ESTRATEGIAS DE INSERCIÓN LOCAL DE NUEVOS RECURSOS GENÉTICOS: NÚCLEOS DE SELECCIÓN EN CONEJOS

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RESUMEN

El conejo, contrariamente a lo que ocurre con otras especies, ha sido domesticado muy recientemente. Ello hace que la mayor parte de diferencias entre razas sean recientes. Por otro lado el conejo ha sido tradicionalmente criado en ambientes de traspatio, lo que unido a lo anterior hace que las interacciones genotipo-medio sean muy escasas. Esto implica que la implantación de razas sintéticas provenientes de núcleos de selección en los que se ha realizado una mejora notable de caracteres productivos sea más sencilla y ventajosa que en otras especies. La producción industrial de conejo utiliza una hembra cruzada de dos líneas seleccionadas por tamaño de camada y un macho finalizador proveniente de una línea seleccionada por velocidad de crecimiento. Es necesario implantar, pues, tres líneas y disponer de mecanismos de multiplicación, bien en las propias granjas o en granjas multiplicadoras. El principal problema de implantación es el tamaño de la operación, puesto que un núcleo pequeño de 150 hembras por línea podría suplir reproductores a granjas que contaran en total con 30.000 hembras reproductoras, y en muchas ocasiones no es viable realizar un suministro tan importante. En este caso el precio de las reproductoras aumenta, lo que dificulta la implantación del sistema. En esta comunicación se discute la experiencia de implantación de líneas de conejo en distintos países y la estrategia a seguir para que estos esquemas tengan éxito.

PALABRAS CLAVE: Conejo, selección, recursos genéticos.

SUMMARY

STRATEGIES OF LOCAL INSERTION OF NEW GENETIC RESOURCES: RABBIT SELECTION NUCLEUS

Rabbit domestication is rather recent, conversely to what has happened in other species. This implies that most differences between breeds are recent. Besides, rabbit has been always reared in family in-house farming, thus interactions genotype x environment are practically inexistent. As a consequence, implantation of new rabbit synthetic lines from selection nucleuses, in which genetic improvement has been carried out, is easier than in other species. Industrial rabbit production uses crossbreed dams from lines selected for litter size, and terminal sires from lines selected for growth rate. Thus it is needed to start with three lines and to have multiplication facilities, either in the farms or in multiplication farms. The main problem found to implant nucleuses is the size of the breeding scheme. A small nucleus of 150 does per line can provide crossbred dams to farmers having a total of 30.000 does. Many times it is difficult to create such an organisation, and the cost of producing crossbred dams increases. In this contribution the experience of implanting nucleuses in several countries is discussed, as well as the strategies to follow to be successful.

KEY WORDS: Rabbit, selection, genetic resources.

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INTRODUCTION

When introducing a new breed in a country or in a region, there are often three main concernments:

1. The breed should be more profitable than the existing breeds in the area.
2. No genotype-environment interaction should appear.
3. Local breeds should not disappear in order to keep genetic biodiversity.

There is nothing to oppose to the first requirement, but the other two ones should be examined more closely. Genotype per environment interactions is a matter of concernment when highly productive breeds are implanted in a poor environment, and there are some classical examples of problems derived from bringing Frisian dairy cattle in tropical climates. However it is not impossible to find positive genotype per environment interactions, or to find breeds better adapted to poor environments, for example Nelore zebu in Brazil. Genotype per environment interactions affect mainly beef and sheep production and to a much lower level pigs poultry and rabbits. These last productions are usually bred in intensive systems that are rather similar along the world. Genetic improvement is made in a selection nucleus and it is spread trough multipliers. A different genetic per environment interaction was presumed to occur in these intensive systems: due to the good production conditions of the nucleuses, it was supposed that best animals from a nucleus will not be the best in commercial conditions. However, when calculating these interactions with modern statistical devices it was shown that they were small. In rabbits, El Raffa et al. (2005a) have calculated interactions genotype per environment due to rabbits selected in Valencia and implanted in Egypt, and all interactions were very small, genetic correlations of performances between countries were near 1.

Concerning genetic biodiversity, it is true that local breeds tend to disappear when new productive breeds arrive. Whether or not they should be conserved is not the matter of this paper, and I will only remind that to conserve a breed there should be a reason; a cultural, productive or biological reason, but a reason. A breed in danger of extinction is often a breed that is not productive even in its own environment. Sometimes the same conservation arguments are used for breeds and for species conservation, but unlike species, breeds are usually human products that can be reinvented or recreated when needed.

In the case of rabbits, Rabbit domestication is rather recent, conversely to what happened in other species. Besides, rabbit has been always reared in family in-house facilities, similar in many countries, thus genotype-environment interactions are practically inexistent. As a consequence, implantation of new rabbit synthetic lines from selection nucleuses, in which genetic improvement has been carried out, is easier than in other species. Two interesting experiences of implementing rabbit selection nucleuses in Egypt and in Uruguay have been described, with early results, by Blumetto *et al*. (2002) and el Raffa *et al.* (2005b).

INDUSTRIAL RABBIT PRODUCTION

When introducing rabbits in developing countries and in areas in which they were not introduced before, three types of production are envisaged:

1. Few does per family to provide meat for self consumption.
2. Part time farms with 20 or 30 does.
3. Full time production in industrial farms with 200 or 300 does, managed by one person or one family.

The first situation can be considered only in cases of very poor countries or areas, and it should be managed with care, since sometimes very poor people will not be able to manage the few animals they have available (failures applying this system have been reported in countries as distant as Nigeria and poor areas of Mexico). Some successful experiences have been reported in Papua – New Guinea (Grant *et al.*, 1996).

The second situation is much more common and it is possible to develop these small part-time farms in most developing countries and rural areas. The third situation is applicable to countries with tradition with cooperatives or other forms of organised production (China, for example) and in industrialised countries in which rabbit production is common.

Industrial rabbit production uses crossbreed dams from two maternal lines selected for litter size, and terminal sires from a line selected for growth rate (Figure 1).

Thus it is needed to start with three lines in a nucleus and to have multiplication facilities, either in the farms or in multiplication farms. We will examine now practical requirements of the system.

THE NUCLEUS

A Nucleus can be run by a state-national organisation, a cooperative of farmers or a private farmer. In practice the implantation should follow the same steps, but there are some differences linked to the type of owner; for example, state organisations can stand for a longer time the implantation period, but they are less flexible than private farmers when taking decisions. Besides the objectives are

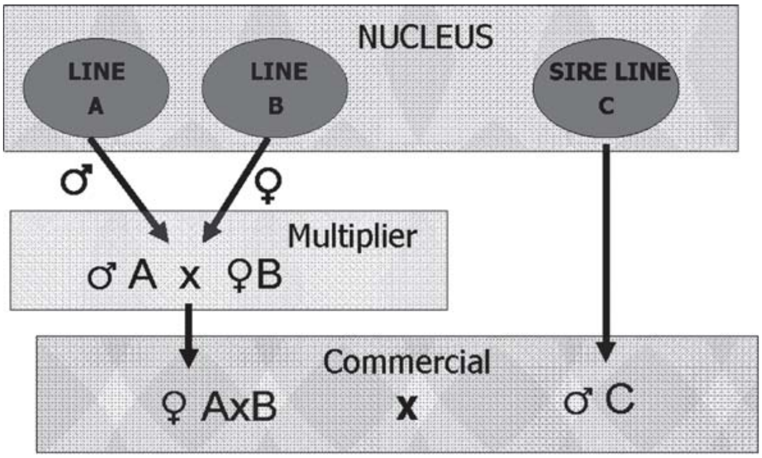

Figure 1. Two maternal lines A and B are selected in the Nucleus for litter size and are sent to multipliers to produce the crossbreed dams used in commercial farms. A terminal sire C is selected in the nucleus and directly provided to commercial farms.

not necessarily the same. Nevertheless there are some considerations that apply for all nucleuses:

1. A nucleus needs a genetic program. This implies not only to pay a geneticist, but the need of some controls, recordings, animal identification and careful management. Rabbit is a small business, thus any new item in the fixed costs represents a large amount in the proportion of costs per rabbit sold. Grand parents produced by a nucleus will cost between four or five times more than commercial rabbits. Implanting a new crossbreed product needs time, thus *at the beginning the nucleus is likely to have economic losses*, and this should be taken into account by the promoters.
2. A nucleus needs an extremely healthy environment, and should be always ready to stop selling animals if some illness appears. Dissemination of illnesses from a nucleus is not only a pathological disaster, but stops the confidence of the farmers in the program (with good reasons).
3. A nucleus needs about 150 dams and 20 sires per line in order to avoid inbreeding and to have animals enough to perform selection efficiently. Thus, facilities for at least 450 does are needed. When this is not possible, a schema of part- nucleus is many times feasible. The nucleus may only have one maternal line and will import sires for the other two lines. As much less sires than dams are needed, maintaining only one line means that only facilities for 150 does and 20 sires are needed. The nucleus will supply grand mothers to multipliers, whereas maternal grand sires and terminal sires will be supplied elsewhere. This works well when suppliers of these lines are found. For example, in Spain there are seven nucleuses working under these premises, linked to the Universidad Politécnica de Valencia for running the genetic program of their line and having supply of males for the other two lines.
4. When there is no easy supply of maternal and terminal sires from a nucleus and it is not possible to have facilities for 450 females, it is better to have a terminal sire line and a maternal line than two maternal lines. The reason is that growth rate is easier to select than litter size, and genetic progress in growth rate is easily seen by the farmers. The other maternal line can be produced by a farmer, and in this case some considerations to take into account are:
    1. The farmer will need clear instructions about how to take records and how to plan mating. Technical advice should be provided to tell him which offspring should be selected.
    2. The farmer will work with less productive animals that are also less resistant to bad environment conditions, thus he should be compensated for this and for all the extra work required in the nucleus.
    3. Multipliers should agree in buying grandparent stock to the farmer. The farmer owning part of the nucleus should be respected by the multipliers, otherwise they will not accept to have a supply of grandparents from him.

5. A main problem found to implant nucleuses is the size of the breeding scheme. A small nucleus of 150 does per line can provide crossbred dams to farmers having 30.000 does (figure 2). Even having only one line, this line can provide grand parents for 15.000 does. Many times it is difficult to create such an organisation, and the cost of producing crossbred dams increases. At the beginning the size of the organisation can be lower,

some thousand dams, but promoters should be conscious that they cannot start a nucleus scheme having influence in just some several hundreds dams. Even if the objective of the program is not to optimize the production of the nucleus, the size of a nucleus-multiplier-commercial farm scheme should be taken into account.

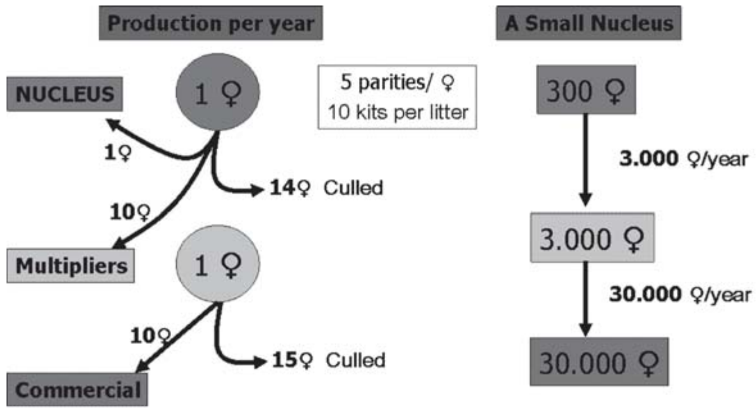

Figure 2. Size of a Nucleus scheme. It is considered that the cycle of rabbit production is approximately one year (in intensive systems it could be even lower), an average of five parities per dam and ten kits as average litter size. Culling represents not only culling but losses due to pathological reasons. Figures are just a rough approximation to give an idea about the size of the problem.

MULTIPLICATION FARMS

Thus, there are two types of multiplication facilities:

1. Multiplication facilities in the farm: a part of the production farm is used for multiplication. This is convenient because the crossbred dams are born in the production farm, thus they are better adapted than does coming from other farms. Risks of disseminating illnesses are also minimized. The problem is that the minimum size of a production farm to access this system is about 200 does, thus it is not possible to have these facilities in part-time farms. Two practical considerations are:
    1. A farm of 200 does will buy to the nucleus about 20 grand parent does per year. They only would need two maternal sires, but it is convenient to have four or five maternal sires to minimize the risk of having a genetically bad sire just by chance.
    2. Grandparents are more sensitive to bad environments than crossbred does, thus special care should be taken with them in the farm. It is a good policy of the Nucleus to ensure free replacement of, say, a 20% of the acquired stock. Sometimes farmers can pretend their grand parent stock died when it did not, but these cases can be easily managed by the Nucleus soon.
2. Multiplication farms: These farms should buy grand parents to the Nucleus and sell crossbred does to the part–time farmers. Usually a multiplication farm will be run by a private farmer instead of a public organisation. Here there are some practical important considerations:
    1. Although we have the same crossbred female by crossing males of the A with females of line B or by crossing males of line B to females of line A, the nucleus should provide to the multiplier males of only one line and females of the other line, never males and females of both lines. Otherwise management is more complex and the farmer can have the temptation of starting a “nucleus” himself instead of buying grand parents to the Nucleus.
    2. Multipliers should have an excellent health status; otherwise they can spread not only genetic progress but also pests.
    3. Farmers should trust multipliers, otherwise they will not buy does to them. The selection of which farmers will be the multipliers is not always easy and rural sociology arguments have a definite influence.
    4. Benefits of the multipliers have to be estimated and controlled. If they work under a contract, it should be taken into account that working with purebreds is less productive due to the lack of

heterosis for litter size and the lower health resistance of purebreds, thus the multiplier should be compensated for this lower production. If they just buy grandparents to the nucleus, it should be taken into account the selling price of the crossbred does to avoid too high prices that will lead to unjustified benefits that can degrade the image of the program in the eyes of the farmers.

COMMERCIAL FARMS

Farmers can be industrial ones or part-time ones as we have commented before. Farmers should trust the program, and the best way to get this is to allow them to try the animals the program produces at reasonable prices. There are some considerations that are usually applicable to farmers:

1. It is important to persuade them that new breeds are synthetic, thus no racial standards are needed at all. It is most important to avoid the creation of pedigree books and similar devices.
2. It is easier for farmers to see the advantages of terminal sires, and it is also cheaper for them. Dissemination of genetic progress of the nucleus can start selling terminal sires before they acquire crossbred dams. However, the pathological status of a commercial farm can compromise the health of the sires and dams they buy, thus it would be a good practice to ensure free replacement of, say, a 20% of the acquired stock as I suggested before. Again, sometimes farmers can pretend their parent stock died when it did not, but these cases can be easily managed by the promoters.
3. Visits of farmers to the Nucleus should be radically prohibited, since otherwise the health status of the Nucleus is compromised. No exceptions must be made. A good film of the work done in the Nucleus should be satisfactory enough.
4. Farmers should be informed as clearly as possible about all the characteristics of the program, removing any impression of mystery or secrecy of the genetic procedures. Farmers should know that the genetic program is neither a thing everybody can do in his farm nor a high technology that only trans-national companies can afford. Dealings with multipliers or with industrial farmers should be transparent, to avoid any reticence or suspicion of preferential treatment. In other words: farmers should trust the program.

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