

# Possibilities for Breeding in Organic Dairy Farming

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*In the organic sector there is an ongoing debate about the development of organic breeding methods. The debate revolves around two issues: 1) how the principle of naturalness in organic agriculture (that is, using natural processes wherever possible) can be reconciled with the increasing use of modern reproduction techniques in conventional breeding; and 2) whether animals produced by conventional breeding programs are actually suitable for organic agriculture or whether the organic sector itself should start producing animals that fit into organic production systems. Investigations into these issues gave rise to a doctorate research: "Selective breeding in organic dairy production" (Nauta, 2009).*

## Organic farming and breeding

Breeding has never been an important issue to many organic farmers. After they convert their farm to organic production, most farmers focus their attention on soil fertility and animal health, and continue using breeding stock from conventional supplies. However, when asked most farmers say they assumed breeding will become regulated within the organic certified process and part of the whole organic production chain (Nauta et al., 2005). The reasons given for this assumption are the modern reproduction techniques used in conventional breeding schemes and the imbalance between the breeding goals of conventional breeders and organic production. Organic farmers need dairy cows that can cope with organic production environments, where there is no or less reliance on the input of fertilizers, concentrates and medicines. In short, animals have to be able to produce under the conditions of the local farm resources.

The reproductive technologies used in conventional programs were of second concern to farm-

ers. Consumers are not aware of such practices and, therefore, farmers feel there is little danger of public concern over organic farmers using bulls from such systems. However, farmers themselves did not feel good about it. When they made their decision to become organic, they would also have liked to change to an organic breeding process.

## Breeding practices

Based on organic principles, breeding should be carried out along natural processes. The best organic way to breed animals is by natural mating. Realizing this, a growing group of farmers are changing the process by keeping a bull on the farm for breeding. This bull is often purchased from another farm or bred from one of the best cows in the herd that had been inseminated with the sperm of a conventional breeding bull. Some farmers in the Netherlands have started breeding bulls by using both parents that come from their own herd. In such a farm-based breeding program the farmer has to take care to avoid inbreed-





**The first organic AI bull in the Netherlands, a Red Holstein bull with the polled gene and bred on an organic dairy farm and semen is on the market since October 2009 for 8 Euros per straw.**

ing. To do this they can use a kinship-breeding scheme (Nauta et al. 2005, see also ).

Many farmers and other stakeholders, however, agree that not all breeding can be done by natural matings. Bulls can exchange diseases between farms and animals, they are dangerous and many farms are not equipped for keeping bulls. Artificial insemination (AI) was introduced to tackle such problems and the dairy sector does not want to go back to 'the old days'. Therefore, most farmers will continue using AI with semen from conventional bulls as the only method of breeding on the farm. Some farmers, who choose to work with their own bulls, may collect semen from their bull, a process that can be done by a specialized company. This semen will be diluted and frozen and can be stored in a nitrogen container at the farm and used for AI when needed. However, in the Netherlands such sperm cannot be used on other farms since it is not EU-certified.

### **Is an organic breeding program possible?**

How can an organic breeding program be set up? For an individual farmer it is just a matter of introducing a bull onto the farm, and the decision to do this is based on personal preference. However,

for a group of farmers or for the whole organic dairy sector the situation is more complex. Many farmers and other stakeholders (researchers, advisors, policy makers) have their own vision of what are the possibilities for organic breeding.

A breeding program using bulls for AI relies on the large scale data collection necessary for testing bulls and used to estimate breeding values. The dairy organic sector is relatively small for such a system and the reliability of estimated breeding values would be low, which makes a breeding program less effective. In addition, the populations of dairy cows on organic farming are very diverse. Many different breeds are kept and many farmers crossbreed their cows with many different breeds. As a result there are many small populations of dairy cows, for which a regular, traditional breeding program based on large scale testing is not possible in the conventional way. Such breeding schemes would also be very expensive for the small organic sector. Testing one bull costs about 30,000 euros. Therefore, a new way of organizing organic breeding is necessary.

### **Use what we have**

The organic dairy sector has many farmer-breeders who like to breed a specific, native or exotic breed or type of cow for their own farm. Some manage this with AI bulls, others with bulls raised in the herd. If using AI there is the supply of semen from conventional breeding programs. The biggest supply of semen on offer is from Holstein bulls, but semen from bulls of many other breeds (native and from abroad) is also available on the market.

When using AI, national borders do not apply, and breeding with bulls from different countries is possible, thereby broadening the market and increasing the genetic base that is available. This



could make the possibility of an organic breeding program more feasible, although, to make the best use of the international aspect of breeding more information on genotype-environment interaction between different organic populations would be necessary. On top of this the organic sector needs a cheaper system for selecting and testing bulls. Waiting until a bull has a high reliable breeding value is impractical. So a so-called ‘cold’ system, in which the bulls are culled (or sold for natural mating) after a collection of a certain amount of semen, may be more appropriate.

The individual breeding farms are the basis of the system, these farms provide specific genetic lines bred by kinship breeding (pure lines) or combination breeding. These latter breeding farms use bulls from other (organic or conventional) farms and combine specific traits that are important for organic production. The kinship breeders use bulls from their own herd and provide bulls with ‘double blood’ for specific traits. In an overall breeding scheme, other farmers can purchase bulls or semen from these different farms using bulls from the same breed or a different breed for crossbreeding.

### Stimulating the process

The possible breeding scheme describe above are not a reality and may never develop in this way. It is a vision based on the conclusions from a PhD research project. The question is can breeding programs be developed this way. To find out more about the possibilities of this system, three different aspects need to be considered: the overall breeding program; the supply of semen from organic AI bulls; and the nucleus breeding based on kinship breeding and line breeding. The first step would be to simulate an overall breeding program for different population sizes (national and/or international) and traits, and to look at the genetic progress and prevention of inbreeding. The next step would be to develop a bio-AI network by building up a supply of frozen semen from a number of AI bulls that were bred on organic farms and bringing this to the market. This has already begun and the first bull was launched in October 2009. Further, a network of nucleus breeding farms (line breeding and kinship breeding with different breeds) has been set up. With information collected from these projects it is hoped to build further on the development of organic dairy breeding.



Farmer choosing to breed with his own bull.





**With kinship breeding the herd will get very uniform.**

### Young bull system

Two important issues in the set up of an organic breeding program are its genetic progress and the cost of the system. With the relatively small organic populations it seems impossible to compete with the genetic progress that can be made in large conventional programs. Also, the cost of selecting bulls is too high for the small organic sector. The small sector and the high costs per bull also make it difficult to control inbreeding, a relatively large number of bulls must be available to ensure against this. To tackle these problems a so-called “young bull” system might be a possibility. This concept was developed for the Guernsey breed, by Bichard (2002). In this system every year a relatively large group of young bulls are selected and used by the farmers for AI. After a small amount of semen has been collected the bulls are then culled, making it a “cold system”. By introducing new bulls every year and by selecting bulls from mothers that fulfil the breeding goals best, the generation interval is short-

ened. This means the genetic progress can compete with the genetic progress of a large scale testing program. By using enough young bulls from different genetic lines per year, inbreeding can be controlled easily. This system can be used over larger populations but is, in fact, also used at a farm level in the kinship breeding scheme.

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