

GUIDE TO RABBIT PRODUCTION AND MARKETING IN KENYA

INTRODUCTION

Our advice for people with conditions like Arthritis and Gout, High Blood Pressure is to desist from eating red meat and instead use white meat as their protein source. Protein from white meat is derived from sea foods, pork tenderloin, poultry, double muscle in beef, domesticated game birds and rabbits.

These notes will be devoted to our members who wish to increase their savings through rabbit production. Production of good quality affordable rabbit meat is a means by which our strategic objectives can be achieved. Some of these objectives are good health and employment creation. To realize these objectives, we have found it necessary to give simple and easy to follow guidelines to our members and well wishers on the important aspects of rabbit production. We have picked international recommendations on rabbit production, and encourage our members to adhere to the recommendations so that we can also participate and prevail in the world market.

Recommendations:

Welfare of rabbits

1. The welfare of rabbits can be safeguarded under a variety of management systems. The system employed should be appropriate to the health and behavioral and physiological needs of the rabbit. This, together with the facilities available and the skill of the rabbit keeper, will determine the number of animals kept at any one time and the way in which they are grouped. Rabbits are animals which need individual and frequent attention. It is essential that the rabbit keeper should watch for signs of distress or disease and take prompt remedial action.

2. The signs which, taken together, indicate good health in a rabbit colony are set out in paragraph 3. The rabbit keeper should be able to recognise impending trouble in its earliest stages and may often be able to identify the cause and institute remedial measures, failing which veterinary or other expert assistance should be quickly obtained.

3. Important indications of health are alertness, clear bright eyes, good posture, vigorous movements if unduly disturbed, active feeding and drinking, firm dark-coloured pellets, clean and healthy fur and skin, and grooming. Ear-mite infestation is a common debilitating and disfiguring disease of rabbits and it is important that the external ear canals and ears should be free of debris and encrustations. Attention should be paid to any departure from the normal.

4. The signs of ill-health may include listlessness, dullness in the eyes, tucked-up posture and grinding teeth, shaking of the head (suggesting ear canker), loss of appetite, running eyes and tear-stains, nasal discharge, abdominal distention, scouring, stained fur, the presence of wet droppings, sneezing and snuffles, scratch marks (suggesting ectoparasites), swelling of the face (suggesting myxomatosis), sore hocks and lameness.

5. Ailing or injured rabbits should be segregated wherever possible and treated or, if necessary, be killed humanely without delay.

Housing

6. Advice on welfare aspects should be sought when new buildings are to be constructed or existing buildings modified.

7. Problems can arise if total air space in the rabbitry is either inadequate or excessive and the building is not correctly ventilated, and therefore careful attention should be paid to these aspects of welfare during planning.

8. Internal surfaces of housing, pens, hutches or cages should be of materials which can be effectively cleaned and disinfected, or easily replaced when necessary.

9. Ventilation, heating, lighting, feeding and watering equipment, electrical installation and all other equipment should be designed, sited and installed so as to avoid risk of injuring the rabbits.

10. Material containing paint and wood preservatives which may be toxic to rabbits should not be used on surfaces accessible to them. Particular care is necessary to guard against the risk of poisoning from old paintwork in any part of the building or when second-hand building materials are used.

Fire and other emergency precautions

11. Farmers should make advance plans for dealing with emergencies such as fire, flood or disruption of supplies, and should ensure that all staff are familiar with the appropriate emergency action. At least one responsible member of the staff should always be available to take the necessary action.

12. Fire precautions should be a major priority for all rabbit keepers. Expert advice on all fire precautions can be obtained from fire prevention officers of local fire brigades.

13. In the design of new buildings, or alteration of existing ones, there should be provision for rabbits to be released and evacuated quickly in the case of an emergency. Materials used in construction should have sufficient fire resistance and adequate doors and other escape routes be provided to enable an emergency procedure to be followed in the event of a fire. Where possible straw storage should be separated from rabbit accommodation to reduce the risk of rabbits from fire and smoke.

14. All electrical, gas and oil services should be planned and fitted so that if there is overheating or flame is generated, the risk of flame spreading to equipment, litter or straw (where used) or to the fabric of the building is minimal. It is advisable to site main power on/off controls outside buildings. Consideration should be given to installing fire alarm systems which can be heard and acted upon at any time of the day or night.

15. In case a 999 call has to be made, notices should be prominently displayed in rabbit houses stating where the nearest phone is located. Each phone should have fixed by it a notice giving instructions to the Fire Brigade on how to reach the rabbit houses.

16. There is usually some warning if interruptions in the supply of feeding stuffs and, so far as possible, arrangements should be made to lay in adequate stocks of feed or water to offset the worst effects of such a contingency.

Accommodation

17. Accommodation should be designed and maintained so as to avoid injury or distress to the rabbits.

18. The type and arrangement of accommodation should allow for efficient working and for each rabbit to be properly inspected.

19. In open-sided buildings or other enclosures which are exposed to the weather, rabbits in cages should be provided with adequate protection from the weather elements.

Floors

20. All floors on which rabbits are kept should be designed, constructed and maintained so as to avoid injury or distress to the rabbits. For welded wire floors, mesh of suitable size should be used. Square mesh should not exceed 19 mm x 19 mm and rectangular mesh should not exceed 7.5 mm x 12.5 mm. Wire of not less than 2.64 mm diameter is recommended and should not in any case be less than 2.032 mm. The mesh should be flat and any rough spots arising during manufacture or from wear during subsequent use should be smoothed off.

21. The adults of some strains, particularly of the larger breeds, may need to be kept on solid floors. Wherever solid floors are used an ample supply of clean bedding should be provided to ensure a dry sleeping area. Likewise, in

other systems, the use of straw or similar material in the lying area is strongly recommended. Rabbit urine is of economic importance; therefore collection should be incorporated into the floor design.

Ventilation and temperature

22. Ventilation rates and house conditions should at all times be adequate to provide sufficient fresh air for the rabbits. In particular accumulations of ammonia, hydrogen sulphide, carbon dioxide, carbon monoxide and dust should be avoided. Care should be taken to ensure that the ventilation system allows adequate air flow below cages, and dwarf walls or solid sides should be avoided wherever possible. There should be an alarm system to warn the rabbit keeper of failure of any automated equipment. Expert advice may be necessary to ensure correct temperature, airflow and humidity.

23. Care should be taken to protect confined rabbits from cold air streaming through the rabbit house during cold weather.

24. Extremes of temperature should be avoided. Excessive heat loss should be prevented by the structural insulation of external walls and roof of the building, or by the provision of adequate bedding. It is essential to avoid conditions which could cause chilling in young rabbits just leaving the nest. Appropriate measures should be taken to prevent temperatures rising to the point where heat stress, indicated by prolonged panting, occurs. As a general guide the aim should be to achieve a temperature range of 10C - 20C.

Lighting

25. During the hours of daylight the level of indoor lighting, natural or artificial, should be such that all rabbits can be seen clearly. However it may be advantageous to cover the nest box at the time of kindling. There should be a period of darkness in each 24 hour cycle. However, adequate lighting should be available for satisfactory inspection at any time.

Mechanical equipment and services

26. All equipment and services including feed hoppers, drinkers, ventilating fans, heating and lighting units, fire extinguishers and alarm systems should be cleaned and inspected regularly and kept in good working order. All automated equipment should incorporate a fail-safe device and, where the rabbits' welfare is dependent upon such equipment, an alarm system to warn the rabbit keeper of failure. Defects should be rectified immediately or alternative measures taken to safeguard the health and welfare of the rabbits. Alternative ways of feeding and of maintaining a satisfactory environment should therefore be ready for use.

27. All electrical installations at mains voltage should be inaccessible to rabbits and properly earthed.

Space allowances

28. When planning new accommodation or modifying existing buildings account should be taken of the size of the breed and natural behaviour of the animals, which includes hopping, sitting with ears erect and play.

29. The total floor area should be sufficient to enable the rabbits to move around and to feed and drink without difficulty. Accommodation should allow sufficient area so that all rabbits can lie on their sides other than at times when nesting boxes are used. The following space allowances, which are in use commercially, should be regarded as absolute minimum:

SYSTEM	MINIMUM FLOOR SPACE
In cages	CONVERSION: 1 m ² =10.00 cm ²
Doe and litter to 5 weeks of age	0.56 m ² total area (22 inches ²)

Doe and litter to 8 weeks of age	0.74 m ² total area (29 inches ²)
Rabbits 5 to 12 weeks of age	0.07 m ² per rabbit (3 inches ²)
Rabbits 12 weeks and over (other than those used for breeding) (multiple occupation cages)	0.18 m ² per rabbit 9inches (7 inches ²)
Adult does and bucks for breeding	0.56 m ² per rabbit (22 inches ²)
In hutches	
Doe and litter to 5 weeks of age	0.75 m ² total area (29.5 inches ²)
Doe and litter to 8 weeks of age	0.93 m ² total area (36.5 inches ²)
Rabbits 5 to 12 weeks of age	0.009 m ² per rabbit (3.5 inches ²)
Adults does and bucks for breeding	0.75 m ² per rabbit (29.5 inches ²)

30. Accommodation for rabbits over 12 weeks of age should be not less than 45 cm high, or of sufficient height to allow rabbits to sit upright with ears fully erect.

31. The nest box should be large enough to enable the doe to get into and out of it to feed the young without injuring them. As a guide, the nest box should be a minimum length of 30 cm and have a minimum floor area of 0.08 m² but a larger area should be allowed for giant breeds.

32. The lowest side or end of an open-topped nest should be low enough to enable the doe to enter or leave the nest without risk of injury to herself or her litter, but sufficiently high to prevent the young from leaving the nest prematurely. As a guide, for most breeds of rabbits the height of the lowest side or end of the nest box should not be less than 15 cm. The nest should have an entrance of not less than 0.023 m² in area and be sufficiently large for the doe to pass through without difficulty or risk of injury. Sunken nests have the advantage that very small rabbits can find their way back to the nest.

Feed and water

33. Whatever feeding is adopted, all rabbits should receive a daily diet which is nutritionally adequate to maintain health. A new type of feed should be introduced over a period of a few days.

34. A plentiful supply of clean fresh water should be easily accessible to the rabbits at all times. For example a lactating doe with a large litter, close to weaning, may drink up to 4.5 litres of water a day. To enable all rabbits to drink satisfactorily the nipple drinker should be about 25 cm from the bottom of the cage.

35. Stale or contaminated feed or water should not be allowed to accumulate.

36. Where bowls are used for either feed or water they should be of impervious material and of a design which cannot be knocked over and can be cleaned easily.

37. When fed by any system which does not allow continuous and unrestricted access to feed, all rabbits in the group should be able to feed at the same time. The feeding of a small quantity of hay or straw in addition to normal diet may be beneficial and provide activity for the rabbits.

Management

General

38. Each rabbit should be inspected frequently during the day because, once ill, rabbits deteriorate rapidly.
39. It is desirable to establish a regular work routine. Care should be taken not to frighten the rabbits with sudden unaccustomed movement or noise, but without placing too much emphasis on quietness.
40. Adequate control measures should be taken to avoid disturbance by rodents and other animals.
41. Frequent checks should be made on the state of the bedding.
42. Premises and equipment should be regularly cleaned and thoroughly dried before restocking. Thorough disinfection should be carried out at suitable times to reduce the danger of continuing infection.
43. Vaccinations, injections and similar procedures should be undertaken by competent, trained operators. Care should be taken to prevent injury and unnecessary disturbance of the rabbits.
44. Artificial insemination is a highly skilled procedure and should be carried out with the advice of a veterinary surgeon by competent, trained personnel maintaining a high standard of hygiene and taking care to avoid injury and unnecessary disturbance of the rabbits.
45. Mating should be supervised, and to minimise the possibility of fighting, does should be taken to the buck.
46. Litters under a week of age should be disturbed as little as possible and young rabbits should not be weaned before four weeks of age.
47. Overgrowth of incisors can sometimes interfere seriously with feeding and cause damage to the rabbit's lips. The provision of wooden gnawing blocks particularly for breeding stock, can avoid the necessity to undertake tooth-trimming. Where tooth-trimming is necessary, it should be performed by a competent trained operator.

Toe nail trimming

48. Toe nails of confined adult rabbits should be trimmed periodically to prevent toe damage from overgrown nails catching on the hutch or cage. Care is needed when trimming to avoid damage to sensitive tissue.

Marking

49. Where it is necessary to mark rabbits for permanent identification, tattooing is preferable to tagging which may result in damage to the ear being caused; a ring above the hock may be used but must be checked regularly to ensure it does not become tight, causing injury. Marking should be carried out by competent operators taking care to avoid unnecessary pain or unnecessary distress to the rabbits.

Handling and slaughter of stock on the premises

50. The proper handling of rabbits requires skill, and it should be undertaken only by competent persons. Rabbits should be lifted by grasping the loose skin at the back of the neck and supported by placing the hand under the hindquarters. Handling should be carried out quietly and confidently exercising care to avoid unnecessary struggling which could bruise or otherwise injure the animal.
51. When rabbits are killed on the farm this must be done humanely.

Rabbits kept out of doors

52. Attention is drawn to the relevant recommendations in paragraphs 33 - 51 inclusive.

53. Precautions should be taken to protect rabbits from predators.

54. Shelter from sun, rain and wind should always be available, and the hutch or pen roof should be extended sufficiently to ensure this.

55. Accommodation should be so designed and maintained as to avoid draughts. Rabbits should have access to a dry-bedded area.

NUTRITION

Recommended Diet for Adult Rabbits

Pellets

- Maximum of 1/8 of a cup per 1.8kg of body weight of a high fibre pellet per day. (18% or higher fibre, protein content at 13-14% and fat content no higher than 3%)
- For young growing rabbits, pellets can be given free choice until 6 to 8 months of age, then decrease to the maintenance amount as above.
- Store pellets in a closed container in a cool, dry place. Only buy enough for three months at a time.
- Do not use pellet mixes that contain grains and seeds along with pellets, as the rabbit will select its favourite items and leave the rest, meaning it will not be getting a balanced diet.
- Please note not all commercially available rabbit food are good for rabbits. Some are not balanced and can cause severe problems for rabbits with gut stasis. Contact us for advice on which brands of rabbit food are the best.

Fresh Hay (or grass)

- Always to be available. This is the most important ingredient.
- Young bunnies should be exposed to hay as soon as they can eat on their own.
- Mixed grass hay is better than alfalfa as it is lower in calcium and calories
- Store in a cool, dry place in an open bag to allow circulation. Discard damp hay.
- Rabbits on 100% alfalfa hay should not get any pellets
- Prefer loose long strands of hay compared to pressed cubes or chopped hay

Greens

Feed at least 3 types daily in a total minimum amount (all types of green together) of 1 heaped cup per 1.8kg body weight. This is a minimum, as the bunny adjusts to this diet more can be fed.

Feed Freely

(These food products contain fibre, vitamins e.g. A & C, minerals and carbohydrates)

- Beet tops
- Carrots
- Carrot tops
- Green pepper (Pilipili hoho)
- Outer cabbage leaves
- Maize leaves
- Sukuma wiki (Kales)
- Mulberry tree leaves

- Wheat grass
- Dandelion greens
- Dandelion flowers
- Local weeds

Foods to avoid

Avoid starchy foods or high sugar content foods such as; legumes, beans, peas, corn, bananas, grapes, oats, wheat products, nuts, potatoes, rolled oats and breakfast cereals.

We know that rabbits love starchy foods, and these can be fed in very small amounts for adult rabbits - yet it is easy to overdo, and may result in soft stools or serious stomach upsets.

There is research suggesting high starch and low fibre diets may contribute to fatal diseases.

For Overweight Rabbits

- Remove all pellets. Rabbits can make their own rich supply of nutrients in the caecum.
- Do not fast rabbits for weight loss. Where rabbits are only given food for a certain amount of time each day, this leaves the bucks with nothing to do physically and mentally for long hours. Rabbits were designed to eat large amounts of food frequently and such a measure may lead to a sluggish gastrointestinal tract due to lack of stimulation.
- If your rabbit is not used to getting fresh foods, start out gradually feeding them with the leafy green vegetables and add a new food item from the list every 3 to 5 days.

Rabbits eating paper and wood

This is seen where the bunny has stopped eating pellets, but eats all the newspaper in their enclosure or hutch. These rabbits are craving fibre, as they are not on unlimited (or usually any) hay or greens.

Supplements (enzymes and bacteria)

These products do no harm, but are usually unnecessary when the rabbit is eating a more natural diet.

The advantages of Rabbit farming

- Rabbits are highly prolific in nature
- Consume a large amount of forages from diverse origins and so can be reared on small amounts of costly concentrates.
- They can be reared in the kitchen garden/backyard of farmer's house
- Initial investment cost is low
- Quick returns i.e. six months after the establishment of farmIncome generation at quarterly interval makes the repayment easy.
- Apart from providing wool, rabbits also provides income from manure, urine etc.
- Residual feed, together with rabbit manure is highly suitable for vermin-compost which in turn provides excellent manure for fertilising the fields.

Feed requirements of rabbits (gms/day)

Class	Description	Pelleted feed	Hay	Greens + Vegetables, Fruit garden waste
1	Breeding stock (on an average)	280	80	adlib
2	Weaners (7-12 weeks)	60	30	adlib
3	Growers (13-24 weeks)	90	30-40	adlib
4	Adult rabbits (above 24 weeks)	140	50-60	adlib

HEALTH

Disease Prevention/Control

1. Clean sanitary conditions of rabbit cages, sheds and equipment, balanced feed and fresh clean water are essential to prevent chances of infection.
2. The rabbits should be prevented from coming in contact with the faeces.
3. Overcrowding should be avoided.
4. Proper ventilation should be provided.
5. Flies which may act as carriers of the infection should be kept under control in the rabbitry.
6. Common diseases of rabbits and recommended preventive/control measures are given in Annexure – V
7. Rabbit cages should be disinfected with blow lamp after every shearing and kindling cages before the doe is shifted and after weaning.
8. Burn dead sick rabbits at once to keep the diseases from spreading.
9. The bedding of the nest box should be burnt after use.
10. The dead animals should be buried soon after post mortem (if required).

Care of young ones

1. The nest box should be removed after 5 weeks of kindling.
2. Kits should be examined and dead ones should be removed daily.
3. If the bedding becomes wet it should be replaced by a fresh and clean one.
4. Weaning should be done at 5th or 6th week after kindling.
5. No sudden change in feed is advisable.

Watering

1. Water should be available round the clock particularly to a lactating doe.
2. Always give fresh and clean drinking water.
3. Always keep water pots clean and remove sediments daily. Water pots should be cleaned thoroughly every week.
4. Use of properly designed Automatic watering equipment can also be made.

Equipment

1. Use scientifically designed cages and equipment. The ideal gauge for floor of the cage is 14-16 with a mesh size of 19x19 mm or 25x13 mm. The walls and roof can be constructed with lighter gauge i.e. 16-20 with a mesh size of 25x25mm.
2. The feeders should be designed and placed in such a manner that the feed can be poured from outside and should be 5-7.5 cm. above the cage floor to avoid contamination by urine, feces or water. The rim of the feeders should be round and turned inward ½” so that the rabbits do not spill the feed/water.
3. The watering equipment of 400-500 ml. capacity made up of aluminum, earthen or any other locally available cheaper material may be used.

Location and Housing

1. Areas having temperature ranging between 10o C and 20o C and relative humidity ranging between 55 and 65% throughout the year are ideal for rearing Angora rabbits.
2. Ensure adequate facility for clean water, electricity, approach road, supply of breeding stock, feed, fodders, veterinary aid and nearness to market for sale of wool and meat of culled animals.
3. For small size rabbit farms hutch system may be adopted which is a self contained cage-cum-nest box with it's own roof.

4. In case of larger farms cages may be arranged inside the sheds in single or two tier under hanging or step wise rack system.
5. Provide adequate floor space per rabbit. The space (hutch sizes) requirement for different categories of rabbits is given in Annexure – III.
6. Rabbitry roofing should be preferably of wood, thatch or other locally available cheaper materials.
7. Construct sheds in such a way that predators and birds do not enter the shed. In case of open hutches proper fencing should be provided to protect the rabbits from their predators.
8. Construct rat proof civil structures for feed and wool storage.
9. Keep the shed/pens clean by regular cleaning and disinfection to make it free from flies/mosquitoes and a foot dip should be maintained at the entrance of the sheds.
10. Rabbit cages should be cleaned regularly, especially disinfected before kindling.
11. During kindling period cage/hutch nest box should be kept clean so that kits do not pick up diseases like coccidia.
12. Feeders and waterers should be cleaned regularly and mash feed should be removed from the feeders which can be used for feeding other livestock species.

Breeding Management

- The average age at first mating is about 5-7 months and it varies with the physical maturity of individual rabbit and also breed.
- Mating should be done either early in the morning or in the evening.
- The doe is to be taken to the buck cage and never vice-versa.
- The breeding should be planned in such a way that about 3 to 4 litters per doe are obtained per year during multiplicative stage.
- The nest box is kept in the cage around 25th day of pregnancy with loosened jute wool or wood shavings.
- Male rabbits can be used for mating until they are about three years.
- In order to prevent inbreeding depression rabbits from the same family should not be bred. Therefore, replace male rabbit about once every year.
- After three years, the full grown female rabbits should be replaced either by new purchases or females of own farm.

Care of young ones

- The nest box should be removed after 5 weeks of kindling.
- Kits should be examined and dead ones should be removed daily.
- If the bedding becomes wet it should be replaced by a fresh and clean one.
- Weaning should be done at 5th or 6th week after kindling.
- No sudden change in feed is advisable.

Disease prevention/control:

- Clean sanitary conditions of rabbit cages, sheds and equipment, balanced feed and fresh clean water are essential to prevent chances of infection.
- The rabbits should be prevented from coming in contact with the feces.
- Overcrowding should be avoided.

- Proper ventilation should be provided.
- Flies which may act as carriers of the infection should be kept under control in the rabbitry.
- Rabbit cages should be disinfected with blow lamp after every shearing and kindling cages before the doe is shifted and after weaning.
- Burn dead sick rabbits at once to keep the diseases from spreading.
- The bedding of the nest box should be burnt after use.

Breeding Management in Rabbit Farm

Selection of Rabbit Breed

1. Select right type of the breed for maximization of economic benefits. Various wool type of rabbit breeds and their characteristic features are given in Annexure – II.
2. Breeding males and females should be of different sire lines, below one year of age, devoid of visual deformities like patchy wool, buck teeth, sore hock, visual reproductive defects and should be true to the breed.
3. Purchase of breeding stock should be avoided from rabbitries with high incidence of diseases like pneumonia, sore hock, coccidiosis, enteritis or with poor reproductive efficiency i.e. <50%.
And this much of money you can earn every 45 days.
Isn't this simple, easy, affordable and huge & quick returns business.

Selection of Breeding Stock

The selection of breeding buck and doe is very much important aspect of breeding since good progeny is expected from good buck and doe. One has to consider the breeding stock in terms of fertility, maternal instinct, milk yield, growth rate, fecundity and viability.

(a) Buck

The male rabbit is known as buck. A buck develops its breeding capabilities at the age of 8 months. An ideal buck should continue to maintain its reproductive ability at least for 2 to 3 years. A young buck may be allowed to mate one doe at an interval of 3 to 4 days. But, from 12 months of age onwards it may mate 4-6 does in 7 days. A buck beyond 6 years of age should be culled since semen quality declines. In order to keep the buck healthy additional protein, vitamin and minerals are to be supplemented in diet. Two breeding bucks should not be kept in same place as they will fight each other and cause injury.

(b) Doe

The female rabbit is known as doe. A doe should have the perfectability to reproduce. A doe becomes capable to reproduce based on breed, nutritional status and seasons. The smaller breeds attain sexual maturity earlier than larger breeds. A small breed may accept mating at 3-4 months of age whereas the larger breed may accept mating at 8-9 months of age. A doe can be used for breeding up to the age of 3 years and culling should be made afterwards.

Reproduction

(a) Ovulation

The rabbit belongs to a group of mammals which do not ovulate spontaneously. There is no oestrus cycle. Ovulation requires stimulus of mating and thus induced in nature. Sexual stimulation with copulation or in response to exogenous, gonadotropins, ovulation takes place. Sometime females may stimulate each other to the point of stimulation. This type of ovulation is expected in does becoming pseudo pregnant or sterile for few days. Ovulation is apt to occur within the range of 9-13 hours. But, generally it takes place at 10 hours following mating. It is thought that does may remain in constant heat throughout the year or in breeding season. But, it is known that follicles develop and regress in cycles of 15-16 days. There is a lack period when the doe may lose interest for the buck. Ovulation can also be induced through mechanical stimulation of vagina.

(b) Mating

A doe whether is in heat condition or not is difficult to recognize outwardly. But, does may show some manifestations like restlessness, nervousness, rubbing of head and chin on the side of the cage or other objects. The vulva becomes swollen and purple in colour. But, acceptability of the does to the bucks or does reaction to bucks should be taken as a criteria for heat. Therefore, detection of heat through buck should be made before allowing for copulation.

The approximate age of first mating is around 5-6 months of age. As a rule doe should be taken to the cage of buck but never be done vice versa to avoid fighting. Early morning and early evening are the most conducive time for mating. A receptive doe will lift her tail and allow mating. Males vary greatly in their sexual drive. A buck may be slow in performing the service to a strange cage. If a buck is virile and doe is in perfect heat, mating will occur almost immediately. After successful mating the buck usually produces a typical cry and falls down to one side of the doe. One mating is usually sufficient. If a female does not allow any mating, one should wait for 3 to 4 days or assist mating by holding the female. After mating the doe should be returned to her cage.

In a commercial production unit, a rabbit farmers wants to have five or six litters per doe per year. This is possible only by weaning the litter at five weeks of age and mating the doe immediately following weaning. Each breeding cycle will take 65 to 75 days. This can also be achieved by mating the doe 21 days after kindling.

(c) Pregnancy

The gestation (pregnancy) period in rabbit ranges from 28-32 days (average 30 days). The nest box is to be kept within the cage to facilitate the doe for preparing bedding for the new born. The nest is to be provided at least 5-6 days before parturition. The nest box should contain nesting materials like straw, grass, wood savings etc. Saw dust should not be used as bedding material. A doe may pullout some of her own hairs to make nest for litters. Adequate measures should be taken concerning feeding and management during pregnancy period. Quantity of feed should be increased for 10 to 15 days of pregnancy. Plenty of fresh water should be provided. Environmental stresses should be avoided as far as possible.

Pregnancy can be detected by various methods:

(a) Through palpation of abdomen by which embryos can be felt by hand. This is best done at about two weeks after mating. This technique can be perfectly done through experience.

(b) Placing the buck near the doe for mating. A buck may not mate a pregnant doe.

(c) Uterine swelling-uterus may swell up to 12 mm at 9 days after mating. It may reach 20 mm at 13 days. Only experienced keeper may be able to predict the changes accurately.

(d) Changes in body weight-There are significant change in body weight from mating up to 30 days. Average gain of around 300-400 gm has been suggested from mating to 30 days in large sized rabbit.

(d) Kindling (Parturition)

Process of giving birth of new baby of rabbit is known as kindling. It is a natural physiological phenomenon. The parturition very often takes place at late night or early morning. It may not require any interference by the keeper. The process usually completes within 7-30 minutes. Sometime all the litters may not be born on succession. Some may born after several hours or a day. The pregnancy may required to be terminated through injection of oxytocin. Following parturition the does used to lick the young and may eat the placenta. The baby rabbits will try to suckle the mother. If the number of litter is eight, all may be able to suckle since doe has eight teats. The baby rabbits those will be unable to suckle may turn weak and susceptible to diseases. Many of them may even die prematurely. The does should not be disturbed during this time and be fed ad lib. Adequate food and water should be provided so that optimum amount of milk is available to the baby rabbits. Rabbit used to nurse her young usually at night or early morning only for once. 6-12 baby kids may be barn from a single kindling.

(e) Weaning

Immediately following birth baby rabbits are solely dependent on their mother. They are born naked. But at about 7 days, there is growth of hair and vitality of them. The eyes used to open after 10 days. The baby rabbits can lead

their lives without mothers' milk at about 21 days of age. The young should be removed from their mother not before 4th week. The doe should be removed from the cage. Foods like concentrates and grasses should be provided. The baby rabbits can chew and eat after 3 weeks of age. The does can be rebred provided the physical conditions of them are satisfactory in nature after one week of kindling.

(f) Identification of Sex (Sexing)

Sexing is done at the time of weaning. The baby rabbit has to be placed on the hand and by the pressure of thumb and forefinger the sex organ is to be pushed on either side. In case of buck the penis will come out as a protruded mass having rounded tip. But, a slit will be located in case of Doe.

Description of rabbit reproductive stages

Buck:Doe ratio	1 male for 10 females
Age at first breeding	Small breeds - 4 months age (Polish, Dutch) Medium breed - 5 to 6 months (New Zealand White, Chinchilla)
Reproduction characteristics	A female rabbit appears to have no definite oestrus cycle although a certain rhythm exists in their sexual receptivity. Cycle lasts for about 12 days of which 4 are infertile.
Signs of heat	Congested, purple and moist vulva, restlessness, rubbing the chin on the sides of the cage, lying in mating posture and lifting the tail
Mating behaviour	The doe is always taken to the buck's cage for mating, and if the doe is in full sexual receptivity it will lift the tail and within a minute the buck will be mating the doe. Mating is successful when the buck falls to one side or backwards after mating
Ovulation	Ovulation occurs 10 - 13 hours after copulation – reflex ovulation
Pseudo pregnancy	Pseudo pregnancy in rabbit may result from sterile copulation and lasts for 16 to 17 days. At the end of this period she may pull hair from her body and attempt to make nest and shows development of uterus and mammary gland.
Gestation period	28 -34 days (average 31 days)
Pregnancy diagnosis	The methods adopted to determine the state of pregnancy are test mating, weight gain method and the 'palpation technique'. The palpation technique is the most reliable method if done by an experienced person.
Palpation technique	A completely relaxed doe should be placed on a table which has been covered in sacking to prevent her from slipping. The doe should be restrained by gently holding the fold of skin behind ears and over the shoulders. The left hand is placed under the body between the hind legs and in front of the pelvis. The uterine horns are felt gently using fingers and thumb. The thumb is placed to right of horns. Embryos can be located and felt like small marble shaped bodies slipping backwards between thumb and fingers when moved gently in a sideways direction. An experienced person can determine pregnancy by 8th to 10th day of mating using this technique. During last week of pregnancy a nest box lined with wood shaving or hay or fibre should be placed inside the cage.
Litter size	6-8
Weaning	4-6 weeks
Kindling interval	2 months (it may be as short as one month if bred immediately following kindling)

MARKET ASPECTS

Rabbit Meat

Being the best white meat, demand for rabbit meat is increasing in the local market. Most of the hotels in Kenya are willing to introduce rabbit meat in their menus but the challenge has always been a constant source to sustain the demand.

The only available rabbit meat is obtained from farmers who produce rabbit for breeding but are forced to reduce the extra bucks produced and not required for breeding purposes. A kilo of rabbit meat ranges between Kshs.500.00 and 1000.00 in the local market. The export market is not mentioned for we are far from reaching the production capacity. Several NGO are working on modalities of increasing production through sensitizing campaigns and funding to the existing farmers. The World Bank and financial institutions (e.g. Equity Bank) are taking the same interests in rabbit farming through small rabbit breeders groups.

Breeding Rabbits

This becomes the biggest market locally due to the increase in the number of new farmers from the middle class who are starting on large scale after realizing the potential and high returns in the business. A one month rabbit is

URINE, 1 MO.	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
DOES 1	975	975	975	975	975	975	975	975	975	975	975	975	975	975	975
BUCKS (lbs)	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
REPAYMENTS	SEP	OCT	NOV	DEC	JAN	FEB	MAR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1.12. CAT. 1	3869.3	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
1.12. CAT. 1	3869.3	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30

TABLE. 2 REVENUE, BANK STATEMENT, LOAN REPAYMENT AND BANK BALANCE FOR LOANS @12% AND 24% RATE OF INTEREST

CAT	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	B/F	ADV. PAYABLE
R.I. 12% P.A.	REVENUE +6,000.0 I. RATE @ 12% P.A.													
							+6,000		+6000		+6000			
REVENUE CAT 1 -URINE	1,385.0	1,385.0	1,385.0	1,385.0	1,385.0	1,385.0	1,385.0	1,385.0	1,385.0	1,385.0	1,385.0	1,385.0		
BANK STATEMENT	1,385.0	2,770.0	4,155.0	11,540.0	12,925.0	10026.15	14926.85	12442.55	15958.25	13473.95	16989.65	14505.35		
LOAN REPAYMENT	-	-	-	-	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30	3869.30		
BANK BALANCE	1,385.0	2,770.0	4,155.0	11,540.0	8641.15	7541.85	11057.55	8573.25	12088.95	9604.75	13120.35	10636.05	A 1: 10,636.05	2

REVENUE CAT 1	1,385.0	1,385.0	1,385.0	1,385.0	1,385.0	1,385.0	1,385.0	1,385.0	1,385.0	1,385.0	1,385.0	1,385.0		
BANK BALANCE	1,385.0	2,770.0	4,155.0	11,540.0	12,925.0	10026.15	13127.3	10228.45	13329.6	9330.75	12431.9	9533.05		
LOAN REPAYMENT	-	-	-	-	4283.85	4283.85	4283.85	4283.85	4283.85	4283.85	4283.85	4283.85		
BANK BALANCE	1,385.0	2,770.0	4,155.0	11,540.0	8641.15	5742.3	8843.25	5944.6	7945.75	5046.9	8148.05	5249.20	B 1: 5,249.20	3

RABBIT BREEDS & STRUCTURES



Rabbit house Floor



Rabbit cages in a shed



California Breed



New Zealand White



Earlobe-Chinchilla



N.Z. + Cross breed



Wood+ Wire Cage



2 Level Cage System