

Conservation and crossing

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It seems, that conservation of genetic resources is incompatible with crossing of different breeds. The crossing is, however, not a single breeding method.

Different methods of crossbreeding

The basic methods in animal breeding are the pure bred breeding and crossing. The different methods of crossing can be classified as follows:

Crossbreeding methods using the additive gene effect

The aim is to improve a breed and after the crossing to continue breeding in pure bred form.

1. Single crossing with the same or very similar breed (Blutaffrischung) for improving some traits E.g.: Simmental with Hungarian Grey. It must be repeated after some generations.
2. Single crossing for introduction major genes E.g.: Normal, horned Charolais crossed with the polled variety. After a selection it is not necessary to repeat.
3. Improver crossing The use of an improver breeds's genes and to maintain it in a given procent. E.g: Hungarian Milking Spotted population
4. Upgrading. To use the improver breed and to repeat its use up to 4 – 6 generation E.g.: Holsteinization all over the world.
5. Creation of a new synthetic breed. To use more breeds and to maintain them in a certain percentage or reserve the open form E.g.: Norwegian Red cattle.

Commercial crossing

The aim is to produce offspring for sale, exploiting the effect of heterosis.

There are two types of it :

a) Discontinous forms of crossing

6. Single, direct commercial crossing. To cross two breeds and the whole offspring is for sale
7. Three or four line hybrids. The females of the first generation are crossed with another breed or two single crossed animals make the final product. In both case the original breeding stock must be maintained in pure bred populations.

b) Continous crossing forms

8. Interchanging crossing Two breeds A (female) and B (male) are producing the commercial offspring and the same first generation is used for the next one from breed A, and the next one from B males and so on. E.g.: Mangalitza and Bershire.
9. Rotational crossing : more breeds (3 – 5) are used changing one after the other. E.g. : KAHYB pig hybrid system with inbred lines in Hungary.
In these cases only the males must be reproduced within pure bred breeding.

The problems

In theory the use of other foreign breeds are not allowed in saving or maintaining a domestic animal breed. The question is in wich case or in which conditions and which forms of crossing are, however exceptionally allowed to use. Theoretically the conservation of a breed can be effected only when the basic material remains intact from the impact of another breed. Thus, the crossing is not allowed when the population of the given breed is endangered.

The endangeredness of domestic animal breeds was discussed several times by different conferences and there are different forms of categorization. There are scientific approaches and experimental ones. At an FAO conference in 1985 after a long discussion a special categorization was discussed and accepted for all the species. In my opinion this one is the best for practical use, because it is flexible enough for different cases. It is summarized in table 1.

Table 1.

The categories	Number of females	Possible activities
Extinct	The recreation is not possible	To be confessed
Critical	Less as 100	To increase the population
Endangered	100 – 1000	To maintain with special measures
Vulnerable	1000 – 5000	To maintain with different breeding goals
Insecure	5000 – 10 000	To take care of sale and prices
Normal	more as 10 000	Normal breeding

The population size is the first aspect for the permissibility of crossings
 For vulnerable and insecure state is already allowable to use cross breeding in special cases without real disadvantage of preservation of a breed.
 It is quite understandable that more reproductive species and breeds or those with longevity are better adaptable to commercial crossing.

The details :

1. Single crossing (Blutauffrischung) never allowed, only line crossing if they do exist
2. Introduction of major genes is never allowed in conservation, but it is possible in order to create a new variety, which must not be considered the original breed any more.
3. Improving with another breed is never allowed in conservation
4. Up graded breeds must not to be considered as saved ones only perhaps as a new breed. E.g.: the Hannoverian horse breed improved by Thoroughbred and Trakehner is a new sport horse breed and not the original Hannoverian..
5. In creation of a new breed the conserved breed can be used as a component, but out of conservation programme.
6. A single commercial crossing is allowed if the population size allows and the reproduction of the pure bred population is not hindered by the cross breeding programme. The offspring is for sale of course.
- 7., 8.,9 in continuous crossing a saved breed can be used as a component in some cases, if the population size allows but out of preservation programme,.

Some good examples

Poultry breeds

In poultry breeds beside the maintenance of pure bred stock it is easy to produce commercial offspring as well. A good example are illustrated in table 2.

Table 2.

Genotype	12 week live weight g	Standard deviation	CV %
Hung. Speckled	1 470	233	16
Hung naked neck	1471	272	19
Color pack F ₁	2 877	464	16
White rock F ₁	2 699	427	16
Master grey F ₁	2 701	385	14
S 77 F ₁	2 630	507	19
Hung. Speck.x Naked neck	1 915	327	17
Average of Hung. Speckled crosses	2 176	692	32
Hung. Yellow ♂	1 319	148	11
Plymouth F ₁ ♂	1 935	251	13
S 77 F ₁ ♂	2 568	410	16
Redbro F ₁ ♂	2 286	415	18

The crossing of Hungarian Yellow hen with different terminal breeds gives good results and the similar results were produced by Hungarian yellow crossbreds.

Pig species

In pig breeding the best example for the two breed commercial crossing is the Berkshire x Mangalitsa crossing which was very popular among privat consumers.

Nowadays the Duroc sow crossed by Mangalitzta boar is very attractive for commercial production. The reproduction is better compared to the litter size of pure bred Mangalitzta and the meat quality is also acceptable in international market.

Bovins

The quasi classic example is the crossing of Hungarian Grey cow with Charolais bulls. Table 3 shows the comparison of meat production of pure bred Simmental, with Hereford and Hungarian Grey cross bred offspring Sires were in all cases Charolais bulls.

Table 3.

G e n o t y p e	Fertility	Weaning weight kg	Production / cow / year
Simmental pure bred	74	254	188
Simmental x Hereford	85	229	195
Simmental x Hungarian Grey	87	245	213

It was a good example for the role of the autochtonous breeds as maternal lines.

Horse breeding

In horse breeding the commercial crossing is not poopular. So, it is difficult to find examples. The progeny of a good Thoroughbred stallion goes into breeding of sport horse breeds. It made the problems of Irish Draught horse.

The best example, however, is the producing of mules, where the use of crossbred offspring in breeding is not possible...

Summary

The crossbreeding is allowed also in conservation of domestic animals, if it does not impact disadvantage in the maintenance of pure bred breeding population. So when the population is over the endangered status it is possible to use the commercial crossing.

Use of the saved breed in different crossing components is possible but out of conservation programme.

The question of crossbreeding and conservation programmes is open for discussion.

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