factor, particularly with regard to feeding and cleaning out.

6.4 Siting the rabbitry

The choice of sites for the backyard rabbitry is usually fairly restricted. The following points are therefore more concerned with the small commercial unit which may be situated at some distance from the dwelling.

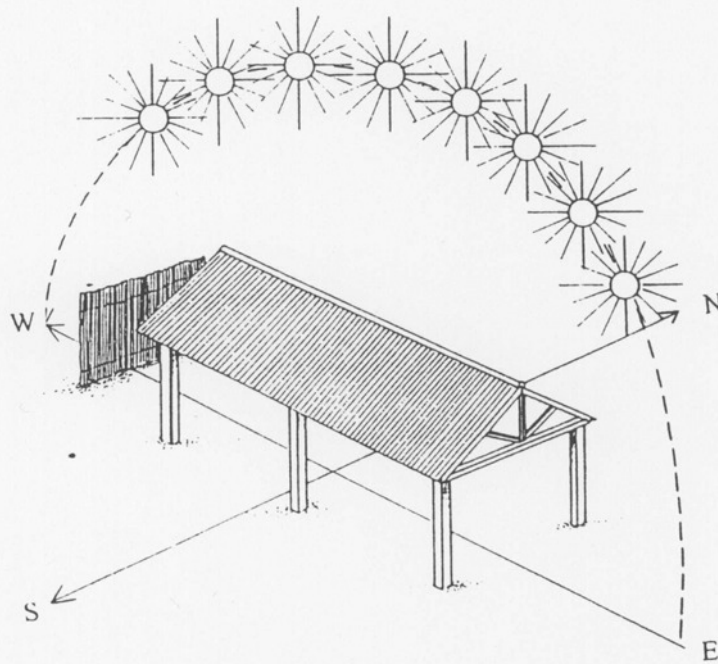
6.4.1 Communications Accessibility of the site is important for the delivery of building materials and feed and for the transport of produce to market.

6.4.2 Security There is probably no way of keeping out a really determined thief. Measures can be taken to make it as difficult as possible for a thief to break in. These may include surrounding the rabbitry with a good fence, including a burglar alarm, fitting bars across windows and good locks on doors. Keeping a watchdog can act as a deterrent.

6.4.3 Drainage A well drained site is important in areas where heavy rains and flooding are liable to occur. Two factors affecting drainage are the slope of the land and the type of soil. The worst situation is in a hollow where the soil is heavy clay. Water is likely to lie on the surface of the ground for a long time after a storm. Gentle slopes, on medium to light soils, provide the best sites.

6.4.4 Water Rabbits need a plentiful supply of fresh, clean water for drinking. Water is also needed for cleaning the rabbitry and equipment.

6.4.5 Climate Careful siting can often help to minimise the harmful effects of the weather. Shelter from the prevailing wind is desirable and can sometimes be provided by natural features such as trees and bushes. Although sunlight is good for rabbits, they need to be protected from the direct rays of the sun during the middle of the day. For this reason the roofs of rabbit buildings in the tropics and sub-tropics should run east-west (parallel to the path of the sun), thereby providing as much shade as possible.



6.4.5 Siting the rabbit house - in a line east to west, to give protection from the sun

6.5 Buildings

The main function of a rabbitry are to provide protection from adverse climatic conditions, from predators and from thieves. In some systems, particularly the smaller ones, the hutches themselves have a solid roof and walls which provide shelter from wind and rain and shade from direct sun. These hutches are suited for standing outside in the open.

In the larger rabbitry, the hutches are usually arranged within a building or under a shelter.

6.6 **Materials for constructing the buildings**

A wide range of materials can be used for construction. Availability and cost are the most important criteria in deciding what to use.

6.6.1 The Roof For the small rabbitry a thatched roof is appropriate. Although thatch does not last so long as certain other materials, such as corrugated iron, it has much better insulating properties against heat and cold. If the roof is properly made it should keep out the rain for several seasons. The initial work and subsequent maintenance of thatch can become costly in the case of larger buildings and for these it may be better to use galvanised iron.

To overcome the poor insulation provided by an iron roof against the heat of the sun, materials such as palm leaves can be fastened on top during very hot weather.

The roof can be supported by poles set in the ground to a depth of at least 100cm. Concrete is sometimes used to fill in the holes in order to increase rigidity. Any strong poles can be used as long as they are reasonably straight. For the heavier type of roof, a pole with a top end of at least 10cm diameter is desirable. The thick end of the pole which goes into the ground should be protected against termite damage by painting with some form of preservative, such as creosote. The roof timbers can also be made from poles, which are cheaper than sawn timber. In savannah areas where poles are not available, columns to support the roof can be built from bricks.

6.6.2 The Walls The use of bricks made locally can help to keep down the cost of the building. In areas where there are forests, offcuts of wood can sometimes be obtained cheaply from 'saw mills' and may be used in place of brick for the walls.

Those parts of the building where no solid wall is required may be left open partly covered by a variety of materials. Iron or wooden bars, spaced close enough, or diamond mesh, may deter thieves or larger predators. Small predators, such as rats and snakes, can only be kept out by 13mm chicken wire netting, which is expensive. Materials such as bamboo mats, hessian and polythene, which are arranged to roll up and down at the sides of the building, enable the temperature and ventilation to be

controlled to a certain extent. These materials can sometimes be provided in a cheap form such as old fertiliser and feed bags.

6.6.3 The Door This may be constructed from materials which include sawn timber, offcuts, small bush poles, iron sheets, wire netting, bamboo etc.

6.6.4 The Floor The provision of a concrete floor, while rather costly, has certain advantages in an enclosed or semi-enclosed building. The main advantage lies in being able to clean out and disinfect the building thoroughly. In the simplest designs the floor slopes gently towards the door.

If a concrete floor cannot be provided, the earth floor should be rammed hard which will discourage rats from building nests.

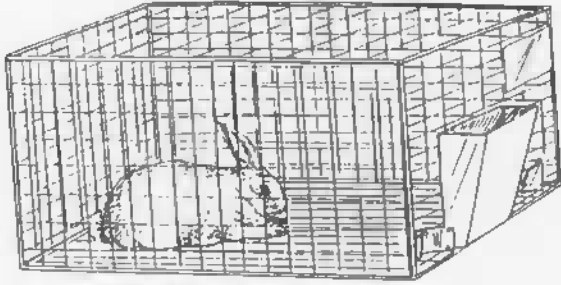
6.7 Hutches

Rabbits spend all their lives in the hutches, the construction of which is therefore of prime importance. There are several things to consider: the dimension, the materials used in construction, the arrangement within the building and the number of hutches required.

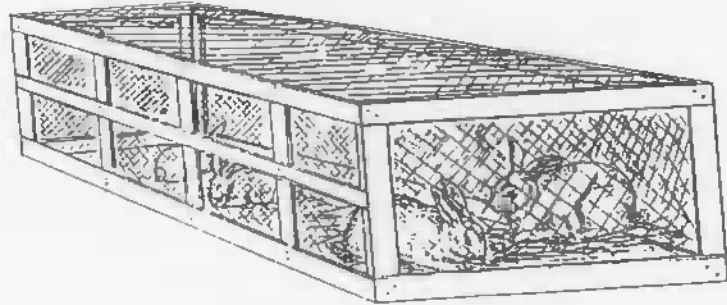
6.7.1 Hutch dimension

(a) The Breeding Hutch We shall consider first the standard breeding hutch which must be large enough to accommodate the doe together with her litter until weaning time. Suitable dimensions of hutches for different mature weights of rabbit are shown below.

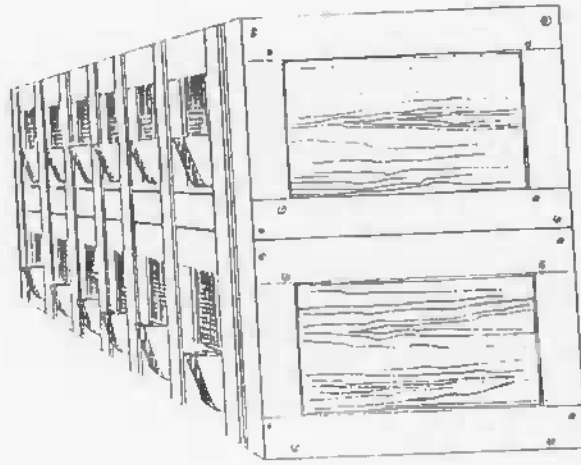
<u>SIZE OF RABBIT</u>	<u>DIMENSIONS OF HUTCH (cm)</u>		
	<u>Length</u>	<u>Breadth</u>	<u>Height</u>
Large (over 5kg)	120	60	60
Medium (4-5kg)	100	60	55
Small (2.5-4kg)	80	60	50



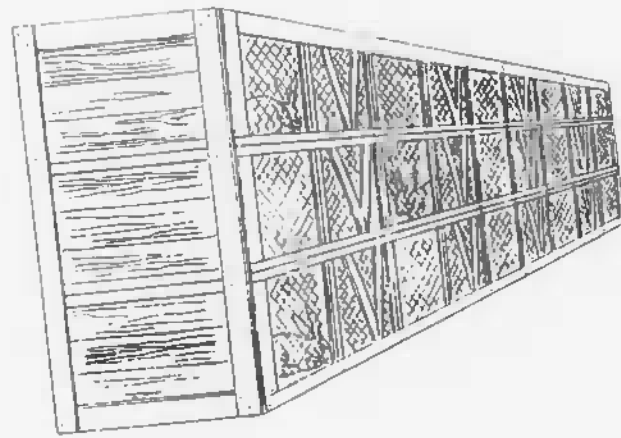
single hutch



colony hutch



two and three tiers



(c) Hutches for Bucks Although bucks can be kept in the same size hutch as for single does, the larger breeding size of hutch is recommended.

(d) Colony Hutches (see Fig. 6.7.1) At weaning, two or more families of young rabbits are sometimes combined together and moved to a colony hutch for fattening.

Below is a table to give a guide to the floor area required for young rabbits kept together from weaning until they weigh 2kg each (rabbits are often slaughtered at this weight).

Number of rabbits kept together up To 2kg weight	Dimensions of colony hutch floor
--	----------------------------------

5 rabbits	2m x 1m
10 rabbits	2m x 2m
15 rabbits	2m x 3m
20 rabbits	2m x 4m

6.7.2 Materials for construction of hutches

(a) Wood and wire netting These were the most common materials used to make rabbit hutches and they still are often used today. The frame consists of timber of approximately 50 x 25mm thickness to which wood is nailed for the floor and wire netting for part of the front. The rest of the front is a door made of wood or wire netting with a wooden frame. The back, sides and roof of the hutch are covered with either wood, wire netting or a combination of these, depending on the climatic conditions. Outdoor hutches are usually all wood, except for the front. The roof is covered with felt or iron with a slight slope so the rain runs off.

Indoor hutches, particularly in hot countries, should be covered mostly with wire netting to allow for maximum ventilation. The main advantage of using wood lies in its relative cheapness and availability.

What are the drawbacks in the use of wood for rabbit hutches? One is that rabbits are fond of gnawing it and edges which are vulnerable may have to be protected with strips of metal. Another disadvantage is that hutch floors made of wood get rotten in time from urine.

(b) Weldmesh Today it is common to find rabbit hutches, or cages, constructed entirely of this material. There are several advantages over wood:

- (i) Construction is simple and quick.
- (ii) Little maintenance or repairs are required.
- (iii) Droppings and urine pass through the floor of the hutch so that bedding is unnecessary. Much less work is required to keep these hutches clean than in the case with hutches with solid wood floors.

The following are some points to note in the use of weldmesh in the construction of rabbit hutches:

- (i) The material is available in different weights or thickness (gauge) and in different mesh sizes.

Cage floors should be made of 14 or 16 gauge with a mesh size of 19 x 19mm or 25 x 13mm. The walls and roof can be constructed of lighter wire (16-20 gauge) with a mesh size of 25 x 25mm. Aluminum is the best material, but metal which has been galvanised after welding is also resistant to corrosion.

- (ii) The material is bought in rolls and cut into suitable lengths using strong wire cutters. (Time can often be saved in construction by bending lengths to form two or more walls. Also hutches can be made in groups rather individually). In order to join lengths of the material together it is necessary to use special metal clips and pliers designed for the purpose.

- (iii) After construction of the cages, care should be taken to see that there are no rough edges on which the rabbits could injure themselves.

6.7.3 Hutch Doors It is worth spending time in the construction of the doors so that they will be secure and convenient to operate.

The details of the construction will vary according to the type of hutch but these general principles apply in most cases:

- (a) The door should be large enough to allow every part of the hutch to be reached easily by hand and should therefore measure about 40 x 40cm.
- (b) In a line of hutches, the doors should all open the same way according to the direction in which the attendant normally travels along the line.
- (c) Door fastenings should be of a standard type - easy to operate and secure.

6.7.4 Arrangement of the hutches within the building

Inside the building hutches can be arranged in several different ways, depending on the size of the building and the system of manure collection. In a large rabbitry there may be up to three hutches high or each row may be only one hutch high. Whatever the arrangement, the lowest hutches should be at least 50cm above the ground. Also all hutches should be at least 90cm away from any walls to allow proper ventilation.

(a) The single-tiered arrangement

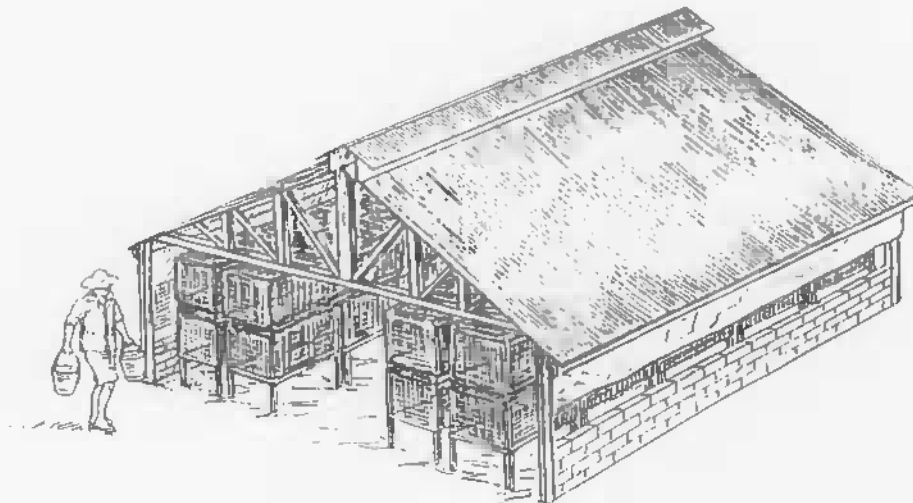
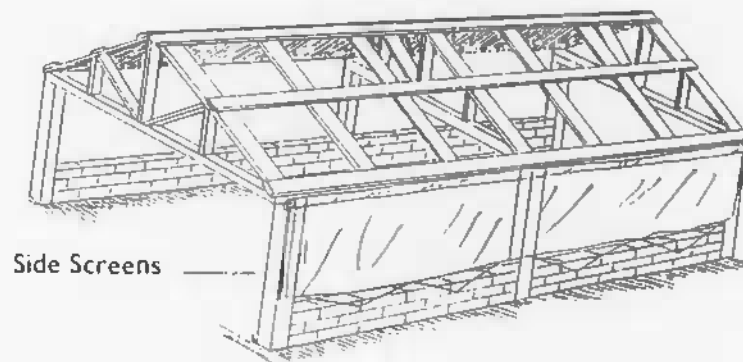
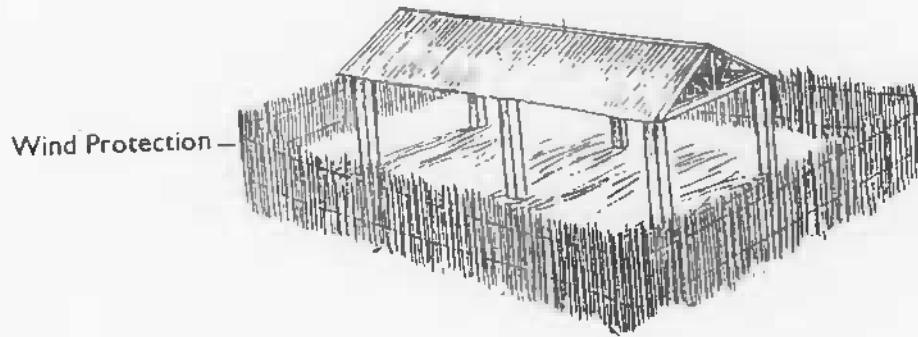
With this arrangement, each row is only one hutch high, but several hutches long. So the hutches will all be at the same height from the ground (at least 50cms). It is convenient to have the hutches at eye level if the hutch doors are at the front of the hutches. Some wire hutches have the doors in the roof of the cage, so it is easier if hutches are arranged at a lower level.

When hutches with wire mesh floors are used in the single-tiered arrangement, the droppings and urine pass through the wire mesh onto the ground. The disposal and use of rabbit manure is discussed in section 8.6.

b) The multi-tiered arrangement With this arrangement, each row has two or three tiers of hutches.

The advantage of this is that more hutches can be kept in the one building. The main disadvantage is that with hutches with wire mesh floors, trays are necessary to catch the droppings and the urine, so that they do not fall on the rabbits below. These trays need

6.7.4 Rabbit Housing



4. Row Arrangement

frequent cleaning. If hutches with solid floors are used, these need cleaning out every day. So the multi-tiered system is more labour intensive than the single tier system.

6.7.5 Supporting the hutches There are various ways in which the hutches may be mounted or supported.

- (a) The hutches may be mounted on horizontal supports which are fixed to the upright poles supporting the roof (see Fig. 6.7.5).
- (b) Each hutch may be mounted on an independent stand.
- (c) The hutches may be suspended by wires from the roof of the building. This method is of course the cheapest and although the hutches are not held rigid and may sway about slightly, the rabbits do not suffer as a result. It also has the advantage of making it more difficult for rats to get into the hutches as there are no legs to climb.

6.7.6 Number of hutches required The breeder should make sure that he has enough hutches to accommodate his rabbits at all times.

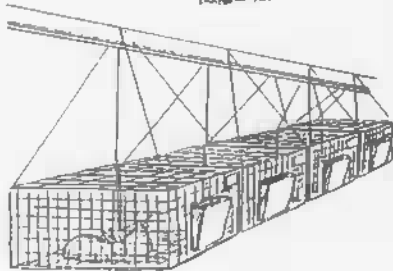
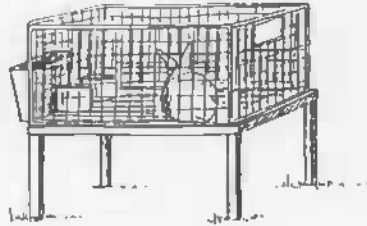
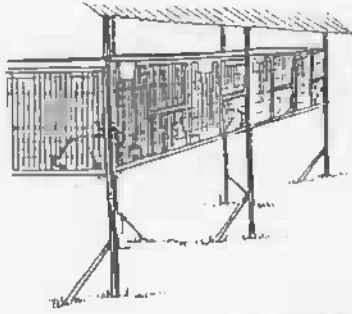
The actual number and size of hutches required will depend on certain factors, the most important of which are:

- The average number of litters per doe per year.
- The age at which young rabbits are slaughtered. The younger they are at slaughter, the less time they occupy a hutch.

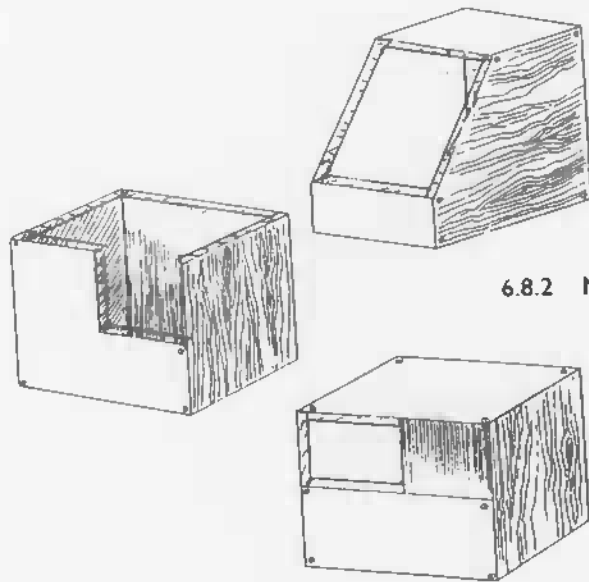
Having hutches empty for short periods is necessary because it provides an opportunity for thorough cleaning and disinfection.

In general, if the breeder is aiming for four litters per doe per year, he will need one single size hutch for each doe, and two birth and rearing hutches for her offspring; also each buck will require his own hutch.

6.7.7 Quarantine hutches Whenever a new rabbit is brought in to the rabbitry from somewhere else, it must be kept in isolation in a quarantine hutch for two weeks. If it is



6.7.5 Support for hutches (on posts or supported by wires)



6.8.2 Nesting boxes, various types

incubating a disease when it is bought, it will start to show signs of the disease during its two weeks in quarantine. It can then be treated or returned to its previous owner or slaughtered according to the condition. (see Chapter 7). In this way it will not have been in contact with any other rabbits and so the disease should not spread.

Any sick rabbits from the rabbitry should also be put into a quarantine hutch.

The feature of quarantine hutches are:

- (a) The hutches must be in a separate building away from the main rabbitry.
- (b) A bucket of disinfectant and a pair of overalls should be at the entrance to the building.
- (c) Each hutch must be separated and there should be no way for a rabbit in a quarantine hutch to be in contact with any other rabbit.
- (d) Because some diseases are transmitted in the air (sneezing for example), the sides of adjacent cages should be solid. There should be a passage of at least 100cm wide between rows of hutches (because the hutches will have wire fronts so that the rabbit keeper can see in.)
- (e) The manure from each hutch should not be allowed to fall onto the ground. It should be collected and burned.

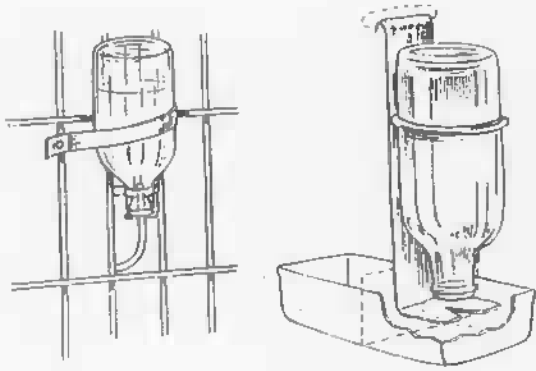
6.8 Equipment

The amount and type of equipment used in the rabbitry depends a great deal on the producer. What can he afford to buy? What can he make himself or adapt from articles, such as old cans and boxes that are available locally?

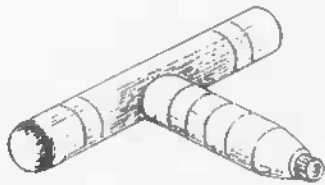
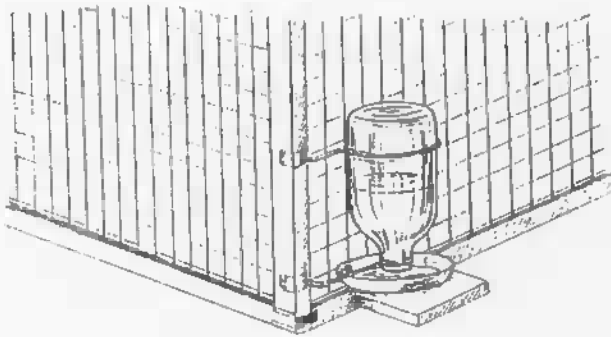
6.8.1. Drinkers A good source of drinking water is most important.

- (a) Old oil cans with the tops cut off. These are quite commonly used and have the advantage of costing nothing. Care should be taken to make sure that the edges are not rough or sharp to avoid injury to the rabbits. The cans will go rusty in time but can be replaced. A means must be found to prevent the rabbits from turning the cans over, which some rabbits will do even if the cans are full of water.

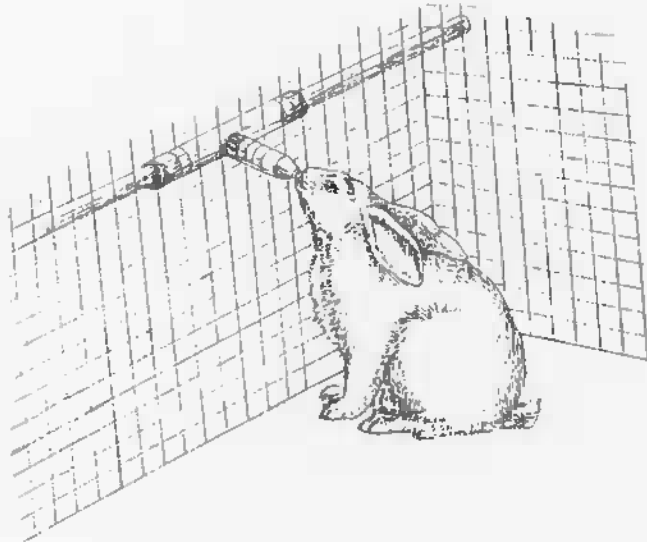
6.8.1 Watering equipment



Inverted bottles



Automatic system



There are two ways to do this:

- (i) Wire the can to the edge of the cage or to the hutch door.
- (ii) Fasten the base of the can to a bigger piece of solid wood.

(b) Containers made of earthenware or concrete These can be made locally and are therefore fairly cheap. As they are heavier and wider than cans, they are not so easily overturned (see Fig. 6.8.2). Their disadvantage is that, if made too shallow, the rabbits sometimes foul the water.

(c) Bottles Inverted one litre bottles fixed to the side of the hutch can be arranged to provide water in two ways (see Fig.6.8.1).

- (i) The mouth of the bottle is arranged over a tray, most of which is inside the hutch. Water passes from the bottle into the tray until stopped by atmospheric pressure. The rabbits drink from the tray and water flows in to replace what they have drunk (see Fig. 6.8.1).

- (ii) A 6mm glass tube leads from the bottle into the cage. Rabbits will soon learn to suck water through the tube, water will not pass through it without the small amount of suction which the rabbits are able to exert.

The advantage of providing water in this way is that it can not be contaminated by the rabbits. The disadvantage is that it is a labourious job to re-fill the bottles compared with re-filling cans and other open containers.

(d) Automatic water supply (See Fig. 6.8.1) A system of automatic drinkers is costly to install and is normally only considered by the commercial producer.

A tank is installed in the rabbitry above the level of the rabbits and water flows from it under gravity along polythene pipes close to the hutches. A short branch pipe enters each hutch at a convenient height for the rabbits to drink. A nipple screwed in to the end of this pipe allows the rabbit to drink from it.

The main advantage of this system is in saving labour, but care should be taken to check it every day to make sure it is functioning properly.

6.8.2 Feeders There are several types of containers for providing concentrates.

(a) Cans and earthenware pots These are similar to those used for supplying water and have the same advantages and disadvantages.

(b) Hoppers These can be made from galvanised iron or from old food cans (see Fig. 6.8.2). The most convenient type allows the feed to be replenished from outside the hutch. It is important that the lip of the trough should be set at the correct height above the floor of the hutch, at about 10cm high.

(c) Hay racks Racks can be constructed in various ways. They should be arranged so that the feed can be put in the racks without having to open the door of the hutch (see Fig. 6.8.2).

6.8.3 Nest Boxes The importance of the nest box is explained in section 3.5. Without the nest box, an alternative is to place a clean sack or piece of cloth on the floor of the hutch, together with plenty of fresh bedding which may be soft hay, straw or grass. If the doe has no means of making a nest, the babies will almost certainly die from cold or neglect.

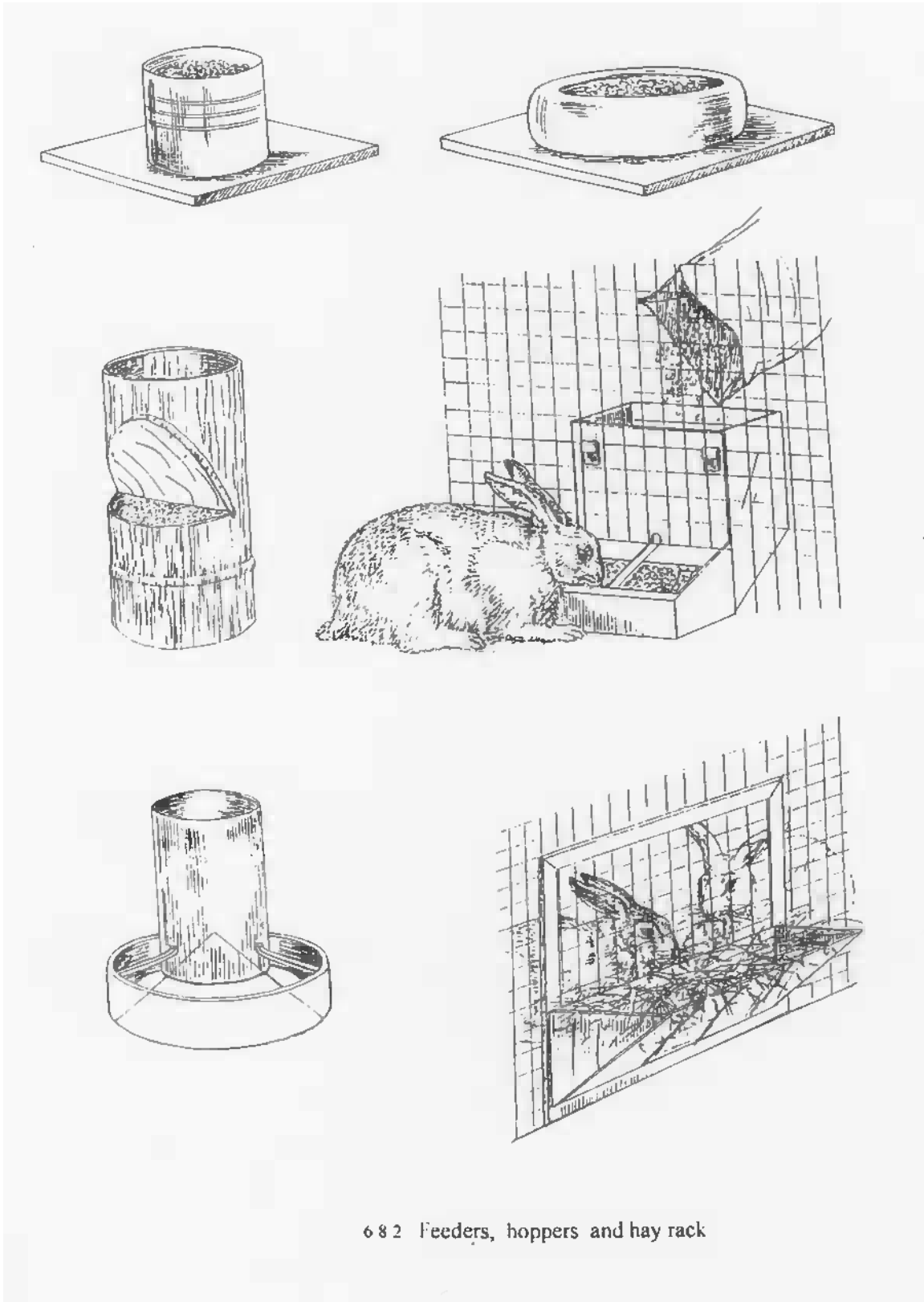
Nest boxes can be made from a variety of materials (wood, plywood, hardboard, bamboo) or provided in a form of wooden or cardboard boxes or baskets. There are various designs with and without tops. The recommended dimensions are 40cm x 30cm x 30cm (high).

6.9 Storage

Sufficient space for storage is important in the rabbitry. What needs to be stored?

6.9.1 Feed Storage Hay is one item that may have to be stored. If it is made during the growing season and fed to the rabbits during the dry season when fresh green fodder is not available. Hay which has to be bought in at this time can be expensive and it may therefore be worthwhile for a small farmer to make some himself and store it .

He can store hay for a year or more, provided he has a suitable storage place where the hay can be kept dry.



682 Feeders, hoppers and hay rack

Concentrates should not be stored for more than six weeks by the rabbit producer. The best containers for storing grains and rabbit pellets are metal bins, but these are costly. Earthenware containers, made locally, are cheaper substitutes. Sacks are not good for storing feed as they are easily damaged by rats. If sacks have to be used, even for a short time, they should be placed away from walls and with the bottom layer of sacks off the ground on a low wooden platform. This allows circulation of air and helps to prevent the feed becoming damp when it would become lumpy and bad. Buildings where feed is stored should be rain proof and cool.

6.9.2 Medicines A special place should be reserved for keeping any medicinal products that are used for the rabbits. This may be in a locked cabinet in the feed store or within the owner's house. Medicines and medical equipment (syringes etc.) should be kept in cool, clean surroundings. Bottles should be clearly labelled. Keep all medicines away from animals and children.

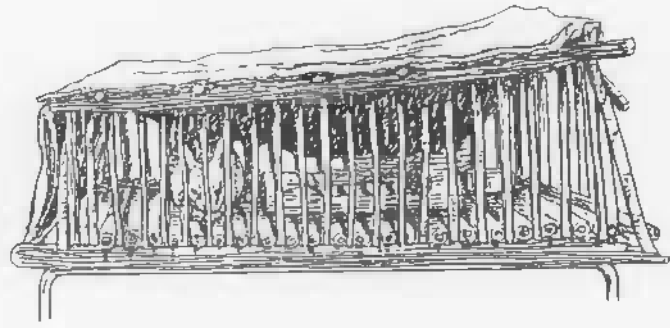
6.9.3 Products Rabbit meat should be consumed or sold as soon as possible after slaughter. This is especially true in hot climates where fresh meat goes bad very quickly. The only way of storing rabbit meat for any time is in refrigerators (for a few days) or in freezers (for a few months).

The storage of rabbit skins is dealt with in section 8.5.

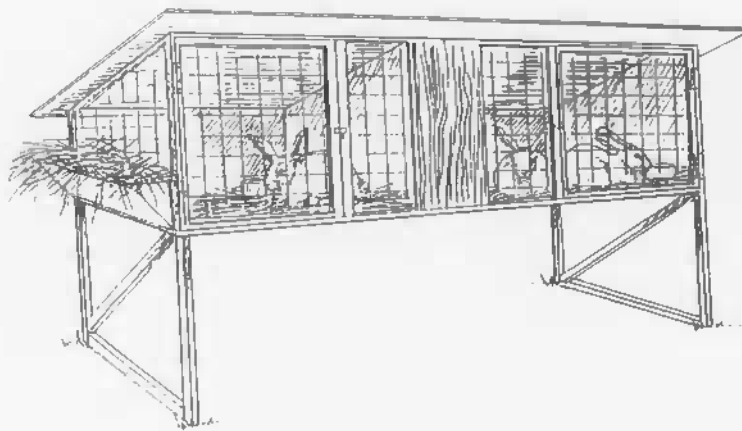
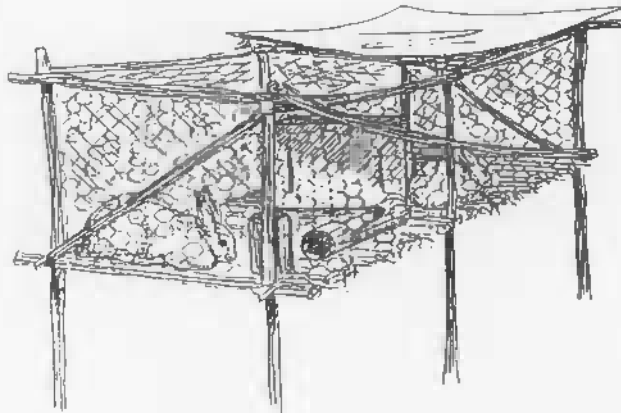
6.9.4 Cleaning Equipment Thorough cleaning and disinfection of the rabbitry on a regular basis is very important (see section 7). Because of this, a suitable place should be set aside for the storage of all equipment and materials that are used for this, such as brushes, brooms, cloths, detergents and disinfectants.

6.10 The Backyard Rabbitry

Backyard rabbit keepers have different methods. In many cases the rabbits are not kept in individual hutches but in larger enclosures.



Cheap construction



Improved type

6.10 Backyard rabbit keeping

Separate hutches are a big advance over one single enclosure because it is then possible to keep control over breeding.

Let us start with the prospective rabbit keeper who has no money at all to spend on housing. Any hutches or shelters have to be constructed from materials that are available and free.

It is usually necessary to have a strong rainproof roof for the hutches so that they can stand outside. This would not be necessary if a shed was available in which they could be put. An alternative is to fix an awning to one of the walls of the dwelling house and to have the hutches underneath.

REVISION QUESTIONS

1. Why it is necessary to house rabbits?
2. Describe three of the most important factors in the design of housing relative to the comfort of the rabbit.
3. What materials can be used for constructing the buildings?
4. What materials can be used for making hutches?
5. How can the hutches be arranged within the building?
6. How can the hutches be supported?
7. What are the quarantine hutches for? What are the special features of quarantine hutches?

STUDY PROJECTS

- 1 Visit several rabbitries and study the design of hutches and buildings. Do not forget that a good rabbitry not only needs to give protection to the rabbit, it should also be cheap to construct and ease to use. Decide what locally available materials should be used.
2. Discuss the problems of siting the rabbitry.

CHAPTER 7

DISEASES AND OTHER HEALTH PROBLEMS

7.1 Introduction

Health care is an important way of making sure that rabbits stay productive. Every rabbit keeper should know how to recognise and, if possible, prevent and cure illness which can affect rabbits.

Much has already been said in this book about preventing sickness and injury. Good feeding and proper housing, for example, are as important as anything described in this chapter. This is especially true for rabbits because they are not free to find their own food and shelter. They rely entirely on the rabbit keeper to provide everything they need.

In this chapter we look at:

- a) The recognition of health and disease (7.2).
- b) Prevention of disease (7.3).
- c) Resistance to disease (7.4).
- d) What to do if there is an outbreak of disease (7.5).

We will also look at the symptoms, causes prevention and treatment of 12 particular problems:

- e) Coccidiosis (7.6)
- f) Snuffles and cold (7.7)
- g) Haemorrhagic septicemia (7.8)
- h) Pneumonia (7.9)
- i) Tuberculosis (7.10)
- j) Salmonellosis (7.11)
- k) Myxomatosis (7.12)
- l) Mastitis (7.13)
- m) Injuries and abscesses (7.14)
- n) Internal parasites (7.15)
- o) External parasites: mange, ear canker, etc. (7.16)
- p) Poisoning (7.17)

7.2 The Recognition of Health and Disease

A good rabbit keeper takes time to look at his animals carefully every day. He is checking to see that they are healthy and are not showing any signs of disease. If anything is not quite right he must recognise it early to prevent it from becoming more serious. What signs should he look for?

7.2.1 Coat The coat of the animal should be sleek and glossy all over with no dull patches. The shedding of hair (moulting) at certain times of year is quite normal but scurf (loose flecks of skin) should not be present on the coat.

7.2.2 Eyes The eyes should be bright with no discharge coming from them. The rabbit should appear alert.

7.2.3 Movement When it moves, the movements should be easy and free. When resting it should be relaxed and breathing evenly and silently at a rate of from 38-65 breaths per minute. The rabbit should not sit huddled in a corner, nor should it move stiffly.

7.2.4 Appetite A normal appetite is a good sign. If an animal suddenly goes off its food, the cause should be investigated immediately. It could be an early sign of disease, or it could be due to a sudden change in diet.

7.2.5 Droppings These should be normal in amount and appearance. Any signs of diarrhea should be noted and the cause investigated.

7.2.6 Body The body of a healthy rabbit is well fleshed in the right areas - the back, loins, rump, thighs and shoulders. It should not appear 'bony', nor should it be 'pot-bellied'.

7.2.7 Weight and Growth Adult rabbits should stay at about the same weight, though some breeding females tend to lose weight when they are suckling their young.

Loss of weight, or failure to grow, accompanied by a harsh, starting coat, is probably caused by disease.

7.2.8 Discharges There should be no discharges from any part of the body including the eyes, nostrils, mouth, vent, anus and teats.

7.2.9 Sores and Swellings The skin should be free from sores and there should be no swellings anywhere

7.2.10 Temperature and Pulse The pulse rate of a healthy rabbit is normally 140-150 per minute and the body temperature is 39°C. These are not checked every day of course, but only if a disease is suspected.

7.3 **Prevention of Disease**

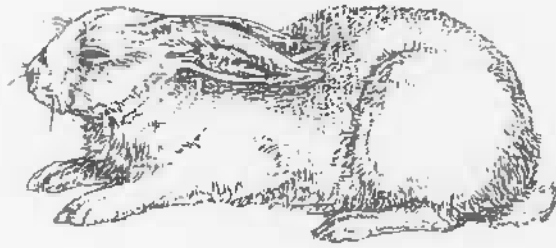
The best way to deal with disease is to prevent it occurring by good management. The following measures will help to prevent disease:

7.3.1 Buy from a reputable breeder Any new rabbits bought in should come from a reputable breeder with a good record of health in his rabbitry.

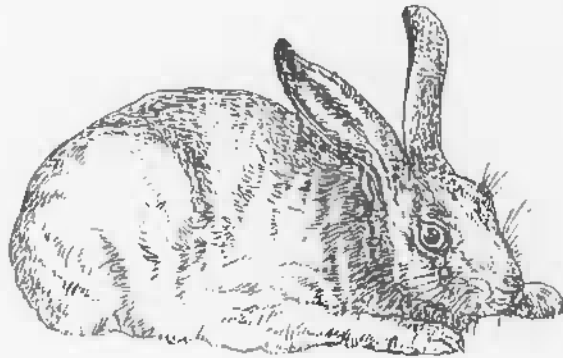
7.3.2 Quarantine quarters should be established in a place separate from the other rabbits (see Section 6.7). They should be used for:

(a) New arrivals These should be kept for two weeks in quarantine to make sure they are free from disease. Rabbits returning to the rabbitry after a period of absence (e.g. for showing or mating) should also spend two weeks in quarantine.

(b) Rabbits suspected of having a disease If a disease which can be spread from one rabbit to another, such as myxomatosis, is suspected, the affected animals should be isolated (see Section 7.5).



healthy



an unhealthy rabbit



7.3.2 Cleaning, washing and disinfecting a nest box
rabbit

7.4 **Resistance to Disease**

All animals have a certain amount of built in resistance to disease. If this resistance is lowered in any way the animal becomes more likely to catch a disease. There are many things which may lower the resistance to disease, some of which are due to bad housing and management, such as cold, wet, draughty conditions and poor feeding.

The presence of one disease may also lower the resistance so that the animals get another disease as well. For example snuffles may lead to pneumonia, particularly if the rabbit is cold or damp or poorly fed.

7.5 **Action to take on the outbreak of disease**

If the measures outlined in the previous section are taken, a serious outbreak of disease will be unlikely. However disease can occur in even the best managed rabbitries and the rabbit keeper must be prepared to deal with it. Careful observation of his stock every day will enable him to detect signs of possible disease at an early stage. Action may then be as follows:

7.5.1 Isolate any animals suspected of having an infectious or contagious disease. This means that they should be kept in cages in a totally separate place from all the other rabbits including wild rabbits (see Section 6.7.7 Quarantine Hutches). During your daily routine, you should attend to your healthy rabbits first, then go to treat your sick rabbits in the quarantine area. Wear if possible different overalls when treating the sick rabbits and leave them hanging up in the quarantine building when you finish.

Put a bucket of disinfectant near the sick rabbits and thoroughly wash your hands, arms and boots in it after treating each sick rabbit.

7.5.2 Thoroughly clean and disinfect the hutch and all equipment which has been used for the affected rabbits.

7.5.3 Comfort Make sure the sick rabbits are warm and comfortable to give them the best chance of recovering from the disease.

7.5.5 If possible diagnose the trouble and take appropriate measures to treat it. In the case of valuable breeding stock, call the veterinarian or your extension agent.

7.5.6 If the animal does not respond to the treatment, or if there is no treatment for the particular disease (e.g. Myxomatosis), it is necessary to slaughter the animal and burn the carcass.

Never eat the carcass of a diseased rabbit and do not feed it to any other animals (such as dogs). The disease will still be in the carcass and may infect people or animals if they eat it. Always burn the body of a rabbit which died because of disease.

7.6 Coccidiosis

7.6.1 Symptoms (the signs by which the disease is recognised). Coccidiosis is a disease of the intestines and sometimes the liver. It is more common in younger rabbits just after weaning but it can also affect older rabbits. As rabbits get older they sometimes develop resistance to coccidiosis.

An affected rabbit usually has diarrhea, sometimes with a little blood in it. It will often sit hunched up, with its legs extended forwards. The fur will look dull and harsh, and the rabbit will lose weight.

7.6.2 Cause Coccidiosis is caused by protozoa called Eimeria. It attacks the intestines and sometimes the liver. The droppings (usually diarrhea) of affected rabbits will contain many Eimeria eggs. These can be identified by sending a sample of an affected rabbit's droppings to a laboratory for examination. The disease is passed from one rabbit to another by these droppings and by contamination of feed, bedding and hutch equipment.

7.6.3 Prevention (see Section 7.3) Regular thorough cleaning and disinfection of hutches and equipment is especially important with Coccidiosis. To prevent the disease from spreading, it is essential to keep everything absolutely clean, particularly the hutches, feeders and drinkers.

7.6.4 **Treatment** As already discussed in Section 7.5 Drugs used for treatment are:

- (i) Sulphamezathine. Give 1ml per 1.5 litres drinking water per rabbit per day.
- (ii) Sulphaquinoxaline. Give in feed, mixed at a rate of 255g/ton.
- (iii) Pancoxin (Amprolium manufactured by Merk Sharp & Dohme).

7.7. **Snuffles and Colds**

7.7.1 **Symptoms** Snuffles is a serious, very contagious disease. Affected rabbits have a thick, sticky, white nasal discharge. They sneeze a lot and have a high temperature. The fur on their legs become matted. Snuffles may develop into haemorrhagic septicaemia (see Section 7.8) or pneumonia (see Section 7.9). Sometimes affected rabbits develop abscesses. Snuffles must not be confused with colds or temporary irritations (caused by smoke or dust in the air for example) A rabbit with a cold or a temporary irritation will sneeze and have a thin, clear, runny nasal discharge. It will usually not look ill.

7.7.2 **Cause** Snuffles is caused by bacteria called Pasteurella. These bacteria can also cause several other diseases such as pneumonia, haemorrhagic septicaemia, genital infections, conjunctivitis, middle ear infection and abscesses. If a rabbit has a lot of resistance to disease (see Section 7.4) it will probably not be as ill as a rabbit with low resistance. So poor nutrition, and bad housing, which lower the resistance to disease, will make a rabbit more likely to get Snuffles.

Colds can also be caused by Pasteurella.

7.7.3 **Prevention** Of the points in Section 7.3, proper ventilation is the most important to avoid snuffles and other respiratory diseases. Rabbits have very sensitive noses so it is essential to keep the air fresh and clean.

7.7.4 **Treatment** As in Section 7.5, and:

- (a) Improve the ventilation.
- (b) Drugs used for treatment include:
 - (i) Penicillin

- or (ii) Sulphaquinoxilone in food (225g/ton)
- or (iii) Furazolidone in food (50g.ton)

7.8. **Heomorrhagic Septicemia**

7.8.1 **Symptoms** This is a very serious disease, and rabbits will often be found having seemed perfectly healthy the day before. If they do show symptoms, they look ill and have very fast noisy breathing. They have a high temperature.

At post mortem (see Section 7.5.7), there will be clear yellow liquid in the chest, and the lungs will have some haemorrhages.

7.8.2. **Cause** This disease is caused by Pasteurella. Rabbits with low resistance to disease, poor housing or poor feeding are more likely to get it.

7.8.3 **Prevention** General good management, especially ventilation, hygiene and feeding (see Section 7.3).

7.8.4 **Treatment** As in Section 7.5. Drugs used in treatment are the same as for Snuffles (see Section 7.7.4).

7.9 **Pneumonia**

7.9.1 **Symptoms** Rabbits with pneumonia sit huddled with their heads held high and tilted backwards. They look ill. Often there is a watery or pus discharge from the nose and eyes. They make a great effort to breathe because breathing is so difficult. They stop eating and are dull and listless. Their temperature is high and their breathing is very fast and often noisy. Often, they die from pneumonia. At post mortem (see Section 7.5.7) the lungs will be congested and mottled.

7.9.2. **Cause** Pneumonia is often secondary to other diseases like colds and snuffles. It is caused by several bacteria, often Pasteurella. Conditions which will lower a rabbit's

resistance to pneumonia are: cold, wet, draughts, sudden change of temperature (climate), dirty air (smoke, dust, ammonia from manure) and overcrowding.

7.9.3 **Prevention** As in Section 7.3.

7.9.4. **Treatment** As for snuffles (section 7.7.4).

7.10 **Tuberculosis**

7.10.1 **Symptoms** Infected rabbits may die suddenly, or they may have diarrhea, become thin and weak and gradually stop eating. they often develop a cough and find breathing difficult. They will also die.

7.10.2 **Cause** Bacteria called *Yersinia pseudotuberculosis* cause Tuberculosis in rabbits. It is infectious to people and other animals and birds. Rabbits get the disease from food or water which has been contaminated by infected birds, animals or people.

7.10.3 **Treatment** There is no treatment. Affected animals must be slaughtered and burned. People and other animals can get the disease from rabbits, so wash everything thoroughly in disinfectant.

7.11. **Salmonellosis**

7.11.1 **Symptoms** Rabbits with salmonellosis are very ill, with a high temperature for a short time. Then they die. They may abort (give birth before 30 days pregnancy or have a vaginal discharge).

7.11.2 **Cause** Bacteria called *Salmonella* cause salmonellosis in rabbits. This disease is infectious to people and other animals. Rabbits get the disease from food or water which has been contaminated by infected birds, animals or people.

7.11.3 **Prevention** Prevent contamination of food and water.

7.11.4 **Treatment** There is no treatment. Affected animals must be slaughtered and burned. People and other animals can get the disease from rabbits so wash everything thoroughly in disinfectant.

7.12 **Myxomatosis**

7.12.1 **Symptoms** A rabbit with Myxomatosis has inflamed and swollen eyes, nose, mouth, anus, genitals (penis or vulva). Often there is a purulent discharge from the eyes and nose. Breathing becomes difficult, and the rabbit will gradually stop eating. Affected rabbits look ill with a rough coat. They often develop swellings on other parts of the body, particularly where they have been handled. They usually die in 10-12 days.

7.12.2. **Cause** A virus called a Myxoma virus which is spread to other rabbits by the rabbit fleas, sometimes by mosquitoes, and by direct contact between rabbits.

7.12.3 **Prevention** Rabbits can be vaccinated to prevent myxomatosis. Thoroughly clean out the hutches to make sure there are no fleas. Try to keep the rabbitry free of mosquitoes. Make sure there is no contact with wild rabbits which may either have the disease or have infected fleas on them.

7.12.4 **Treatment** There is no treatment. Slaughter and burn affected rabbits.

7.13 **Mastitis**

7.13.1 **Symptoms** Mastitis is an inflammation of the mammary glands (milk producing glands on the doe's belly) of lactating does. It is a serious condition because the doe will not let her litter suckle, so they will probably die.

The mammary glands become swollen, painful and may change colour from pink to red to dark or purple. The doe goes off her food, gets a high temperature and looks ill. She will often drink a lot. She stops looking after her litter, and they become restless, hungry

and may die. The mammary glands may develop into abscesses which will burst and discharge pus. If the doe is not treated, she will die.

7.13.2 **Cause** Mastitis is usually caused by bacteria. The bacteria are passed from rabbit to rabbit in many ways but especially by dirt and flies. Dirty nest boxes or bedding can give a doe mastitis. If the mammary glands are bruised or injured in any way, they are much more likely to get mastitis.

7.13.3 **Prevention** Mastitis can be prevented by using clean bedding and clean nest boxes. Careful handling of does to make sure that the mammary glands are not injured or bruised will also help.

7.13.4 **Treatment** As in Section 7.5, and:

- (a) Give the doe more fresh green food and less concentrates (pellets).
- (b) Bathe the affected mammary glands with -
 - (i) Clean warm salty water (1 teaspoonful of salt in ½ litre of clean warm water).
 - or (ii) Warm clean water with a little antiseptic.
- c) Drugs used for treatment include
 - (i) Penicillin
 - (ii) Tetracycline's (Aureomlin soluble powder, in food and or water).
- d) If the doe can not feed her litter, try to foster them if they are young enough (see Section 3.9). If they are too old to be fostered, try weaning them early.

7.14 Injuries and Abscesses

7.14.1 **Symptoms** Cuts and swellings are the commonest symptoms of injuries. An abscess will start as a small swelling which will gradually get bigger. Sometimes they burst, discharging a lot of pus which smells disgusting.

7.14.1 **Causes** When rabbits fight they are likely to injure each other with bites and scratches. Physical injury may also result from badly constructed hutches in which the rabbits may cut themselves on protruding nails and sharp pieces of wood or wire.

Abscesses will sometimes develop for no apparent reason. They are usually caused by Pasteurella bacteria.

7.14.3 **Prevention** To prevent wounds from fighting, rabbits must not be allowed to fight. Overcrowding should be avoided, food and water should always be sufficient and uncastrated bucks should not be kept together for too long after weaning. Make sure there is nothing sharp in the hutches. It is difficult to prevent abscesses, but the points in Section 7.3. will help to reduce the chance of getting abscesses.

7.14.4 **Treatment** Small cuts and scratches should be bathed four times daily in warm clean salty water (1 teaspoonful of salt in ½ litre clean water) or dilute antiseptic solution, and covered with antiseptic powder.

It is important to keep flies away, because they will be attracted to the smell of a wound (cut or scratch or other injury). The flies will lay eggs in the wound, which will quickly hatch out into maggots. These maggots will eat into the rabbit and cause much pain, irritation and then death. Use a fly repellent to prevent this from happening.

Any cuts more than 4cms long should be examined by a veterinarian or an experienced rabbit keeper.

Abscesses need to be opened so that the pus can be drained out. An experienced rabbit keeper or veterinarian should be called to do this. Treat the opened abscess in the same way as an injury.

Drugs which may be useful for treating cuts and abscesses are:

- (i) Penicillin or Streptomycin ½ gram applied to the wound or abscess.
- or (ii) Sulphaquinoxilone in food (225g/ton).
- or (iii) Furazolidone in food (50g/ton).

7.15 Internal Parasites

7.15.1 **Symptoms** Serious infestations of internal parasites in rabbits are rare. A rabbit which is infected will usually have diarrhea, weight loss and a dull, harsh coat.

7.15.2 **Cause** There are several internal parasites which can affect rabbits. The most important are roundworms and tapeworm cysts.

a) **Roundworms** These live in the intestines of the rabbit. They produce tiny eggs which are passed out of the rabbit in its droppings. These eggs are easily found if a sample of droppings is sent to a laboratory for examination. Roundworms are easily spread from one rabbit to another by contamination of feed, bedding, hutches and equipment.

(b) **Tapeworm cysts** These develop in the rabbit's flesh. If a rabbit eats the egg of a dog or cat tapeworm, it will form a cyst in its flesh. If a dog or a cat eats this infected flesh, the cyst will develop into a tapeworm in the dog or cat's intestines. Often rabbits can have these cysts without any symptoms.

7.15.3. **Prevention** General hygiene and good management as discussed in Section 7.3. will minimise the risk of getting internal parasites.

Do not feed the flesh of rabbits infested with tapeworm cysts to dogs or cats. Prevent contamination of feeders, drinkers, bedding and hutches by dogs and cats.

7.15.4 **Treatment** In addition to Section 7.5:

- a) Roundworms: a single dose of Thrabendazole by mouth, using 100mg/kg.
- b) Tapeworm cysts: no treatment.

7.16 External Parasites (mites, ticks, lice, flies, etc)

7.16.1 **Symptoms** External parasites can cause mange and ear canker. They irritate the rabbit's skin, so the rabbit scratches and licks a lot and is generally restless. It may shake its head if the head or ears are involved (as in ear canker). The fur in the affected area usually drops out and the skin becomes flaky, sometimes crusty and often red and sore.

Flies are attracted to dirt and bad smells. A rabbit with diarrhea, sores or cuts attracts flies which lay eggs in the affected areas. The maggots which hatch out of these eggs eat the flesh of the rabbit. This causes much distress and irritation to the rabbit. On close examination an area of wet, inflamed skin will be found surrounding the original wound. The maggots are usually visible burrowing in the flesh. The rabbit becomes very ill and will die unless it is treated early. Fleas and mosquitoes carry myxomatosis so the symptoms of this disease may also be seen.

7.16.2 **Cause** There are several external parasites which can affect rabbits. The most important are mites, fleas, lice, ticks, mosquitoes and flies. Most external parasites are easily passed from one rabbit to another either by direct contact with an affected rabbit or by contamination of the hutch, bedding, feed or equipment.

7.16.3 **Prevention** General hygiene and good management as discussed in Section 7.3. will minimise the risk of getting external parasites. Regular removal of manure and the use of a fly spray will also help.

7.16.4 **Treatment** The aim of treatment is to kill the parasites on the rabbits, its hutch and equipment, and to treat any sores on the rabbit's skin. Chemicals are used to kill these parasites. They are applied as a dust, a spray or a bath. Local livestock experts

should be asked to give advice on what chemicals are suitable and how they should be applied. Any sores should be treated as described for injuries in Section 7.14. The hutch should also be thoroughly cleaned, disinfected and treated with a chemical to kill the parasites.

7.17 **Poisoning**

7.17.1 **Symptoms** There are many different symptoms according to the type of poison. Sometimes the rabbit will become excited or unsteady in its movements which is followed by dullness, collapse and unconsciousness. There may be convulsions (sudden movements) and eventual death. Other poisons may cause great pain.

7.17.2 **Cause** There are two main causes - poisonous plants and chemicals.

In all part of the world there are plants which will cause sickness and death if eaten. Rabbits, which eat the food which the rabbit keeper has collected for them, can easily suffer in this way.

A more modern danger comes from pesticides and rat poisons. These chemicals can sometimes contaminate the bedding, food or water of the rabbits.

7.17.3 **Prevention** The rabbit keeper must learn which plants are poisonous and make sure they are not fed to the rabbits.

To prevent poisoning by chemicals, all pesticides, rat poisons and other chemicals should be kept in a separate store. All containers should be carefully disposed of after use by burying or burning. Rat poison should not be placed where rabbits can reach it.

7.14.4 **Treatment** Rabbits showing signs of poisoning need treating immediately but it is often unsuccessful.

- a) Try to encourage the rabbit to drink a lot of water.
This will dilute the poison. If possible, the water should be warm.

- b) Strong black tea or coffee should also be given. This helps to counteract some of the effects of some poisons.
- c) If the rabbit is in pain, it is kinder to kill it quickly.

REVISION QUESTIONS

1. Give three features of a healthy rabbit.
2. Give two ways of preventing disease.
3. What action should you take on the outbreak of disease?
4. What causes Coccidiosis and how is it spread?
5. What causes Snuffles and how can it be prevented?
6. What are the differences between Snuffles and Pneumonia?
7. Describe the symptoms of mastitis
8. Why is it important to keep flies away from rabbits?
9. How will an infection of external parasites be recognised?

STUDY PROJECTS

1. Talk to a government livestock officer or veterinarian about suitable medicines for rabbits. In this chapter we have mentioned several drugs: antiseptic powder, fly repellents; dusts, sprays and baths against external parasites; worm medicine.

The rabbit keeper will need to know

- (i) The names of available medicines
 - (ii) How much to use
 - (iii) How to give the medicine to the rabbit
 - (iv) How much the medicines cost
2. Talk to rabbit keepers about poisonous plants. Make a list of the poisonous plants which grow in your area, noting what kind of land they grow on and the season in which they are most dangerous. Find out if there are any treatments for poisoning.
 3. Talk to experienced rabbit keepers and find out how they safely dispose of empty chemical containers.

CHAPTER 8

THE PREPARATION OF RABBIT PRODUCTS

8.1. Introduction

Most rabbit keeping in the tropics is for the production of meat. Skins and manure are by-products.

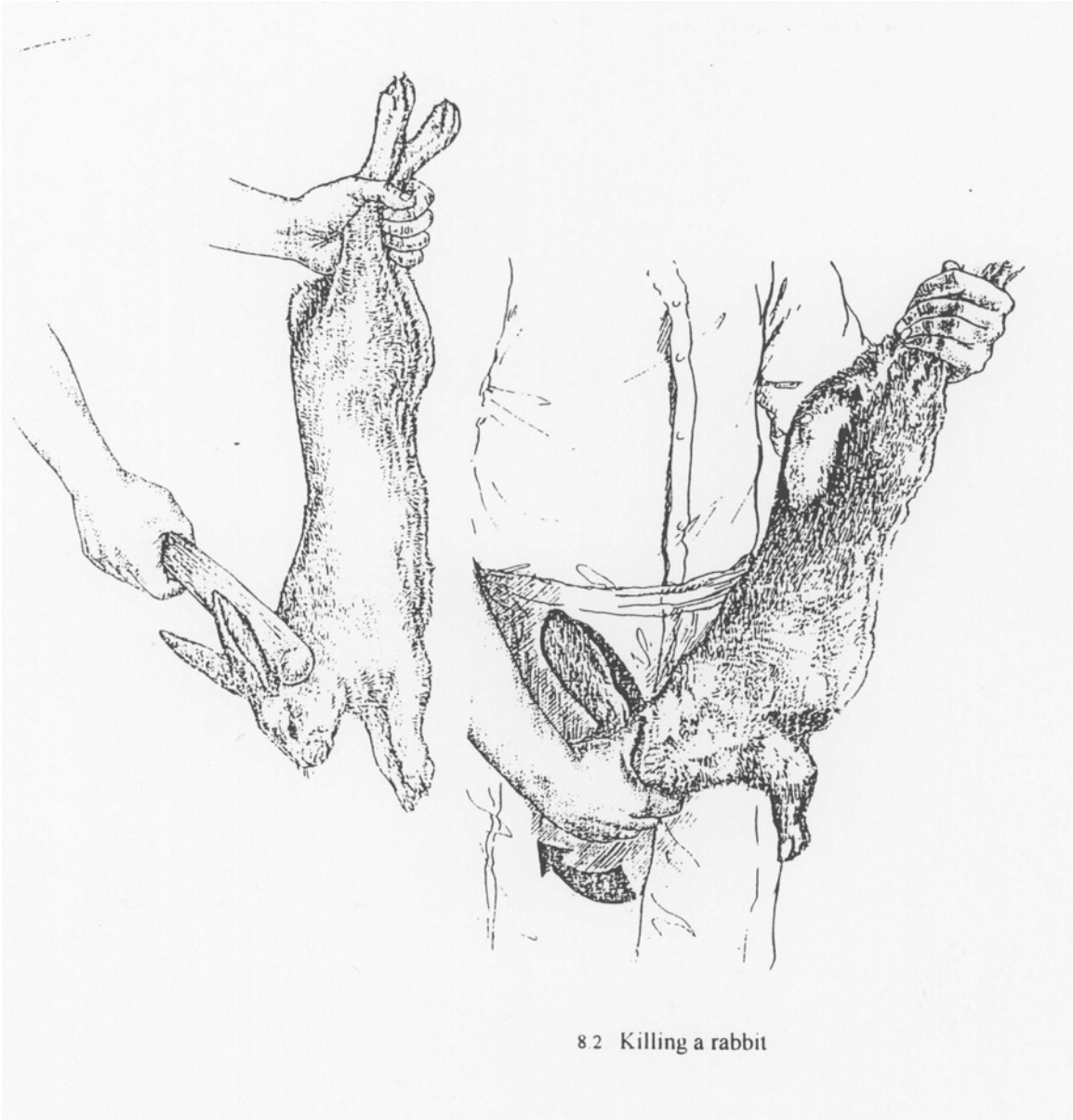
Many rabbit products are wasted because they are not properly treated. If the rabbit keeper knows what to do with these products, he will find rabbit keeping much more profitable.

In this chapter we will look at:

- (a) **Slaughter:** when and how rabbits are slaughtered (8.2).
- (b) **Skinning:** how to remove the skin (8.3).
- (c) **The Carcase:** how to prepare and store the carcass.
(the rabbit's body after skinning) (8.4).
- (d) **Skins:** Methods of treatment for the skins (8.5).
- (e) **Manure:** How to collect and store manure (8.6).

8.2. **Slaughter** The usual time to kill rabbits for meat in Europe and America is when they reach a weight of around 2.2 kg which they do at between two and three months of age.

In the tropics there is a greater variation. Rabbits may be killed at live weights of 1.2. to 3.0 kg, at ages between two and six months.

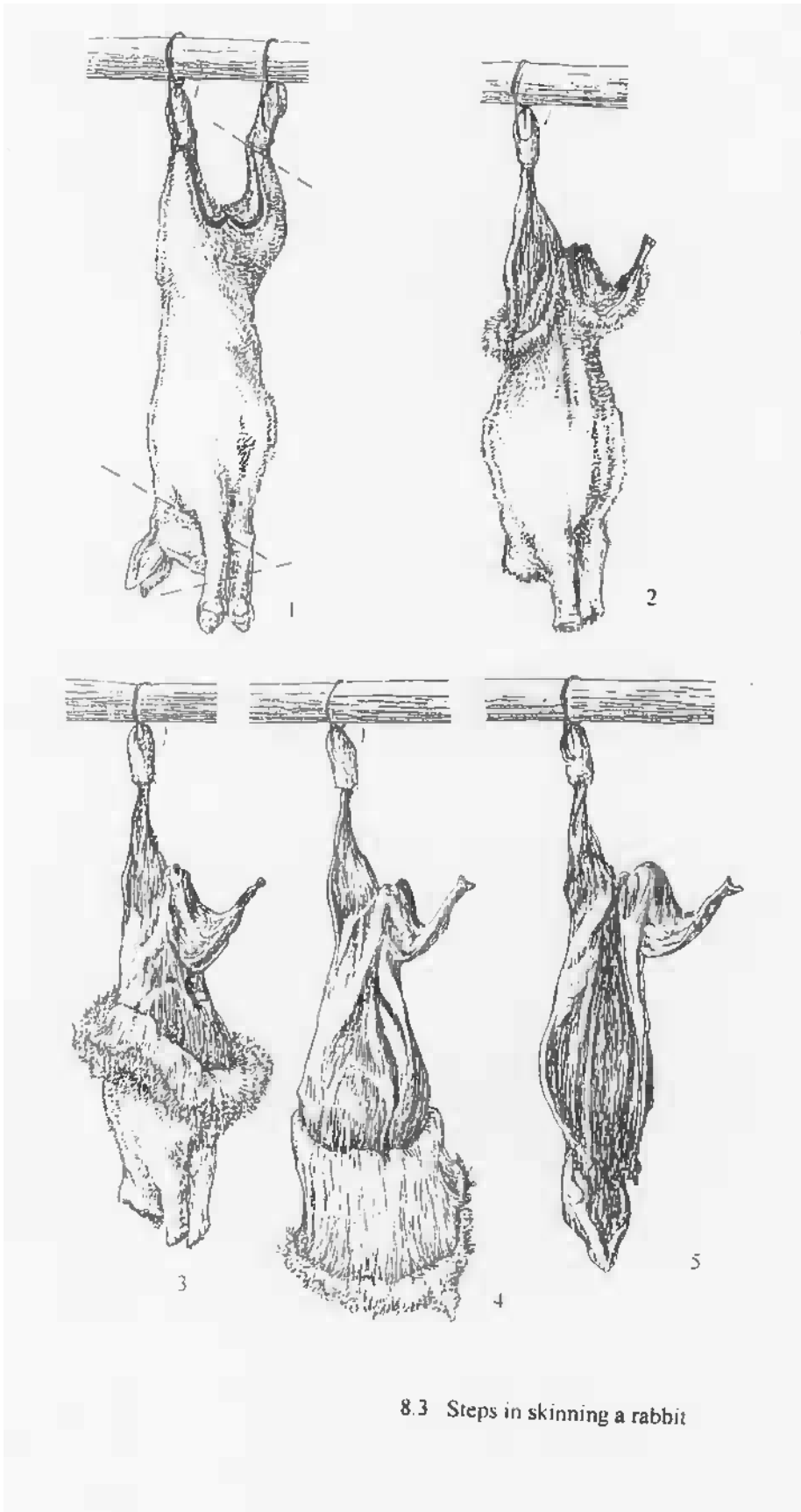


A rabbit should not be frightened at the time of slaughter. Apart from humane reasons, the meat may be damaged if the animal is frightened at this time. Killing may be carried out in two ways -

8.2.1 **By administering a sharp blow** to the back of the head with a stick or iron bar.

This may be done with the rabbit placed on a table (Fig. 8.2. 1a) or by holding it by the hind legs with its head down (fig.8.2.1).

Immediately after slaughter the rabbit should be hung by the back legs and the throat cut to allow the blood to drain out.



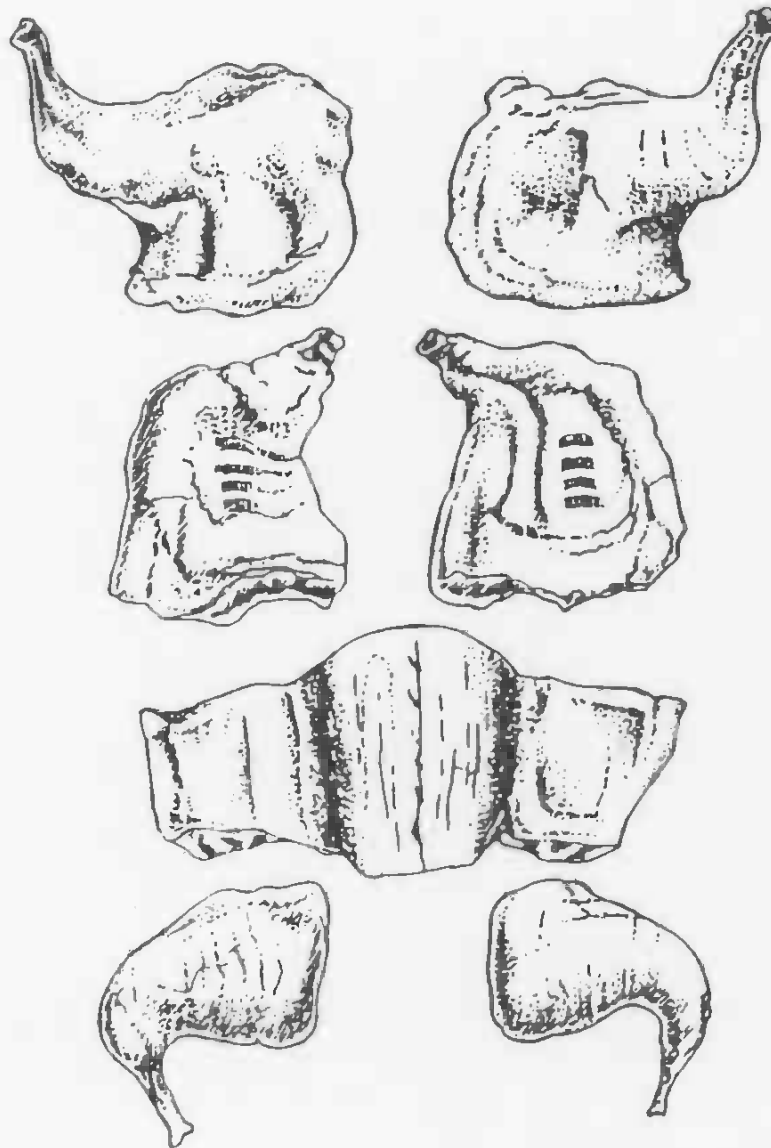
8.3 Steps in skinning a rabbit

8.3. **Skinning** The knife used to skin a rabbit must be very sharp and clean. Skinning should be carried out in the following manner:

- (a) Cut off the tail.
- (b) Make a circular cut in the skin around the neck.
- (c) Join these two cuts by making a long cut along the inside of one thigh, pass the base of the tail and down the other thigh.
- (d) Pull the skin off down each leg and over the whole body as far as the neck.
- (e) Make a cut around the neck on the inside of the skin, and around each front leg.
- (f) Pull the skin over the neck and clear of the body, taking care not to get blood on it.
- (g) Place the skin on a stretcher and hang it up to dry.

8.4. **Preparation of the carcass.**

- (a) Make a cut along the centreline of the belly from the anus to the ribs, taking care not to cut the intestines.
- (b) Remove the intestines and bladder but leave the heart, liver and kidneys. The gall bladder should be carefully separated from the liver and removed without bursting. It contains bile, a green liquid with a bitter taste, which must not be allowed to contaminate the meat. Care should also be taken to remove that part of the intestines which runs through the pelvic bones. To make this easier, the pelvis may be broken and the bones separated.
- (c) Remove the head and the four feet.
- (d) The carcass may be left whole or cut into joints (See Fig. 8.4). This will depend on the market. In most cases the whole carcass is preferred though there may be some local demand for joints.
- (e) Remove pieces of fur, dirt and blood stains from the carcass using a clean, damp cloth and rinse the carcass quickly in clean cold water.
- (f) Store in a cool place (with no flies) overnight.
Further storage may take place for a few days in a refrigerator. Storage for longer period if possible in a freezer.



8.4. How to cut up a rabbit.

8.5. Treatment of the skins

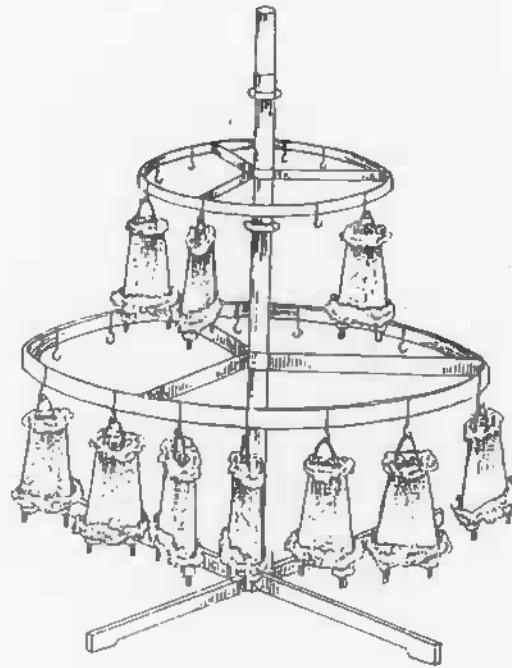
If the main reason for keeping the rabbits is for meat, then the skins are a by-product. They are unlikely to be of high quality, especially those from young rabbits under six months of age. There may, or may not, be a market for them locally. The breeder may wish to keep a few for use in the home. If the skins are to be sold or used, the first step is to dry or cure them, then to treat them chemically.

8.5.1. **Curing** Drying the skin is known as 'curing' and it is carried out as soon as possible after skinning the animal. The skin is slipped over a wire stretcher with the fur to the inside (see Fig. 8.5.1). It is then hung up to dry in a suitable place, shaded from the sun and protected from pests. Any pieces of fat should be scraped off with a knife. The curing should only take a few days.

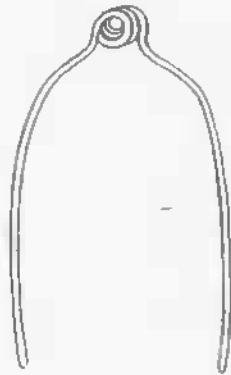
8.5.2 **Tanning** By this process the skins are transformed into leather for a variety of uses. It is normally done in a commercial tannery, but sometimes the rabbit breeder may wish to tan a few skins for his own use. The following procedure is suitable for home tanning:

- (a) Remove the skin from the wire stretcher, slit it down the middle and soak it in clean, cool water, changing the water several times.
- (b) When the skin is soft, place it on a board (fur side down) and remove all the flesh and fat by scraping with a knife.
- (c) Rinse thoroughly in lukewarm, soapy water to which has been added 5 - 10gm soda or borax per litre. Squeeze out the water but do not wring.
- (d) Prepare the following chemical solutions:
 - (i) Dissolve 0.5kg ammonium aluminum sulphate (ammonium alum) OR potassium aluminum sulphate (potash alum) in 5 litres of water.
 - (ii) Mix 150 gm washing soda (crystallized sodium carbonate) and 300 gm common salt (sodium chloride) and dissolve in 3 litres of water.

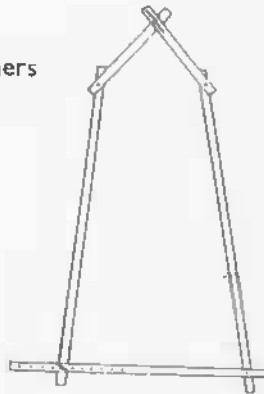
8.5. Curing rabbit skins



Skins Drying



Types of Stretchers



- (e) Pour solution (ii) into solution (i) and stir thoroughly.
- (f) Mix the combined solution as prepared above with sufficient flour to make a thin paste. First mix the flour with a little water to prevent lumps forming.
- (g) Nail out the clean and softened skin on a board, fur side down.
- (h) Coat the flesh side of the skin with a layer of the tanning paste and lay a piece of paper lightly on top for protection.
- (i) The following day scrape off the layer of paste and put on another layer. If the skin is thick (e.g. from a mature buck), a third coat may be necessary. Leave the last coat on for several days.
- (j) Scrape off the last coat of paste and rinse the skin as in (c).
- (k) While the skin is drying, work it thoroughly with the hands over a board, pulling it in all directions. This is most important in order to make the skin soft and it must be done before the skin is dry.
- (1) Finally work the skin in warm, dry, hardwood sawdust to clean it and give a shine to the fur.

8.6. **Rabbit Manure**

Manure from the rabbitry has considerable value as a fertiliser and it should therefore not be wasted. There are several ways of dealing with it.

8.6.1 **Self-cleaning wire cages** No bedding. The droppings fall through the floor of the hutch.

(a) The droppings fall on to a concrete floor and are collected. In this state they are known as clear manure (free from any other material such as bedding). The clear manure may be used straight away on the garden or it may be stored in various ways:

(i) **Composting** A layer of vegetable matter consisting of vegetable leaves, weeds, grass cutting, hedge trimmings, branches ...etc, is spread on the ground to a depth of 10 - 20 cm. This is covered with a layer of rabbit manure of similar thickness, and alternative layers of vegetable matter and manure are added as they become available. The top of the heap is kept tramped to exclude air, and enough water is added to keep it moist. When the heap has reached a convenient height, a layer of soil may be added on top. This helps to conserve nitrogen and to control smell.

(ii) **Dry manure** The fresh droppings are spread out in a thin layer (5-10cm) on a concrete surface in the sun. When the manure has dried so that the moisture content is down to between 12-15%, it is collected in sacks or boxes. In this form there is often a market for it.

(b) **The droppings fall on to an earth floor**

(i) **Straw, grass or wood shavings** are spread on the floor to soak up the droppings and urine. At least once per week this removed and put in a heap outside to make compost.

8.6.2. **Hutches with solid floors** Enough bedding (straw, dry grass or wood shavings) should be provided to soak up the urine and collect the droppings. This should be removed to the compost heap every day and replaced with fresh material.

REVISION QUESTIONS

1. Describe two methods of slaughtering a rabbit.
2. At what ages and weights are rabbits usually slaughtered?
3. Describe how to skin a rabbit.
4. How should you prepare the carcass?
5. What should you do with the skins?
6. How can you store rabbit meat and for how long?
7. Describe two ways of dealing with rabbit manure

STUDY PROJECTS

1. Arrange to observe an experienced rabbit keeper slaughtering rabbits. It is important for you to be able to do this quickly to avoid causing the rabbit any pain.
2. Arrange to observe an experienced person skinning slaughtered rabbits and preparing their carcasses.
3. Visit several rabbitries and find out how they deal with rabbit manure.

APPENDIX 1 - FEEDING

Examples of general rabbit/rations for home mixing

Ingredients □	High energy, high protein, low fibre rations to be fed with good hay	
	A kg	B kg
Barley (ground)	340	290
Oats (ground)	125	200
Maize (ground)	100	100
Soya bean meal (extracted)	100	200
meat and bone meal (50 per cent protein)	175	100
Wheat offal's	100	--
Lucerne meal 15 per cent protein) 22 per cent fibre)	50	--
Grass meal 18 per cent protein) 17 per cent fibre) 5 star	--	100
Mineral/vitamin supplement*	10	10□
Total	1 tonne	1 tonne

1 kg = 2.2 lb

1 ton = 1000 kg = 2204.6 lb

APPENDIX 2

CONVERSION DATA

<u>Weight</u>	1 kg	=	2.2 lb	kg = kilogram
	1 lb	=	0.45 kg	lb = pound
<u>Volume</u>	1 litre	=	1.76 pints	
<u>Distance</u>	1 metre	=	3.3 feet	
	1 foot	=	304 mm	

APPENDIX 3

Nutritional value of Concentrate rations

For adult rabbits:

Crude protein (min)	-	18.0%
Crude fat (min)	-	3.0%
Crude fibre (max)	-	20.0%
Ash (max)	-	10.0%

For young rabbits (creep feed up to weaning):

Crude protein (min)	-	22.0%
Crude fat (min)	-	5.0%
Crude fibre (max)	-	12.0%
Ash (max)	-	8.0%

APPENDIX 4

FEEDING CONCENTRATE

Amount to feed in Grammes per day

SIZE OF RABBIT

CLASS OF RABBIT	Small	Medium	Large
Young breeding stock (8 weeks old - mating)	60 - 80	8 - 100	100 - 120
Older non-pregnant does and breeding bucks	80 - 100	100 - 120	120 - 140
Pregnant does (1st 3 weeks of pregnancy)	100 - 120	140 - 160	160 - 180
Pregnant does (last 10 days) Lactating does with litters Young rabbits (weaning to slaughter)	AD LIB	AD LIB	AD LIB

AD LIB = unrestricted feeding