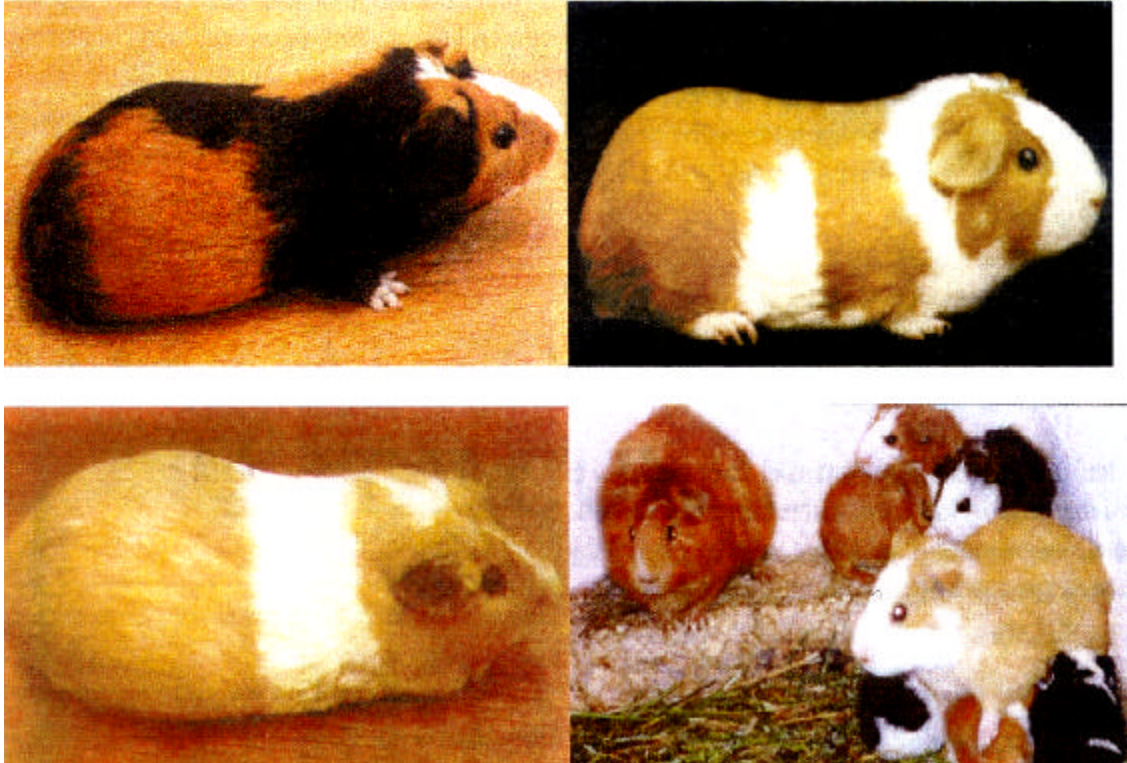


GUINEA PIG MANAGEMENT MANUAL



Elaborated by: Elizabeth Rico Numbela
Claudia Rivas Valencia

Sponsored by: Benson Institute
Proyecto Mejocuy

Printed in: Benson Agriculture and Food Institute
Provo, UT, USA

November 2003

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PROLOGUE TO THE FIRST EDITION

Analysis of the Bolivian population's present Nutritional Security situation shows the present situation of poverty affects 69% of the population, of which 33% are in a moderate state of poverty, while 36.8% are in an extreme state of poverty (31.7% destitute and 5.1% marginal). Also, there is a deficit in the average nutritional consumption, reaching only 1.729 Kca/person/day (PLANSA, 1996).

The production of smaller animals gains more and more interest in our country as a complementary activity inside of the integrated management of production systems of small, important producers in the economy and rural production strategies that permit them to get the most out of their resources and raise the protein level in the indigenous rural animals.

Guinea pig breeding offers a nutritional alternative and also income for the farmer mainly in the region of Los Valles. Aspects of easy management and feeding are contributing factors to the development of this activity. The quality of guinea pig meat and its high levels of protein and energy contribute to improving the nutritional level of the rural population since breeding is traditional with much diffusion and acceptance.

The current Guinea Pig Management Manual is for guinea pig farmers, its objective being to reinforce knowledge acquired in the Family Guinea Pig Breeding Program, which was created as an inter-institutional (MEJOCUY-PESA) cooperation commitment in October of 1997.

At the conclusion of the program, the Manual will be converted into an important thematic guide on guinea pig breeding.

The technical content of the Manual has been elaborated with the experiences of investigation and social interaction gained through 11 years of study by MEJOCUY project investigators. It is organized into 8 components: The first corresponds to the general aspects of guinea pig breeding; the second refers to existing breeding systems in our area; the third has to do with installations and equipment; the fourth to management already stated; the fifth refers to aspects

of nutrition and feeding; the sixth refers to control of diseases; the seventh refers to the determination of production costs considering a case study obtained in the province of Tiranque; and finally, commercialization and consumption. The ninth component is a prescription with some receipts that were taken to the practice.

Elizabeth Rico Numbela

PROLOGUE TO THE SECOND EDITION

With this second edition of the updated and corrected Guinea Pig Management Manual, we hope to make a valuable tool in guinea pig production techniques. All of the incorporated techniques in the new version show the utility that this indispensable manual already had for users, how to be guinea pig farmers in general, students, technicians and professionals from the animal production area.

The Genetic Improvement Project and Guinea Pig Management in Bolivia MEJOCUY, together with the Special Program of Food Production in support with the Nutritional Security PESA, upon implementing the Family Guinea Pig Breeding Program, tried to develop the capacities and initiatives of the group goal with micromanagement, which is fundamental to take a step in sustained guinea pig production.

In poverty stricken countries like ours, it is hard work to implement programs of rural development, even more difficult because these have production level that does not depend financially or technically on the Program or the Project. In this sense, a new production alternative arises from Family Guinea Pig Breeding. With a tendency towards sustainable production, having inserted the production costs in this Manual, these components let the guinea pig farmers validate the retaining level of the same, an aspect that by itself is interesting in light of guinea pig production. These elements permit them to plan their scale and level of production according to their actual possibilities and necessities.

Guinea pig producers, apart from counting on additional marginal incomes, the direct benefit that they obtain with this type of breeding is the contribution to the diet improvement and diversification with protein from the original animal in particular and in general to the neighboring farmers.

In synthesis, it is important high-quality work, which the guinea pig producers and technicians bound to this type of production will need to look into. It would not be fair at this moment to not

recognize and congratulate, on behalf of many others I'm sure, the coauthors Elizabeth Rico and Claudia Rivas for their valuable help that will be for all of us use of the present Manual.

Enrique Fernández Sangüeza

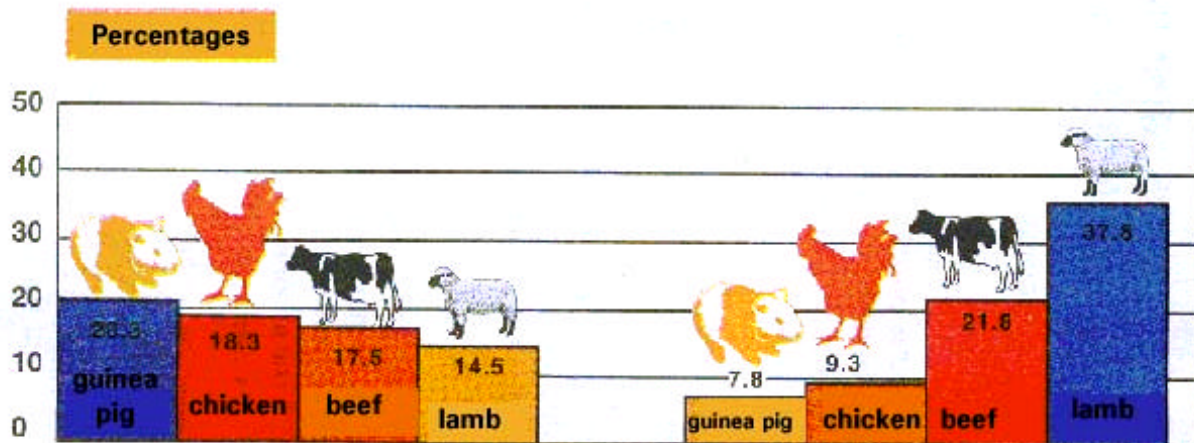
I. GENERAL ASPECTS OF GUINEA PIG BREEDING

The guinea pig (*Cavia aperea porcellus*) is an animal indigenous to the South American Andes. The breeding in Bolivia is concentrated in the region of Los Valles and High Andean regions. The guinea pig is a producer of meat with a high nutritional value.

The guinea pig culture in our country is a complementary activity in the rural production system, which is developed in a way closely related to agriculture. The breeding is oriented for auto consumption, and like food security, it generates additional income for surplus and generates a larger opportunity cost for the working hand since the majority are women and children who do the work.

Guinea pig meat is used as an important source of animal protein given that it is a product of excellent quality, high biological value, is high in protein and low in fat compared to other meats. These characteristics make this product very desirable, as you can see in the following table:

NUTRITIONAL VALUE OF MEAT



Guinea pig consumption is very traditional. It is done usually eaten during festivals, by invitation or between family and friends with a smaller frequency of consumption if restaurants. Guinea pig commercialization is based on important middlemen that get the animals from the farmers or in provincial ferries and later sell them in the city markets.

The native guinea pig is predominant in Bolivia. Better known as a guinea pig Creole, which is smaller in size, is resistant to diseases and is very rustic which enables it to adapt to adverse weather conditions. These guinea pigs grow slowly and produce little meat. The majority of production is for auto consumption, thus contributing to nutritional security.



Figure 1: Reproducing guinea pig of the Native Bolivian lineage

Another line that has been developed in the MEJOCUY project is the “MIXED MEJOCUY.” This guinea pig is medium sized and shows rustic characteristics, apt for the country’s bio climatic differences. Family producers farm them where production is for auto consumption and sale in order to generate important income.

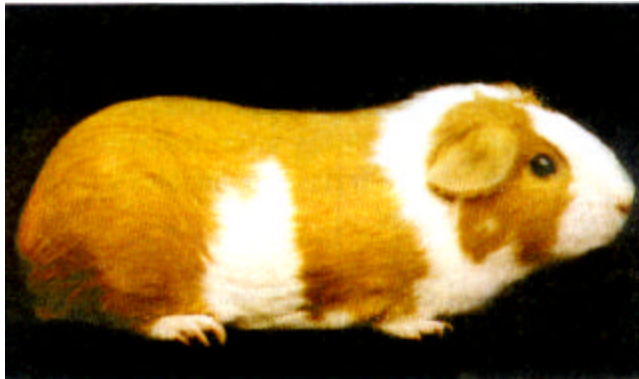


Figure 2: Reproducing guinea pig from the Mixed MEJOCUY lineage

The “New Improved Tamborada,” introduced to Peru in 1988 and locally improved in the MEJOCUY project for a intense and commercial production, shows high weight output characteristics; but is demanding concerning adequate environmental conditions (altitude and temperature), and is also demanding concerning feeding and disease susceptibility.

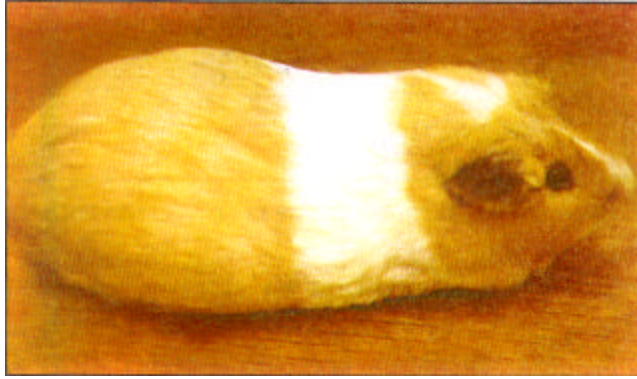


Figure 3: Reproducing guinea pig from the “NUEVA TAMBORADA” lineage

The positive productivity characteristics that this species shows are the following:

- Rusticity and easy management
- Short biological cycle
- Early sexual maturity
- “Neonato al medio” immediate response
- Varied feeding mixtures (alfalfa, corn, barley, oats, etc.) harvest leftover (corn leaves, barley straw, oats, beans, etc.) kitchen crumbs, industrial sub products (wheat bran, soya flour, sunflower, cotton cake, etc.).
- Guinea pig droppings are sub products that are great organic fertilizers

II. BREEDING SYSTEMS

Guinea pig breeding in Bolivia is managed under three systems that are characterized by their function in the productive unit, which are: family breeding system, commercial family breeding system, and commercial family breeding system.

FAMILY BREEDING

The family breeding system is the most predominant in our area. The system’s principal function is auto consumption and special cases to generate income. Sales are made when there is

a surplus, economic needs, and in many cases, for bio climatic limitations that are in direct relation to the availability of food for the animals.

Traditional family breeding insists that technical family breeding be developed in a rustic manner without improved technique applications.

The class of animal used for this end is the Bolivian guinea pig, which has adapted to adverse weather conditions. It responds to purposes of food security and sustainability of the small producers' production systems.

Ten to 30 guinea pigs are managed together. The food is based on harvest leftovers, kitchen leftovers, undergrowth, etc. Inadequate installations are frequently used in areas like the kitchen, bedrooms, and other spaces shared by other species, which makes management impossible and inadequate sanitary conditions.



Figure 4: Traditional family breeding in the kitchen

Management of the animals is done in open colonies where the animals are kept together in an environment without sex or age distinction, which causes premature pairing. When the guinea pigs are kept all together, the female offspring mix with their brothers and fathers causing consanguinity. This brings a depression in productive parameters: high death rate, small number of offspring per birth, and low weights.

Another unpleasant aspect is that traditional breeding requires negative selection, given that the election of animals for consumption is done between the largest, eliminating the best germ plasm.

The accumulated affect of these factors previously mentioned makes the native Bolivian guinea pig a rustic animal with little meat production and resistant to diseases.

The technical family breeding has the same characteristics with respect to the number of animals used, food, and purpose of the production with the only difference that an improved technology and adequate installations uses. Therefore, it obtains better productive animal output.



Figure 5: Technical family breeding

COMMERCIAL FAMILY BREEDING

The family productive unit is in charge of the breeding, using improved breeding techniques. A population of 100 to 400 animals is usually maintained, with the animals being grouped by age, sex, and physiological stage.

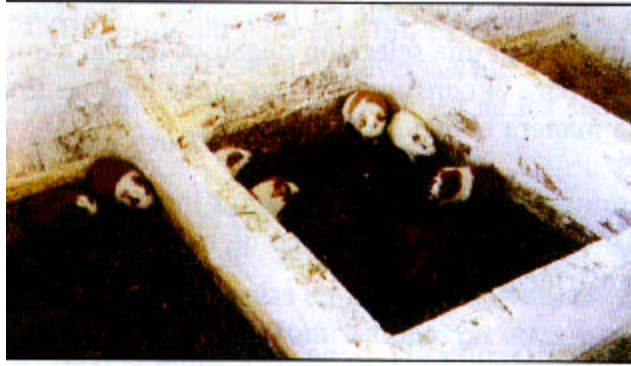


Figure 6: Family breeding

Production is for auto consumption and sales. The class of animal used for this purpose is the mixed guinea pig that is apt to different bio climatic conditions and has a higher output than the native guinea pig. The food supply is dependant on cultivated prairies with mixed species like alfalfa, tares, barley, and oats. Depending on the availability, harvest leftovers are also used such as corn, oat straw, barley, etc and in some cases, supplements with concentrate.



Figure 7: Family breeding – commercial, short forage

TECHNICAL COMMERCIAL BREEDING

In technical commercial breeding, the main function is to produce guinea pig meat to sell in order to obtain benefits. This is why technological packet is used in infrastructure, feeding, management, sanitation, and commercialization.

The type of animal used for intensive commercial production is the improved Peruvian guinea pig, which matures early sexually and has a high meat output.

The animals live in protected areas to avoid predators and to separate them by sex, age, and physiological stage; in this way, ectoparasites are efficiently controlled (fleas, ticks, lice etc.) consanguinity is avoided, and the death rate of the animals is reduced.



Figure 8: Technical commercial breeding

Under this breeding system, a mixture of food is generally used that consists of forage supply and supplementary food. This feeding system fulfills nutritional requirements and obtains optimum output from the animals.

TECHNICAL BREEDING PERMITS US TO:

- Avoid colony breeding to elude animal deterioration.
- Avoid a specific food system, using resources from the region or the different seasonal alternatives.
- Avoid consumption of the best animals and lets us select animals for the coming generations.
- Avoid inadequate installations because the guinea pigs need to live in a protected atmosphere that allows for separation by class, age, and sex without the presence of other predator species like dogs, cats, rats and others that can attack them.
- Avoid hydric limitations because the guinea pigs need to drink water for normal development.
- Avoid closed environments; the guinea pigs need a ventilated area to live in. For best use, areas that do not have light, ventilation, or are not secure can be adapted.

III. HOUSING

Presently, guinea pig breeding is done in a rudimentary form without technical criteria, therefore, Reproductive and productive output is low.

The guinea pig is sensitive to certain climatic conditions and is more tolerant of the cold than the heat. In traditional breeding, to be maintained in the best of conditions, it is believed that smoke is needed to reproduce in optimum conditions. This belief is not true since they are bred in protected areas, mainly to avoid mortality among breast-feeding babies.

The installations differ in construction and design depending on whether is it in the valley, high planes, or tropical areas. It also depends on the type of animal and availability of construction materials.

The best temperature is 18° C. The extreme temperatures, cold (less than 3° C) and hot (more than 34° C) alike, produce prostration mainly in pregnant females and in breast feeding young.

The infrastructure is preponderant on the execution of productive activities. It is necessary to have appropriate installations in order to have guinea pigs produce efficiently.

CONSIDERATIONS FOR THE CONSTRUCTION OF THE HOLDING AREAS

Type of breeding: If the breeding system will be family, family-commercial, or commercial.

Selection of terrain: If possible, it should be near communication lines, markets, available forages, and a water supply.

Orientation of the holding areas: They should be protected from humidity, air currents, and excess heat. It is convenient to be able to adjust the window to that the temperature can be maintained at the desired level, thus avoiding contaminated air, but without provoking air

currents. In warmer and temperate climates, construction should be oriented with respect to the path of the sun (east to west). In colder climates, construction should be oriented so that the sunrays warm the area going from north to south.

HOLDING AREAS

Figure 9: Orientation of the holding area in warmer climates

Figure 10: Orientation of holding area in colder climates

The following recommendations should be taken into account for the construction of the holding areas:

- The guinea pigs should be protected from the cold, excessive heat, rain, and wind currents.
- They should have proper ventilation and lighting. When the ventilation conditions are inadequate, pathological processes and respiratory tracts are affected.
- The location of the holdings should accommodate management, feeding, and cleaning.
- They should not allow predator animals to enter.
- They should have a future option for adding on.
- The climate and materials available in the area should be considered apart from the feasibility to get them and their cost.
- If the guinea pig farm is to be in a cold and/or rainy area, the roof can be made of metal or tile. The windows should not be very large and should have curtains for the nighttime.
- If the guinea pig farm is to be in a warmer area where it does not rain, the roof can be made of tile or clay. The walls can be replaced with netting.
- The holdings or corrals can be constructed of wood, adobe, brick, or net. They will be made one meter and a half long, one meter wide, and one half meter tall. For better security, you can install a net or wood cover for the holdings.
- For the building, the floor, walls, and roof need to be considered. A cement floor is the most advisable for its easy cleaning and disinfection.

- In warmer climates, the building does not need walls, but can be made of nets. On the contrary, in colder climates, the walls are necessary and need to be one meter and a half tall.
- For proper ventilation and protection, plastic or cloth curtains are often hung on the walls.

BUILDING DIMENSIONS

The dimension calculations should be in proportion to the number of female guinea pigs in the production. The female: male ratio is from 6:1 to 8:1. The needs they generate for their reproduction should be accommodated in the building. In practical terms, consider the ratio 1:2. For every reproducer area, two should be constructed for breeding.

TYPES OF INSTALLATIONS

The installations can be

- Cages
- Enclosed areas of wood, brick, or net.

BREEDING IN WOOD, BRICK, OR NETTED AREAS

The corrals are built with a determined size, square or rectangular, distributed in a way in which has the maximum interior space thus permitting wheelbarrows and persons to easily move throughout. In this way, areas for reproduction, for breeding, and reserve animals can all be accommodated.

For breeding in corrals, the following model is recommended:

This model can be modified according to the availability of terrain, and the number of animals one wishes to breed.

FIGURE 11: Design and dimension of building with holding areas

ADVANTAGES:

- Facilitates management and control of the farm
- Construction is easy and permits the use of diverse materials
- Avoids competition among adults for food because they are raised separate.
- Records can be kept so that future reproducers can be detected
- Permits separation of the animals by sex, class, and age
- There is a lower death rate because infection of all the animals is avoided.

BREEDING IN CAGES

Cage installations require a qualified worker in the construction of cages because they should have additional systems of drainage and waste disposal, and feeding systems like bottles food bowls.



Figure 12: Building with cages

ADVANTAGES:

- Better use of space in the breeding area
- More efficient cleaning methods
- Cages are recommended in humid, and high temperature areas

DISADVANTAGES:

- Higher infrastructure costs
- Require human skill for design and construction

Some guinea pig farms that have corral-systems construct cages to increase their capacity for production, combining the two systems.

DRINKING AND FEEDING DEVICES

To feed the guinea pigs in equal proportions, feeding devices for forage and concentrated food are needed, drinking devices are also needed for equal water proportions.

The feeding devices should be simple and practical so that they can be manipulated and cleaned easily. In this way, abuse and contamination of the grasses is avoided to prevent sickness.

The feeding devices for supplementary food (concentrated) can come in different forms. The most simple are cone shaped and made of clay,

The upper part being smaller than the lower part thus stops the animals from going down into the device tipping it over.

It is important to avoid dispersing the food and also to be able to clean it daily. For every reproductive cycle, the devices should be cleaned, washed and disinfected. Humid areas should not be produced in the same.

The drinking devices can be made of mud or cement, with a capacity of one-half liter. They should be stable so that the animal does not spill.

Also, space should be made available for concentrated food deposits, or else, in larger exploitations space should be made for bodily waste.

IV. BREEDING MANAGEMENT

Certain production periods exist in guinea pig breeding. To be successful in guinea pig breeding, you should be careful with the phases of matching, gestation, birth, breast-feeding, weaning, breeding, and selection of repositioning nurseries.

MATCHING

When the guinea pigs reach puberty, they are able to reproduce.

It is called puberty when the female has her first period and the male can cover the female.

Females reach puberty within 6 to 8 weeks. This depends on its lineage and the food that it is given. The males reach puberty 1 to 2 weeks after the females.

Matching is the process of putting the male and the female together to start the reproduction process. The density of the matching and the load capacity in males should be managed together as it should be in pig breeding exploitation.

When the guinea pigs reach the weight and age ideal for reproduction, the male and female should be joined to start their reproductive lives and procreate. Only when the female has her period does she let the male cover her. The female has her period every 16 days with little variation.



FIGURE 14: Matching corral with 1 male for 5 females.

Many different matching methods are used; one of the most common is the system of continuous matching, which consists of putting the reproducing females together with the male during a reproductive phase (1 year) permanently, in which the male fertilizes her during the period after birth. Two to three hours after birth the female has a fertile period with an 85% chance for fertilization.

The interval between births is approximately 70 days (4 to 5 births a year per female). This means that there is no period of sexual rest, and for this reason to avoid tiring, they are given adequate food.

Under these circumstances, the females can be use for 5 to 6 births and then can later be excused.

The other system of reproduction is discontinued matching, which consists of separating the males one week before birth and return them in 21 days. This gives them sexual rest and lets the females recuperate. Under this system, the females do not utilized the post-birth period, and give birth 4 times per year. The females under this system can be used for 7 to 8 births.

GESTATION

The guinea pig is a species that has many babies and the females are able to have their period after birth associated with one ovulation.

The gestation period is approximately 67 days (9 weeks). It is started when the female is pregnant and ends at birth.

The pregnant female needs to be in the more calm areas of the farm because the noises and other distractions can make them run, become nervous, and/or treat each other improperly which in turn causes abortions.

One should pick up a pregnant guinea pig in the following manner: hold the guinea pig's back with one hand, and the stomach with the other hand and forearm. You must not hold the animal around the neck because that could cause an abortion.



FIGURE 15: Proper way to hold a pregnant guinea pig

The female could abort if she is not fed properly or does not have sufficient water. Remember that guinea pigs drink water from fresh grasses and drinking water.

If the mother is not fed properly during the first weeks of gestation, some of the guinea pigs inside the womb can die. This is the reason in many cases that there is only one breed born.



FIGURE 16: Female in the last week of gestation

During the last weeks of gestation the mothers must be well fed so that the babies are at a proper weight at birth.

BIRTH

At the end of the gestation period the mother gives birth, which requires no assistance and usually happens at night, lasting between 10 and 30 minutes. The number of newborn guinea pigs can vary from 1 to 7. The mother consumes the placenta and cleans the guinea pigs, which are born complete with hair, eyes open, and start to eat forage hours after being born.

The guinea pigs are born very developed because of the long gestation period. They are born with fully functioning eyes and ears, are covered with hair, move by themselves, and eat forage shortly after being born.

After birth, the litters of three or more with large guinea pigs should be marked. This way the best animals for replacement can be chosen.

LACTATION

Lactation is the period in which the mother should nurse her offspring. This period lasts 2 weeks from the moment of birth until the weaning period (14 days). The young guinea pigs should start to breast-feed immediately after birth.



FIGURE 17: New born guinea pigs breast-feeding

The guinea pigs are not as dependent on milk from their mother as other species are. Then the litters are numerous, the guinea pigs grow less because they receive less milk. This is why good food should be proportioned to the reproducers and if it is possible in some cases add grains or supplementary food to their diet.

The mother guinea pigs produce a good amount of milk during the first two weeks after giving birth. After this period, they almost stop producing milk. This is due partly to the fact that the mothers are pregnant after birth. For this reason, it is recommended to separate the guinea pigs from their mothers 14 days after birth.

The nursing guinea pigs need a protected area to live in usually for the winter. It needs to be at a temperature no lower than 12° C.

Identification of the guinea pigs is important because of the selection and removal of the future reproducers. Earrings can be used or a description of some of the animal's particular hair features. The earrings can be made with a metal plate and later be put on the guinea pig's ear, perforating the skin until it is securely on the ear.

The guinea pigs can double their weight from the time of birth to the weaning period, which is why they should be given proper amounts of healthy food. When they are not given enough food, the guinea pigs do not have an adequate weight.

WEANING

Weaning is the separation of the guinea pigs from their mother, which is done after the lactation period or about 10 to 14 days. It is not recommended to do after this time because the guinea pigs are premature (they can have a period after 16 days) and there is a risk that the females leave the reproducing area pregnant.

At the start of the weaning period, the sex should be determined and the animal should be characterized in order to identify it easily. The sex of the guinea pig is determined holding the

guinea pigs by their backs and observing their genital areas. You can see that the females have the form of a “Y” and the males have a clearly different form of a “j.”

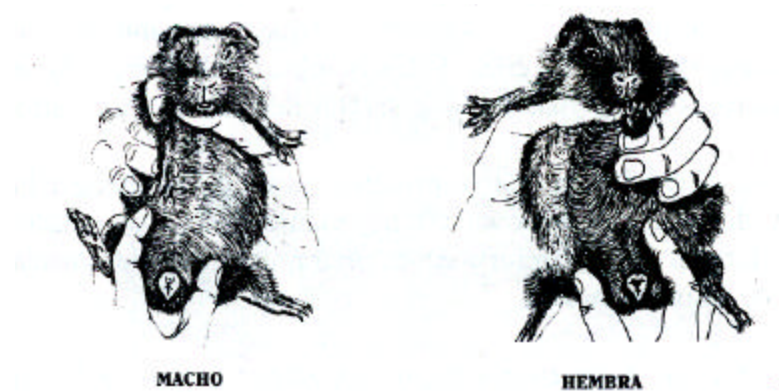


FIGURE 18: Method of determining sex at weaning period

BREEDING

This period involves the time of weaning until they are taken out. The animals should be placed into clean and disinfected corrals in groups of 8 to 10. They should be placed with others of their same sex, taking into account the dimensions of the corral.

Adequate, quality food should be given to the animals so that they have satisfactory development. In this stage, their growth is rapid and the animals respond well to a balanced diet.

The breeding phase lasts 45 to 60 days depending on the species and feeding habits. It is recommended to not prolong this period for too long to avoid fights among the males. This causes wounds and spoils the quality of the litter.

At the end of the breeding period, the best-sized and shaped guinea pigs should be selected to be reproducers. The animals that grew the fastest will be selected, or in other words, guinea pigs with the best size that come from litters of 3 or more. These females should replace the reproducers that need to be removed after giving birth 5 to 6 times.

The largest males of the group should be selected to be the male reproducers. Those that not only have the best size, but also those that are best shaped should be selected, preferably from litters of 3 or more and that have clear colors.

Animals should not be paired with relatives, in other words, parents and children, or among siblings because this can cause consanguinity problems which causes the following problems:

- High mortality rate among the guinea pigs
- Birth defects
- Lineage degeneration

Consanguinity is avoided by putting reproducers into the nursery every two years.

The reproducers can also be changed with other producers that have quality guinea pigs that are healthy.

The well-fed guinea pigs reach their reproductive age more quickly. Therefore, if they are well fed, they can have more young (at 12 weeks old).

There is a larger number of offspring at birth that have a better weight when the female guinea pigs that are pregnant have been fed well. This in turn improves their multiplying ability.



FIGURE 19: Group of animals to be selected for pairing

The sanitary state of the animals is also influences the age of the pairing. The guinea pigs that live in clean areas and that do not have parasites like ticks, fleas, or lice grow faster. Also, very cold weather or excess heat lowers the reproduction age for the guinea pigs.

The females can start their reproducing age at approximately 3 months old, or when they reach 60% of the weight of adults (about a half kilo); they should be healthy and have no defects.

To use males as reproducers, they should be more than 4 months old, weigh more than 600grams, be healthy, and have no defects.

USE OF RECORDS IN REPRODUCTION

In all breeding systems it is beneficial to use records in order to maintain control of the animals. They teach us the best aspects of production.

One should take into account the date of pairing (start of the reproducing stage), and of the births, which permits us to have better control over the birth intervals of the females. This helps us to identify females that are left out, or that have fertility problems, know the number of births per year, and the size of the litter, which helps us determine which animals to keep and which animals to remove because of infertility.

Records should also be kept during the breeding phase in such a way that when the animals are weaned, the date is taken for weaning, the species is noted (if more than 2 are taken) sex, number of animals, date of extraction (for sale or reproducing) etc.

The following is a presentation of the records that can be used in family – commercial breeding:

Record of breeding stage:

Weaning date:..... End of breeding date.....

Number of animals..... Sex.....

Record of animal balance in breeding stage:

| Date | Corral number | Number of animals | Sex | Total | Observations (sales, deaths) |
|------|---------------|-------------------|-----|-------|------------------------------|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Record of reproducers:

Corral number:..... Number of males:.....

| Number of female | Date of Birth | Birth number | Number of Offspring | Observations |
|------------------|---------------|--------------|---------------------|--------------|
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V. FEEDING AND NUTRITION

Feeding of the guinea pig is a very important aspect, given that it depends on the success of the production. Sufficient forage production should be guaranteed considering that the guinea pig is a herbivore and has a large capacity of forage consumption.

Providing the animals with insufficient food has as a consequence a series of problems; Among reproducers, frequent problems are: low fertilization, embryo death, abortions, and small, weak births with a high mortality rate.

Guinea pigs should be given adequate food according to their nutritional needs so that the guinea pigs have a high production rate and grow rapidly.

The nutrients are substances that are found in food and that the animal uses to maintain itself, grow, and reproduce. The animals need different proportions of food.

The nutrients that that animals need are: proteins, carbohydrates, minerals, vitamins, and water.

Feeding consists of adequate selecting and combining different nutrients that have these elements so that they might have a productive efficiency from an economic and nutritional point of view.

Proteins are important because they form the muscles, the hair, and the organs of the body. The forages richest in protein are legumes, alfalfa (*medicago sativa L.*), tares, clovers, kudzu, croup, etc. Grasses are a good source of energy and have low protein content. The most utilized among them to feed guinea pigs are the forage corn, rye grass, and elephant grass.

Carbohydrates provide the energy that the organs need to maintain themselves, grow, and reproduce. The foods rich in carbohydrates are those that contain sugars and starches. Grasses are rich in sugars and starches. In some cases they are used for complimentary food to yellow corn and sorghum.

Minerals mainly form the bones and teeth. If the guinea pigs eat enough grass, it is not necessary to give them minerals in their food. Some farmers give salt to their guinea pigs, but it is not indispensable if they are fed enough quality forage.

Vitamins activate bodily functions and help the animals to grow faster, improve their reproduction and protect them from various diseases. The most important vitamin in guinea pig food is Vitamin C. The lack thereof produces serious growth stunts, and in some cases can even cause death. Adequate fresh forage secures a sufficient quantity of Vitamin C.

Water is the principal component of the body, indispensable for normal growth and development. Water sources for the animals are: water associated with food (fresh forage) that is not sufficient, and drinking water. For this reason, drinking water should be given to the guinea pigs, especially if there is little forage, and if it is ripe and/or dry.

The reproducing guinea pigs need 100 cc of water per day to live. Lack of water in this stage can provoke cannibalism. Guinea pigs in the growing stage need 80 cc of water per day, while breast-feeding guinea pigs need 30 cc per day.

Water can be given out on plates made of clay, which should be washed and refilled with new water daily to avoid contamination.

The following are guinea pig requirements according to the stage of production:

GUINEA PIG NUTRITIONAL REQUIREMENTS

| Nutrients | Unit | Stage | | |
|-------------------|----------|-----------|----------------|---------|
| | | Gestation | Breast-feeding | Growing |
| Proteins | % | 18.0 | 18-22 | 13-17 |
| Digestible Energy | Kcal/Kg. | 2800.0 | 3000.0 | 2800.0 |
| Fiber | % | 8-17 | 8-17 | 10 |
| Calcium | % | 1.4 | 1.4 | 0.8-1.0 |
| Phosphorus | % | 0.8 | 0.8 | 0.4-0.7 |
| Magnesium | % | 0.1-0.3 | 0.1-0.3 | 0.1-0.3 |
| Potassium | % | 0.5-1.4 | 0.5-1.4 | 0.5-1.4 |
| Vitamin C | mg. | 200.0 | 200.0 | 200.0 |

Source: Nutritional requirements of Laboratory Animals, 1990, Universidad – NARIÑO, 1992.

The most commonly used compositions of the food supplies are detailed in the following table:

COMPOSITION OF FOODS USED FOR GUINEA PIGS

| Food | MS (%) | Digestible Energy | P (%) | FC (%) | Ca (%) | P (%) |
|---------------|--------|-------------------|-------|--------|--------|-------|
| Alfalfa | 24 | 620 | 4.9 | 10.5 | 0.45 | 0.06 |
| Oats | 90 | 2600 | 11.5 | 32.0 | | |
| Alfalfa flour | 92 | 2309 | 17.9 | 24.1 | 1.70 | 0.23 |
| Grain corn | 89 | 3790 | 9.3 | 2.0 | 0.03 | 0.31 |
| Corn husk | 90 | 2210 | 3.2 | 36.2 | 0.12 | 0.04 |
| Sorghum | 89 | 3330 | 10.7 | 2.2 | 0.04 | 0.29 |
| Barley | 89 | 3330 | 12.4 | 5.6 | 0.04 | 0.33 |
| Oats | 89 | 2950 | 12.4 | 10.6 | 0.06 | 0.33 |
| Wheat alfalfa | 89 | 2996 | 14.8 | 10.3 | 0.11 | 0.33 |
| Soy | 89 | 2474 | 46.1 | 2.2 | 0.04 | 0.62 |
| Sunflower | 93 | 2551 | 46.3 | 11.0 | 0.38 | 1.05 |
| Cotton cake | 90 | 3090 | 40.7 | 12.6 | 0.17 | 1.09 |
| Bone | 96 | - | - | - | 24.0 | 12.1 |
| “Conchilla” | 96 | - | - | - | 26.0 | - |

Source: Nutritional Requirements of Rabbits, 1991.

FEEDING SYSTEMS

The feeding systems for the guinea pigs are established according to the availability of food and the costs of these foods have throughout the year. Three systems can be implemented depending on the type of breeding (family, family-commercial, commercial), and the availability of food, which are described in the following text.

1. FORAGE BASED DIET

Forage based food consists of having forage as the only form of food. It is highly influenced by the weather seasons and forage production. In this case, forage is a main source of nutrients and assures adequate intake of Vitamin C.

Nonetheless, it is important to note that a diet based on forage does not produce the best results with the animals. It is enough in terms of quantity, but does not fulfill the nutritional requirements.



FIGURE 20: Alfalfa

The guinea pig consumes 30% of its live weight in green forage, and eats almost any type of forage. Alfalfa is the best type of forage that you can feed guinea pigs, but since it is not available in all parts of the country, you can also use other types of forages. The following is a list of some of the forages that can be given to guinea pigs.

- Alfalfa
- Tares
- Croup
- Forage corn
- Oats
- Barley
- “Triticale”
- Rye grass
- Elephant grass
- Harvest leftovers (bean leaves, cabbage, oat straw, barley straw, corn husk, etc.)
- Kitchen crumbs: vegetable leaves



FIGURE 21: Forage corn consumption

Forages for feeding animals after being cut should be aired out for one hour. Forage should not be administered:

- Freshly cut, warm and/or fermented because it provokes flatulence and death.
- Soft or with morning dew because this causes diarrhea.
- Recently fumigated because this could poison them.



FIGURE 22: Cut forage

2. MIXED DIET

A mixed diet consists of a more concentrated forage. Guinea pig production in our environment is based on the use of bulky foods (forage) and little use of concentrated foods. Concentrated foods complete a good diet, for which to obtain maximum supply, it is necessary to complete the diet with accessible supply from an economic and nutritional point of view.

Therefore, forage assures an adequate intake of fiber and Vitamin C and helps to partly cover requirements for some nutrients. Concentrated foods complete a good diet to satisfy the requirements for protein, energy, minerals and vitamins. An optimum supply is reached with this diet.

Feeding with concentrated food could make up 40% of the total food.

The ingredients used for preparation should be high quality and low cost. Products that contain insects, fungi, or that are contaminated with salmonella should be avoided. Elaboration should be done according to the phase requirement, as you can see on the following table:

TABLE 1: EXAMPLE OF CONCENTRATED FOOD (WINTER PHASE)

| Composition | Stage | |
|---|-------------------------|--------------|
| | Gestation and lactation | Growing |
| Fresh alfalfa | 20.0 | 20.0 |
| Mixed hays (alfalfa, oat straw, corn leaf) | 30.0 | 30.0 |
| Baked wheat | 12.0 | 11.0 |
| Wheat bran | 20.0 | 25.0 |
| Sunflower | 14.2 | 11.0 |
| Bone flour | 1.9 | 1.2 |
| “Conchilla” | 1.0 | 1.0 |
| Salt | 0.7 | 0.6 |
| Vitamins and minerals | 0.2 | 0.2 |
| TOTAL | 100.0 | 100.0 |

Source: MEJOCUY Project, 1999.

TABLE 2: LEVELS OF FOOD GAURANTEE

| Nutrients | Reproduction | Breeding |
|------------------------------|--------------|----------|
| Digestible energy (Kcal/kg.) | 2,860.00 | 2,900.00 |
| Total protein (%) | 18.00 | 17.00 |
| Crude fiber (%) | 19.33 | 19.56 |
| Calcium (%) | 1.40 | 1.16 |
| Phosphorus (%) | 0.61 | 0.47 |

The stages in which guinea pigs can be given concentrated food are:

- At the start of pairing so that they have a larger number of offspring per birth
- At the end of the pregnancy so that the offspring have a proper weight

- The recently weaned guinea pigs for two or three weeks.
- One or two weeks before taking the guinea pigs to market.

3. BALANCED DIET

As the name indicates, a balanced diet is a complete and fulfills all of the requirements.

This system takes advantage of the foods with a high content of dry material, being necessary the use of Vitamin C in water or the diet (since it is not synthesized by the guinea pig). The vitamin C is not stable, but decomposes which is why it is recommended to avoid degradation, using vitamin C that is stable and protected.

This system, however, cannot be used permanently, but is to be periodically supplemented by forage.

ADMINISTRATION OF FOOD AND WATER

- Voluntary water use should be secured in mixed food and balanced systems.
- Food should be given at least 2 times a day, with 30% -40% being given in the morning and 60-70% given in the afternoon.
- If concentrated food is given, it should be done in the morning as the first feeding and later, the forage can be given.
- Water should be given in the morning, or in the early afternoon, or between the concentrated food and forage (mixed food). The water should be fresh and free of contamination.
- Forage should not be given right after cutting because it causes digestive problems (flatulence) in the guinea pigs. Forage should be dried in the sun for at least one hour.
- When the food is changed (especially to forage) it should be done gradually to avoid digestive problems.

CONTAMINATED FORAGE

Contamination of forage can be produced in three ways:

- The forage can be contaminated by with large red or black fleas or other insects. In this case, they should be washed with water.
- The forage can be mixed with toxic plants from the area; for example, the valley has the yellow clover, milkweed, hemlock, mallow, etc.
- It can be contaminated with residual chemical products like in the case of fungicides and insecticides.

VI. CONTROL OF PRINCIPAL DISEASES

Controlling principal diseases is one of the biggest problems for the guinea pig farmer because they do not know the causes that produce the diseases, how to prevent them, or how to cure them.

One of the main causes of guinea pig diseases is the fact that they do not live in clean conditions. This is why the corrals should be cleaned and disinfected on a daily, weekly, and monthly basis.

The malnourished guinea pigs are susceptible to contracting diseases. A balanced diet provides them with the nutrients they need to grow healthy and strong. The foods should be fresh and free of contamination.

Every guinea pig put into the corrals should be previously checked and disinfected against possible parasites. At the same time, the infected guinea pigs should be isolated and dead guinea pigs should be incinerated or buried.

GUINEA PIG SICKENESSES

Diseases that infect guinea pigs can be:

1. Infectious
2. Parasites

3. “Micoticas”
4. Deficiency
5. Viral

The main causes of disease are quick environmental changes, considering temperature variations, high humidity, direct exposure to wind, high density, animal overcrowding lack of cleaning in sleeping area, and lack of food among others.

1. INFECTIOUS DIESEASES

Infectious diseases are caused by bacteria that can produce a high mortality rates. The most frequent are salmonella and pneumonia.

A) SALMONELLA

Salmonella is found in a latent state. Guinea pigs are carriers, as it only requires one situation of stress to activate it. This is the most serious disease that infects guinea pigs.

It is transmitted by guinea pig fecal waste, or else from other carrier animals like mice, rats etc. through contaminated foods.

Symptoms

The first symptoms are weakness, lack of appetite, weight loss, bristly hair. Diarrhea, vomiting, and paralysis in the hind legs can also occur. Pregnant and weaning guinea pigs are most susceptible. If the infection attacks the litter, the results are serious and grave.

Prevention

- Food should be of the best available
- Regular cleanings of the corrals, avoiding trespassing of rats, mice, and other animals
- Animals that come from outside should be isolated for at least two weeks
- Eliminate flies, and incinerate the dead animals

Treatment

If the disease appears in an isolated animal, all of the guinea pigs should be treated for three months with Oxomid, Enromix or products whose active agent is quinoline or oxytetracycline. One dose consists of 2 grams per 3 liters of drinking water. Other medications that are used for birds as “nitrofurans.” Usually the doses come with indications depending on the weight of the animal or amount of drinking water or food, which is why doses and application time will vary.

Symptoms

Guinea pigs have fevers and hide as if they were cold. The eyes turn glossy, and respiration is agitated. They often have runny noses and sneeze frequently.

Prevention

- Feed the animals well
- Avoid quick temperature changes, wind, and high humidity in the corrals
- The sick and healthy animals should be separated

Treatment

If the animals are treated as isolated cases, it is preferable to eliminate the sick animals to avoid infection among the rest.

In the case of a general infection, a dissolved antibiotic should be given in fresh, clean water. They can be products formulated for birds, and you can also use intramuscular injections as oxipus or another antibiotic.

2. PARASITE DISEASES

Parasites are those that live feeding off other animals, sometimes causing death. Parasitical diseases can be produced by bugs that live in the skin or hair of the guinea pig (external) or else worms and other microorganisms that live inside of the organism.

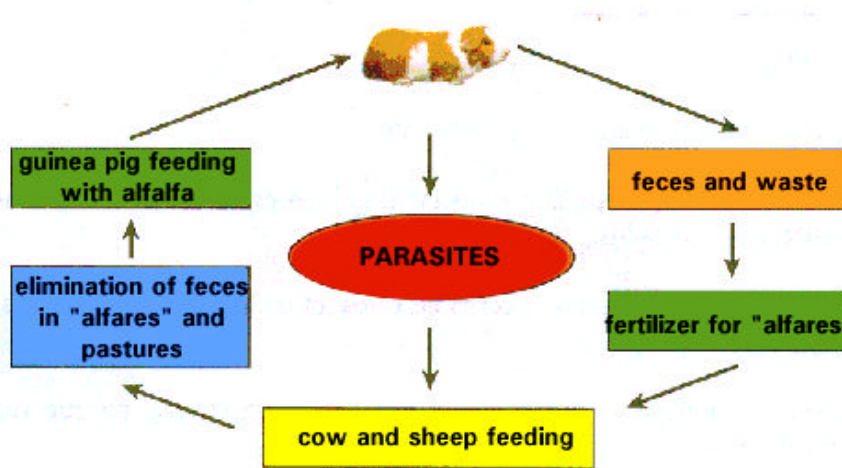


FIGURE 23: Cycle of contamination through feeding

a) External parasites or ectoparasites

These do not necessarily kill the guinea pigs, but cause weight loss, and in turn, less production, given that the animals are not well developed. The external parasites that attack most frequently are: fleas, mites, lice, and bedbugs. Lice and fleas are found on the whole body, while the mites are found around the neck and ears. They feed off of the blood that they suck which is why when an animal is infected it loses weight while the smaller and weaker guinea pigs can die. The parasite sting keeps the animals restless and the hair is found to be bristly.

The ectoparasites that are most difficult to control are the fleas and mites that jump onto the body of the animal. They reproduce and stay on the floors and walls, etc. where they lay their eggs and easily expand.

Prevention

- The corrals should be kept clean
- New animals should be cleaned for parasites
- Do not let the guinea pigs be close to other animals like chicken,

- Do not let in dogs, cats, or rats into the building because the parasites can easily pass to the guinea pigs from these animals.

Treatment

Apply powder or dissolved insecticide. The animals can be sprinkled using Bolfo or in immersion baths with a Sevin solution.

Baths can be by immersion or by spraying. The immersion bath consists of submerging the guinea pig in a tub with dissolved insecticide in water. The guinea pig should be completely submerged. This is done when there are many parasites. The spray or sprinkle bath is done with a pump pack, with which you completely wet the guinea pigs. The walls and floors of the corrals should be wetted also. The guinea pigs are treated the best in the spray or sprinkle baths and are recommended for pregnant guinea pigs.

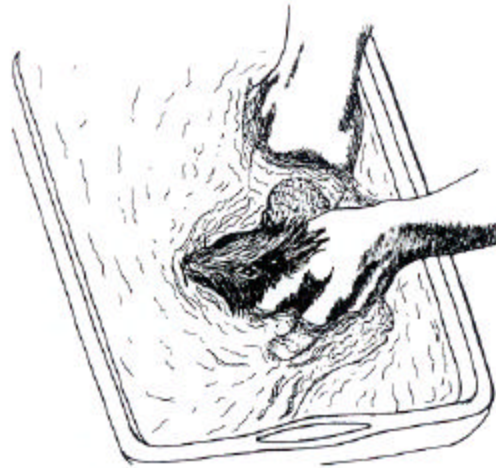


Figure 24: Immersion bath

The following precautions should be considered for bathing:

- Follow the instructions that come with every product
- Get rid of food that has been contaminated with insecticide
- Give baths during the hottest hours of the day. Once the guinea pigs are dry, give them food to eat.

Powder insecticides like Bolfo are recommended when there are not many ectoparasites or when the weather is cold.

It is useful to use tarhui or ash water on ticks, lice and fleas for immersion baths.\

MIASIS

Fly larvae that leave their eggs in the corrals cause Miasis. If the animals live in dirty conditions infested by flies, these larvae easily enter the animal's bodies. Females after giving birth, animals with wounds and weaning guinea pigs are most susceptible. The larvae produce a general decay, given that they feed off of the internal organs, or else go where to the wounds causing the flesh to decompose.

These larvae are fought using bug killers or insecticides that are very efficient for miasis treatment. Lime or oil can also be applied to the roofs, walls, and floors of the building because they prevent the presence of flies. The animals can likewise be treated with Ivomec or Closantel.

B) INTERNAL PARASITES OR ENDOPARASITES

Endoparasites, as their name indicates, live inside of the animal usually in the intestines and the liver of guinea pigs, and besides causing other problems feed off of the blood and other nutrients. The animals lose weight and do not grow. The youngest and malnourished animals can die. The most common parasites are coccidiosis and nematodes.

COCCIDIOSIS

Coccidiosis is a disease that produces very small parasites (protozoan from the genus Eimeria) that live in the intestines provoking internal hemorrhages. They are found 10 to 15 days after weaning. Guinea pigs stop eating, lose weight, and have green colored feces with blood-like characteristics. This disease develops more easily when many animals are put together in corrals and when the corrals are dirty and humid. Many times Coccidiosis is confused with Salmonellas and produces high mortality mainly among the young.

Prevention

The corrals should be cleaned between groups and many guinea pigs should not be put together in one corral. The animals should be weaned after they are two weeks old in clean and disinfected corrals. The forage should be proportioned out in feeding bins so that it does not mix with the feces.

Treatment

Sulfaquinoxalinas is recommended as the active agent. It should be applied according to the product's indications. Nitrofurantoin, and Ibandronic acid are also recommended, which are products formulated like Coccidiosis that can be used in water, drink or concentrated food.

NEMATODES

Nematodes are white worms that live in guinea pig intestines. The female worms eliminate the tiny eggs together with the guinea pig feces. In this way, they contaminate the whole corral, because the guinea pigs in the same corral eat the eggs with their food. These eggs later develop in the intestine and become adults in a cycle that last 45 to 60 days. These worms eat the nutrients that the guinea pigs produce, prohibiting the animal to take advantage of what is eaten.

The younger guinea pigs are more susceptible; adults have a stronger resistance. They can be infected by worms from dogs, cats, chickens, sheep, etc.

Prevention

The guinea pigs should not be bred near other animals. They should be grouped by size and sex. Their food should be given in food bins so that it does not mix with the food.

Treatment

Many products like Levamisole, Ivermectin, Mebendazole in drink or water, or else Ivermectin as an intramuscular injection with a wide spectrum can be used. In severe cases, doses can be measured out after 30 days, applying treatment for 3 consecutive days.

Home remedies can also be used like infused papaya seeds or “molle,” while giving them drinking water for three consecutive days.

DISTOMATOSIS HIPATICA

Fasciola hepatica, distoma or worms of the liver produce Distomatosis. It is a flat parasite in the shape of a leaf that lives in the liver of cows, sheep, guinea pigs, and also in humans as an adult. Its eggs are eliminated together with feces. Once outside, it forms into a worm and moves into a shell and multiplies into tadpole like shapes. They then leave the shell and climb into the grasses and lose their tail. They take hold until they are inside of the animal’s stomach. The animals are infected when they eat the grasses with the parasites. The parasites move from the intestine to enter the liver when they grow into adults. The problem creates high mortality in guinea pigs because it destroys the liver and produces strong hemorrhages.

Symptoms

- Weak and thin animals
- Loss of appetite
- In a dead animal, the liver looks decayed with a species of small worms, or else it looks swollen or hard

Prevention

You should not feed the guinea pigs with grass from where cows and sheep eat. You should feed them the top part of the grass because the parasites live in the lower parts of the grasses.

Treatment

There are many medications used for sheep and cows like Fasinex, Prosantel, Closal and other formulas for larger animals, but can be used for guinea pigs with proper doses according to weight and indications of the product.

3. MICOTICAS DISEASES

These are diseases that are produced by fungi and create scabs on the animals and sometimes infect humans. In the affected zones, the animal gets scales and loses its hair. The stinging that

is produced by the fungi makes the animal itch himself, causing the skin to swell. This causes wounds and finally scabs that make the animal look unhealthy.



Figure 25: Guinea pig with dermatitis

If the disease is not treated, the animal loses weight and decays. When the animals are put to sleep, you can see red spots on the skin.

Prevention

To control the fungus it is necessary to have good lighting and ventilation because the fungus grows in dark, humid places. The animals, mostly males, should not be kept together in one corral for long periods of time because when they sexually mature (approximately 45 days), they become more aggressive and that is when they fight and produce wounds.

Treatment

To treat the micotic problems, you should rub the infected part with a mixture of 5% sulfate and copper and 2% iodine, diluted in 1 part in 4 water.

Iodine can also be applied to the wounds or other chemical products for sale in the market like Fungil, for example.

4. OTHER DISEASES

a) Conjunctivitis

Conjunctivitis is a bacterial infection in the eyes, caused mainly by soil, dirtiness, and ammonium gases produced by urine. Sometimes it is the result of hits or fights inside of the corral or other infections.

b) Tympany

Tympanism is usually caused by quick changes in food or feeding of warm or fermented forage that is not aired out.

Remedies like olive oil applied every 3 hours can be used, until the animal eliminates all that he/she has ingested. However, the animal is usually lost during the process.

SANITARY MANAGEMENT

Guinea pig management should include a sanitary program to stop the yield from being reduced, given the diseases and mortality as a consequence.

The following steps are recommended as sanitary precautions:

- The corral should be closed
- Lime or other disinfectants should be placed at the entrance doors
- There should be restricted entrance to the corral area
- If you have some sick animals, the best alternative is to eliminate them by burning them etc. so that they do not infect the rest of the animals
- The dead guinea pigs should be removed in plastic bags and buried or burned
- A daily checkup of the animals conditions should be conducted
- The floors and walls should be cleaned periodically
- Treatment should be arranged for the sick animals

Daily Routine

- Clean floors and pathways
- Eating and drinking devices should be cleaned

- Disinfection of corrals, clean up leftovers

Monthly Routine

- Disinfection of walls, floors, and roof
- Clean out the beds, scrape and sweep in the corrals
- Clean out the corral in preparation for a bed made of shavings, straw or rice shells at a maximum of 2 inches

Yearly Routine

- Disinfection of the whole facility, including burning, cleaning and lime disinfection
- Application of insecticides
- Repair of walls, roof etc.

DETERMINATION OF THE COSTS OF PRODUCTION

Guinea pig exploitations, like any other economic activity, entails a pre-operative stage, and an operative stage.

The pre-operative stage entails an analysis of variability:

What do we have? – Available resources like space, manual labor, proper conditions, probable market.

What do we want? – Obtain good quality guinea pig meat for auto consumption and for sale to generate income.

The operative stage entails proper management in which an index of productivity and cost analysis can be calculated.

PRODUCTIVITY INDEX

The index in reference to guinea pig productivity is expressed through the Female Factor (FF), which is the total number of animals that produce a female to be sold in one year.

The FF is established numerically, multiplying the fertility rates (F) size of litter, (SL), Births per year (B/Y), lactation survival (LS), breeding survival (BS); It is expressed as:

Example using a simulated nursery of 100 reproducing females with the following indexes:

| | |
|---------------------------|------|
| Fertility: | 96% |
| Number of Births per year | 4.8% |
| Size of litter | 2.8% |
| Lactation survival | 85% |
| Breeding survival | 90% |

Calculate the number of animals for sale in the course of one productive period (one year), the Female Factor.

The values obtained are replaced in the formula:

$$FF = 0.96 \times 4.8 \times 2.8 \times 0.85 \times 0.90 = 9.9$$

This means that a female will produce 9.9 animals for selling in a productive period of one year, therefore 100 females will produce 990 animals in one year.

PRODUCTION COSTS

The production costs that are presented in the following charts were determined with the guinea pig producers from the Program “Family Breedings” from the province of Tiraque, Community of Plano Bajo. In function with a simulated nursery of 113 reproducers using costs and production indexes obtained in the zone, with the following production characteristics, management, and requirements:

| | |
|--------------------|---------------------------------------|
| Size of litter: | 113 reproducers (100 female, 13 male) |
| Female: Male ratio | 8:1 |
| Reproducers: | Mixed lineage (high adaptation) |

| | |
|--|--|
| Reproduction system: | Continual pairing |
| Female Factor: | 9.9 |
| Installations: | 1 facility with 40 corrals: 13 for reproduction and 26 for breeding |
| Feeding program: | Mixed feeding (forage + concentrate) |
| Surface area for the production of forage: | 0.18 ha. |
| Forages to be cultivated: | Alfalfa and tares |
| Age at weaning: | 10-14 days |
| Age at removal: | 70 days |
| Breeding period: | 56 days |
| Sanitary management: | Clean the corral every 2 months Preventative treatment and cures |
| Commercialization: | On foot, put in nursery |

DETERMINATION OF ALFALFA PRODUCTION COSTS

To determine the cost of 1 kilo of alfalfa, the costs of implantation and exploitation were calculated in the following way

COST OF IMPLIMENTATION OF 1 HECTARE OF ALFALFA (Bs.)

| CONCEPT | AMOUNT | UNIT | COST OF UNIT | TOTAL |
|-----------------------------|--------|------------|--------------|----------------|
| 1. Earth preparation | | | | |
| 1.1 team plowing | 4 | Day | 55.0 | 220.0 |
| 1.2 crossed team | 3 | Day | 50.0 | 150.0 |
| 1.3 tied team | 1 | Day | 50.0 | 50.0 |
| 1.4 weeded | 1 | Day's work | 50.0 | 50.0 |
| Subtotal | | | | 470.0 |
| 2. Seeding | | | | |
| 2.1 Throw | 2 | Day's work | 30.0 | 60.0 |
| Subtotal | | | | 60.0 |
| 3. Supplies | | | | |
| 3.1 Alfalfa seeds | 35 | Kilo | 30.0 | 1,050.0 |
| 3.2 Barley seeds | 200 | Kilo | 2.0 | 400 |
| Subtotal | | | | 1,450.0 |
| TOTAL | | | | 1,980.0 |

EXPLOITATION COSTS OF ALFALFA (Bs.)

| Concept | Amount | Unit | Cost of unit | Total |
|-----------------------|--------|-----------|--------------|----------------|
| 1. Cost of water | 120 | Hours | 26.0 | 3,120.0 |
| Subtotal | | | | 3,120.0 |
| 2. Cultivation labors | | | | |
| 2.1 Watering | 26 | Days work | 25.0 | 650.0 |
| Subtotal | | | | 650.0 |
| 3. Harvest | | | | |
| 3.1 Reaper | 91 | Days work | 25.0 | 2,275.0 |
| Subtotal | | | | 2,275.0 |
| TOTAL | | | | 6,045.0 |

Cost of implementation year: Bs. 1,980.0, which is divided into 5 years because it is the time for exploitation, so:

| | | |
|----------------------------------|-----|---------|
| Cost of implementation year: | Bs. | 396.0 |
| Cost of exploitation year: | Bs. | 6,045.0 |
| Cost of production year: | Bs. | 6,441.0 |
| Kg, yield/ green material /year: | Bs. | 140,000 |

Cost of alfalfa kg./green material: $6,411.0/140,000 = 0.05$ Bs.

DETERMINATION OF FOOD COSTS

| Detail | Nursery | Period (days) | Consumption (kg/animal) | Price (Bs.) | Total (Bs.) |
|------------------------------|---------|---------------|-------------------------|-------------|----------------|
| Reproducing | 113 | 365 | Forage 0.3 | 0.05 | 618.7 |
| Reproducing | 113 | 365 | Concentrated 0.03 | 0.92 | 1,138.4 |
| Breeding | 990 | 56 | Forage 0.2 | 0.05 | 554.4 |
| Breeding | 990 | 56 | Concentrated 0.02 | 0.89 | 986.8 |
| Total cost of feeding | | | | | 3,298.3 |

The following is a projection of annual income, the manure produced is not considered as a secondary tangible income, given that it is incorporated in its totality to the forage production terrains.

PROJECTION OF ANNUAL INCOME (Bs.)

| Detail | Amount | Unit price | Total price |
|-------------------------|---------------|-------------------|--------------------|
| Sale of guinea pig meat | 990 | 8.0 | 7,920 |

The total costs of food have been calculated en Bs. 3,298.3, which in a livestock production become 65 to 70% of the total costs of production. Therefore, they are considered as other costs (sanitary supplies, manual labor, material and equipment). Thirty five percent means Bs. 1,154.4, making a total of Bs. 4,452.7 of production costs. On the basis of these determinations, the benefit is Bs. 3,467.3 over the inverted capital, making a 77.9% increase.

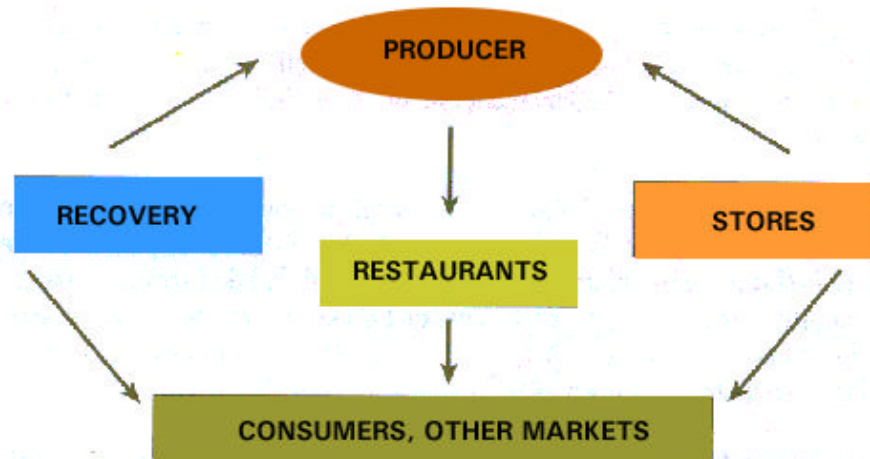
VIII. COMMERCIALIZATION, LABOR AND CONSUMPTION OF GUINEA PIG MEAT

COMMERCIALIZATION

The ease of communication between rural and suburban areas, the likes and preferences of the consumers, as well as the necessity of interchange that the rural person has, has started a system of informal communication that has not constituted in an incentive for breeding. The lack of technicians that permit the development of this product in urban markets, which is constituted in factors that stop the development of guinea pig breeding.

Figure 26: Storage methods for guinea pigs to the urban market of Cochabamba

The dominant forms of commercialization in market are live guinea pigs without determining the weight or age of the animal.



Breeding of guinea pigs is a complementary and/or secondary activity for the rural family. Its volume of production and actual market, apart from the objectives of breeding, are not oriented towards market, which harms the process of commercialization.

With respect to the characteristics of the consumer, the guinea pig is food that is eaten occasionally and traditionally, which does not permit classifying it into a permanent demand group. There are also clear differences in the percentage of consumers according to the zone of reference.

The main reasons for which a large portion of the population does not consume guinea pigs are: the prejudices of the association of this animal with rats, and the tradition of family consumption. The main factors that favor its consumption are the flavor and characteristics of the meat.

The flow of guinea pig storage is decentralized, where the ability or experience of the rescuer or the intermediary is prevalent, more so than a function specialization for the market requirements.

Guinea pig meat is one of the most expensive on the market which is why it is consumed on special occasions. The main factors for its price fluctuation are: the availability of forage, scarcity during some months influence the number of animals offered in markets and the lack of norms of quality and size that permit the setting of price scales in the market.

It is recommended to strengthen the family-commercial breeding system, forming communal associations among producers that obtain better bargaining conditions in the market. This way, there will be better quality animals and more stable and formal offers. This generates at the same time a stable production that develops and uses all of the effective capacity and potential of the market.

TECHNIQUES FOR KNOCKING OUT GUINEA PIGS

Guinea pigs should fast for at least 15 hours before being knocked out. The following steps should be followed:

- They should be placed in a calm place so they are not nervous, since the stress presents difficulty
- The best way to knock out a guinea pig is by bewilderment, which consists in hitting the animal at the base of the head (neck) and immediately proceed to cut the jugular (by the neck)



Figure 27: Bewilderment by hitting

- Hang the animal by its feet to drain the blood to get an excellent appearance of white meat



Figure 28: Blood draining from guinea pig

- Put the guinea pig into hot water (80° C - 90°C) before boiling, for 20 seconds to make it easier to take the hair off, which comes off easily
- Take the guinea pig out of the water and pull of hair mmediately
- Once the hair is taken off, wash and cut the guinea pig from the anus to the neck without cutting the intestines or the gall bladder so that the meat does not have a bad flavor.
- Once the guinea pig is open, proceed to cut the entrails from the trachea down

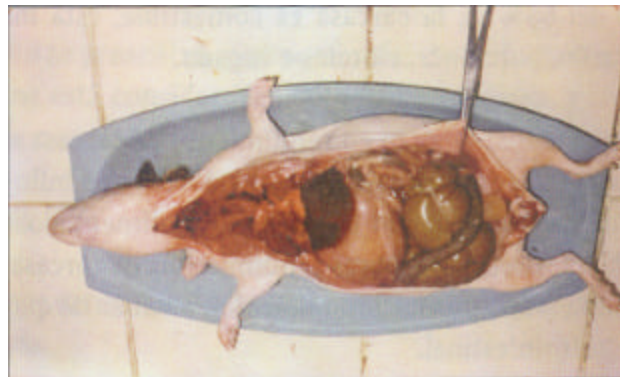


Figure 29: Cut and extraction of entrails

- The channel (meat without entrails) is then washed and then, according to the preference of the consumer, the head and feet can be cut off for a better appearance

- The meat is put into a plastic bag so that it does not dry out. It is then frozen until it is given to the consumer

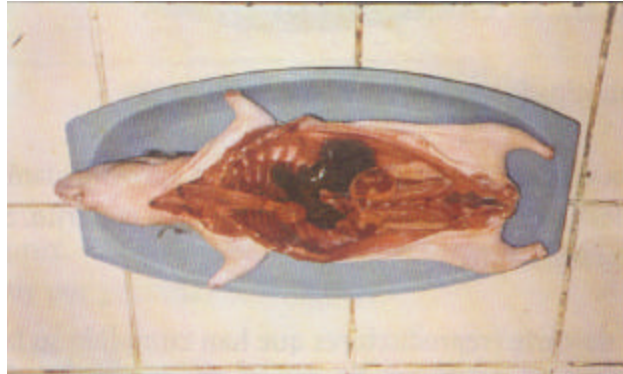


Figure 30: Channel for consumption

The flavor and quality of the meat depends on other factors of the feeding system, method of sacrifice, and posterior manipulation of the meat. More than 65 % of the meat is edible, which includes the skin, head, heart, lungs, kidneys, and liver.

The improved guinea pigs overcome “carcasa” supply for mixed and Creole breeds. The feeding system is another factor that influences the “carcasa” supply. When the guinea pigs are fed concentrated rations, higher supplies of “carcasa” are seen as a consequence of a larger muscular formation, and also has a smaller gastrointestinal content.

Castration improves the quality of the “carcasa” because of the calmness of the castrated animals, given that they are not aggressive and they do not produce lesions.

CONSUMPTION OF GUINEA PIG MEAT

Guinea pigs for consumption:

- Weigh an average of 600g and are approximately 2 months old. They are usually prepared for meals like ch’anqa or fried guinea pig and are normally eaten whole.
- Discarded guinea pigs (reproducers that have completed their reproductive phase), weighing more than 800g, are good for meals like lambreado and baked guinea pig.

IX. RECEPIES

The following are some forms of guinea pig meal preparation. Guinea pig meat is considered to be exquisite and fine, and there are various forms of preparation.

GUINEA PIG CH'ANQA

This is the most general form of consumption, which has the many nutritional qualities.



Figure 31: Plate of Guinea pig Ch'anqa

Ingredients:

- Guinea pig weighing approximately 600g of live weight should be killed and prepared into four parts (1 part per person).
- Potatoes, beans, onions, herbs, and salt as desired and other condiments (optional).

Preparation:

The guinea pig should be cooked with water for 15 minutes, adding the onions, potatoes, and other condiments as desired. The beans and green onions are cooked in another pot.

The guinea pig is served with the potatoes first, then the guinea pigs, beans, green onions, and broth. It should be served hot to prevent the meat from softening.

GUINEA PIG LAMBREADO

This is another form of traditional guinea pig consumption in restaurants.



Figure 32: Plate of Guinea Pig Lambreado

Ingredients:

- Guinea pigs weighing more than 800g divided into four parts
- Potato starch
- Rice, potatoes
- Ground bread
- Vegetables (onions, tomatoes, parsley, “locoto”)
- Condiments (garlic, pepper, and cumin as desired)
- Frying oil
- Salt as desired

Preparation:

Put the necessary amount of water into a pot and cook the guinea pigs with salt, onions and garlic until they are soft.

Drain the pot and prepare the guinea pigs with salt, pepper, cumin, and finally with ground bread. Then they are fried in the oil. It is served with rice, potatoes, potato starch and sauce that is spread on top of the guinea pig.

FRIED GUINEA PIG

Fried and grilled guinea pig is a traditional way to prepare guinea pigs in Ecuador and is very popular.



Figure 33: Fried guinea pig

Ingredients:

- Guinea pigs weighing more than 800g
- Oil
- Garlic and salt as desired
- Potatoes
- Salad (lettuce, tomato, onion, “locoto”)

Preparation:

Prepare the guinea pigs with salt and ground garlic. Prepare two pots, the first at low temperature, and the second at a high temperature. Fry the guinea pig at a low temperature for 5 minutes until the meat starts to show juices. Then fry the guinea pig at a high temperature. This creates a crunchy layer on the outside, with soft meat on the inside. Serve with potatoes and salad.

BAKED GUINEA PIG

This is not a common form of preparation, rather a specialty that is prepared on special occasions.

Ingredients:

- Whole guinea pigs weighing more than 800g
- Green chili pepper

- Oil
- Pepper, salt and garlic as desired
- Potatoes, goose, and sweet potatoes
- Salad (lettuce, tomato, “locoto,” onion)

Preparation:

Washed and dried with a cloth, season inside and outside with salt. Ground chili pepper, garlic and pepper as desired. It is then put inside the oven on a tray. On another tray, prepare the potatoes, sweet potatoes and goose.

Serve with Potatoes, sweet potatoes, goose, and salad.

MEJOCUY

The project for the Genetic Improvement and Management of Guinea Pigs in Bolivia (MEJOCUY) has 13 years of experience in the fields of: genetic improvement, nutrition, feeding, guinea pig management, and small producer training. It has established lines of high output for different bioclimactic conditions of our country. These actions give incentive to the development of guinea pig culturing at a Departmental and National level and reaffirm MEJOCUY as a center of excellence and a pioneer in investigation, production, and offers high quality biological materials for guinea pig farming.

FAO

The United Nations for Agriculture and Feeding FAO executes in Bolivia one of the most extensive field programs in Latin America. This program is possible thanks to the combined efforts of the governor of Bolivia, Cooperation Agencies, Donating countries, and FAO. After being established in the country, FAO, together with the governor of Bolivia, has done diverse projects of institutional strengthening, agricultural development, and other with the intent to satisfy the needs of the present and future generations through programs that do not degrade the environment and that are technically feasible, economically viable, and socially accepted.

PESA

The Special Program of Food Production in Support to the Food Security in Bolivia is a program as a result of following the agreements of the World Food Conference. It is directed to generate food security improving the amount and quality of food, apart from increasing the income of local producers. Presently, the PESA is in its pilot phase, which started with the Agricultural Campaign in June of 1996 to June of 1997. Its activities were done in areas with under used production potential that include El Valle Alto de Cochabamba, Valle Central de Tarija, and the area of Colonización and Valles Mesotérmicos in Santa Cruz.

Benson Agriculture and Food Institute (BAFI)

The BAFI is a non-profit organization recognized in the United States of America as well as in Bolivia. It has been in operation in Bolivia since the year 1981 working with educational institutions that are working with the same mission and vision of the Institute, which is “help to

improve the quality of life of people through better nutritional practices and improved agriculture.

In the interest of MEJOCUY and to help guinea pig producers to improve production, the BAFI participated with this institution to circulate this new addition of the manual not only in written text, but also in text on the Internet.