

Guinea pigs in ecological farming

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HECOSAN is an ecologically managed farm, one hour drive from the Peruvian capital, Lima. Situated in a rural setting dominated by monocultures, it was started to challenge conventional agricultural systems – characterized by low agrobiodiversity and high levels of agricultural inputs – and to demonstrate that a different way of farming is possible. Now, four years after the start, the benefits of building an integrated, biodiversity-rich farm are becoming clear.

As an agronomist, I was concerned with the drawbacks of conventional high-input agriculture. For many years I discussed with colleagues and farmers about alternatives and promoted biological soil and pest management practices. In the year 2000, I decided to put my knowledge into practice by developing a production system based on agroecological principles, and characterized by the integration of crops and livestock and the recycling of resources produced on the farm. The result is HECOSAN, a 3.8 hectare family farm situated in the Chillón river valley at an altitude of 750 metres above sea level, in an area with a dry temperate climate, high levels of solar radiation, an average annual temperature of 24 °C and with annual rainfall of less than 100 mm per year.

Livestock

The farm has a number of different animals; a horse, two cows, poultry, sheep and guinea pigs (*Cavia porcellus*). Guinea pig meat is highly valued in Peru, because of its high protein content (18 percent) and suitability as food for children. The animals produce manure for the farm but they have other roles and uses as well. The horse is used as a draught animal, while the cows produce milk for the farm labourers. The cow's manure is an important component of the farm because it is used in the farm's biodigester that produces liquid fertilizer. The sheep (Hass Black breed) are kept in a stable and produce meat, mainly for the market. The free-ranging poultry help to reduce crop damage by feeding on insect pests. Maize grains complement the poultry's diet. Their eggs and meat are sold on the market.

About 80 percent of the manure produced on the farm is directly used for fertilizing the land. The remaining 20 percent is used for making vermicompost and liquid fertilizer. All types of manure produced on the farm can be used for the production of vermicompost (see article by Daniel on p 12). This is produced on the farm by the earthworm *Eisenia foetida*, and is spread on the land in order to enhance the quality of the soil in terms of structure and organic matter content. Cow dung is reserved for making liquid fertilizer in biodigesters because of its high concentration of microorganisms. These greatly enhance the fermentation process in the biodigester, leading to the production of high quality liquid fertilizer. This is applied to the foliage of the crops, boosting growth.

Crops

A number of annual crops are grown; alfalfa, forage maize, purple maize, peas and cowpea (*Vigna unguiculata*). The maize and the two leguminous crops (peas and cowpea) are grown under rotation. The leguminous crops improve soil fertility and the peas and cowpeas are consumed, with excess produce being sold. The cobs of purple maize are sold and used nationwide for making *chicha morada*, a popular drink. Forage maize is for use on the farm only and produces feed for all the animals. Alfalfa

(*Medicago sativa*) is a very important farm component, because this leguminous forage crop is specifically grown as a feed source for the guinea pigs.

The farm is designed to use the available space as efficiently as possible. Native fruit trees, including avocado (*Persea americana*), lucuma (*Lucuma obovata*) and sweet granadilla (*Passiflora ligularis*) have been planted along the farm's borders. The fruits are sold on the market. Elephant grass (*Pennisetum purpureum*) has also been planted along the farm's border. This forage crop develops very well during the summer months, at a time when alfalfa's growth rate declines for climatic reasons. The strategy of simultaneously taking into account the dimensions of space and time, helps to ensure permanent availability of forage for the animals. Two more drought-resistant plants have been incorporated along the border, forming a productive fence: tara tree (*Caesalpinia tinctoria*) and prickly pear (*Opuntia ficus-indica*). Pods of the tara tree are sold for use in the tannery industry, while prickly pear fruits are for own consumption.

All the biomass on the farm is produced organically. Manure produced on the farm is complemented with *guano de islas*, a seabird excreta that is a rich source of minerals. No agrochemicals are used.

Guinea pig breeding

The breeding of guinea pigs is not complicated, but it is very important not to expose the animals to any type of stress, because this will suppress their immune system and increase mortality rates. Special attention should be given to providing the animals with a balanced diet and to keeping them in proper housing that protects them from sudden changes in temperature. Frequent cleaning of the sheds is also crucial.

Female guinea pigs are sexually mature after 4 to 5 months and males start reproducing at about 5 - 6 months of age. Animals for breeding purpose are kept in compartments of 1.2 m² of size, made of adobe bricks and mud. Each compartment houses ten breeding females and one male. After a gestation period of about 60 days a female gives birth to 2 - 4 young. The young are left with their mother for about three weeks and after that they are weaned, sexed and selected, mainly on size. The young animals are kept for three months in three-level cages constructed with eucalyptus wood, wire and zinc roof sheets, and after that period a second and final selection is made. The animals that performed best in terms of initial weight and weight increase are selected for breeding. They will replace the old breeding animals or will be sold for their favourable breeding traits. The other animals will be sold for their meat.

Starting with an initial stock of 300 straight-haired animals of Andean, Peruvian and Inti breeds (a classification related to the colour of the hair), HECOSAN now has an average annual population of 2500 guinea pigs, including 700 breeding males and females and 1800 animals for fattening. Every month around 250 animals are sold for meat at the market in Lima, fetching a price of US\$2.40 each.

Guinea pig feed

The guinea pig feed mainly consists of alfalfa forage, which is the main source of protein, forage maize and elephant grass, which are good sources of carbohydrate. During summer there is sufficient biomass but in the winter period the growth of the forage plants slows down and the availability of feed is reduced.



1. Entrance
2. Watchman's hut
3. Shed for breeding Guinea-pigs
4. Conference room.
5. Shed for raising guinea-pigs for the market
6. Water tank.
7. Cattle corral.
8. Sheep and goat shed
9. Chicken and duck shed
10. Organic compost pile
11. Water reservoir
12. Avocado (*Persea americana*)
13. Lucuma fruit trees (*Lucuma obovata*)
14. Elephant grass (*Pennisetum purpureum*)
15. Sweet granadilla (*Passiflora ligularis*)
16. Maize 'choclo' (*Zea mays*)
17. Pepper trees (*Schinus molle*)
18. Maize 'morado' (*Zea mays*)
19. Irrigation channel
20. Tara (*Caesalpinia tinctoria*)
21. Alfalfa (*Medicago sativa*)
22. Road

Plan of the HECOSAN ecological farm.

To complement the diet during this period, residues of quinoa, oats and wheat flour is bought and given to the guinea pigs. This feed supplement contains proteins, fibre as well as a balanced amount of minerals and vitamins. The animals grow well on this diet and stress due to nutritional factors is avoided.

Health management

Good health management is of critical importance in guinea pig production. In the beginning we were confronted with serious health problems leading to economic losses, but four years of work and research has enabled us to understand the causes and to develop a suitable integrated management of the animals.

The most important disease is salmonella, caused by bacteria, because of the potential damage it can cause. This microorganism is always present in the system and affects animals with a weakened immune system. To avoid this, good management is required to avoid stressing the animals in any way and the sheds have to be kept very clean.

Another problem in guinea pig keeping is the presence of ectoparasites. They are mainly a problem in the breeding houses, where the conditions are favourable for their multiplication. Severe parasite attack may lead to increased mortality, reduced growth rates and miscarriages. Many farmers use pesticides to control ectoparasites, but at our organically managed farm we had to search for alternatives. After two years of testing we found that the application of a plant extract (*Lonchocarpus* sp.) in combination with carbonic soap (normally used for disinfection) provide excellent control of these ectoparasites. The use of cages for keeping guinea pigs greatly reduces the problem of ectoparasites. These findings have helped us to avoid using pesticides and to solve the problem using a preventive approach and natural methods.

Benefits in the short and long term

As mentioned earlier, the raising of guinea pigs is the driving force of the system. They reproduce rapidly and their management is relatively uncomplicated. The farm generates sufficient income to provide work for two permanent labourers, who take care of the animals and handle all the other components of the system. At the beginning the labourers found it difficult to understand the concept of integrated farming, because their knowledge and experience was based on the conventional agriculture practised in the area, based on monocultures and usually lacking a livestock component.

Comparing HECOSAN with neighbouring farms there is a clear difference in the rate of capitalization of the land, in other words, the extent to which the land has been made useful and productive. At present HECOSAN has 2500 guinea pigs, 200 avocado trees, 100 *lucuma* trees and 20 producing granadilla plants. The farm also has 100 chickens, 30 ducks, 10 sheep, two heads of cattle and one horse. These farm components ensure a sustained economic income over time, help achieving food security and, through the process of nutrient recycling, enhance the stability of the system. The average monthly gross income of HECOSAN is almost US\$900, a very acceptable figure given its small size. In comparison, local farmers who produce cotton in a conventional way obtain a gross monthly income of US\$1024, but the cost of the external inputs that they use is high and no lasting value is added to their property.

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