Practical Cattle Breeding in the Future – Commercialised or Co-Operative, across Borderlines between Countries and Organizations

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Abstract

Due to the development of new technologies, the dairy cattle breeding industry is facing many changes. Selection of bulls will be changed from progeny testing schemes to genomic selection of young animals with a dramatic drop in the number of progeny tested bulls. The breeding goal will be efficient milk and beef production from sound, healthy animals with respect to animal welfare and ethics. This paradigm will lead to further globalization of the dairy cattle industry. The efficiency of the breeding programme will still depend on intensive registration of phenotypic data on farms and common use of data through central data bases. Traditional cooperatives like A.I. centres and cattle breeding associations need to collaborate or merge within countries and across borderlines to secure continuous development of breeding programmes and resulting genetic progress in the population.

From family farmers to dairy cattle industries

The development in the dairy cattle production within Europe and abroad is going through a paradigm shift from small family farms to large dairy cattle industries. Table 1 shows the development in the dairy cattle production in the EU. The tendency is clear towards a major change with larger herds and more extensive production.

Table 1. Development in dairy cattle production.

	Dairy farms (2006) 1 000 farms	%	Dairy cows 1 000 heads	%	Milk quota mill. Kg	%
EU 15, 2007	442	48	17 901	80	118 648	103
EU 15, 2000	636	69	20 355	91	117 069	102
EU 15, 1995	928	100	22 279	100	115 244	100

Source, Eurostat, ZMP and the European Commission
% - EU 15, 1995 = 100

The same development, or an even faster development, is seen in the US. From Wilson, 2009, I have got the following message: *Quote: We believe the U.S. cow numbers will remain stable around nine million cows. In our opinion 645 herds will average 3,200 cows and will produce over 25% of the milk by 2012. We believe 3,600 herds will produce 67% of the milk. We believe another 52,000 herds will produce 33%. Quote ended.*

Larger farms mean a change from the emotional family farmer towards a more hardcore business farmer. The "new emerging dairy farmer (or already existing dairy farmer)" is changing from a loyal cooperative member to becoming more "his own master".

Changes in dairy cattle breeding - the breeding goal

The purpose of all genetic programmes is to add value to the end product: "The dairy or beef products".

Dairy cattle breeding is one of the links in the value chain, and therefore a clear and value

adding breeding goal is necessary. The breeding goal of the dairy breeding organizations has for decades been a dairy cow with high production and solid components, tall, strong, open ribs, sound feet and legs and a well-attached mammary with a strong median suspensory ligament and small teats with good placement.

This breeding goal was to some extend diffuse or subjective, and the breeding goal in Europe has changed towards more sustainable cows. Words such as longevity, durability, functional traits, etc. have become increasingly in focus. Nobody is any longer selecting only for production and some type of traits; functional traits are included in the selection. Miglior, 2004, illustrated this in a study of composition of total merit indices in different countries. He found that there has been a change from the early nineties and 10 years ahead in the priority of traits and their weighting in total merit indexes (TMI). Dairy cattle in the Nordic countries has been selected for functional traits e.g. udder health, health in general and female fertility for the last 20 years using a total selection index.

New traits in the breeding goal

With larger herds and higher concentration of cows, the individual cow disappears and the breeding programme within the herd will be more general.

The breeding goal can be separated into different items.

- Goals that can give the dairy farmer:
  - Increased income (higher milk production)
  - Reduced costs (better fertility, fewer diseases)
  - Less trouble (temperament, milking speed)
  - Easier to sell products (animal welfare and ethics)

In Europe and North America new traits are often discussed e.g. feed intake, feed consumption, locomotion, hoof quality or hoof diseases. All these traits are components in the value chain for making a perfect dairy product that meets consumer demands in the supermarket. However, there are also the more emotional consumer demands such as “Does the cow have a good life? Is it acceptable that calves are killed by birth because they have no value?”

Breeding tools

The efficiency of dairy cattle breeding is of course due to artificial insemination and progeny testing schemes. Progeny testing schemes will still be important, but with genomic selection less important.

Milk recording and data bases with all relevant data create not only the basis for an efficient progeny testing scheme, but also for genomic selection (reference groups) or all research and development within cattle breeding in general. The process of getting good reliable data derived from central data bases and milk recording will definitely be changed.

In the Nordic countries all dairy farmers, inseminators, production and breeding consultants, veterinarians, slaughter houses and dairy plants have online access to national central cattle data bases. The incredible change in structure could be a future threat to the system. With larger and more extensive production methods in the dairy herds with their own computer systems, there is a risk that these herds will not send data to a common data base.

The dairy cattle breeders have been very loyal to the progeny testing schemes for many years and in average voluntarily used 33% young sires without any payment and special benefits. Everybody has got the benefits in good proven bulls. This will be changed!!

Genotyping of genetic markers (genomic selection), sexed semen and other new emerging technologies will also require good reliable data.

Organizations in dairy cattle breeding

The cattle breeding organizations in Europe and North America are still dominated by

farmer cooperative companies owned and controlled by farmers (members). Up till now, there has only been a few larger breeding organizations/A.I. centres owned by private investors. Within the last 10 years, more private owned organizations have started e.g. ABS/GENUS, Cogent and ALTA. In every corner of the cattle breeding organizations there have been many merges, acquisitions and alliances during the years.

This has according to Gura, 2007, lead to some concern on "genetic monoculture". Gura, 2007, made a comparison between genetic companies within poultry, pig, fish and cattle production. In all other species than cattle there are only very few companies in control of the breeding programmes. The breeding programmes for both poultry and pigs are dominated by hybrids, and with this also a lack of diversity between breeds.

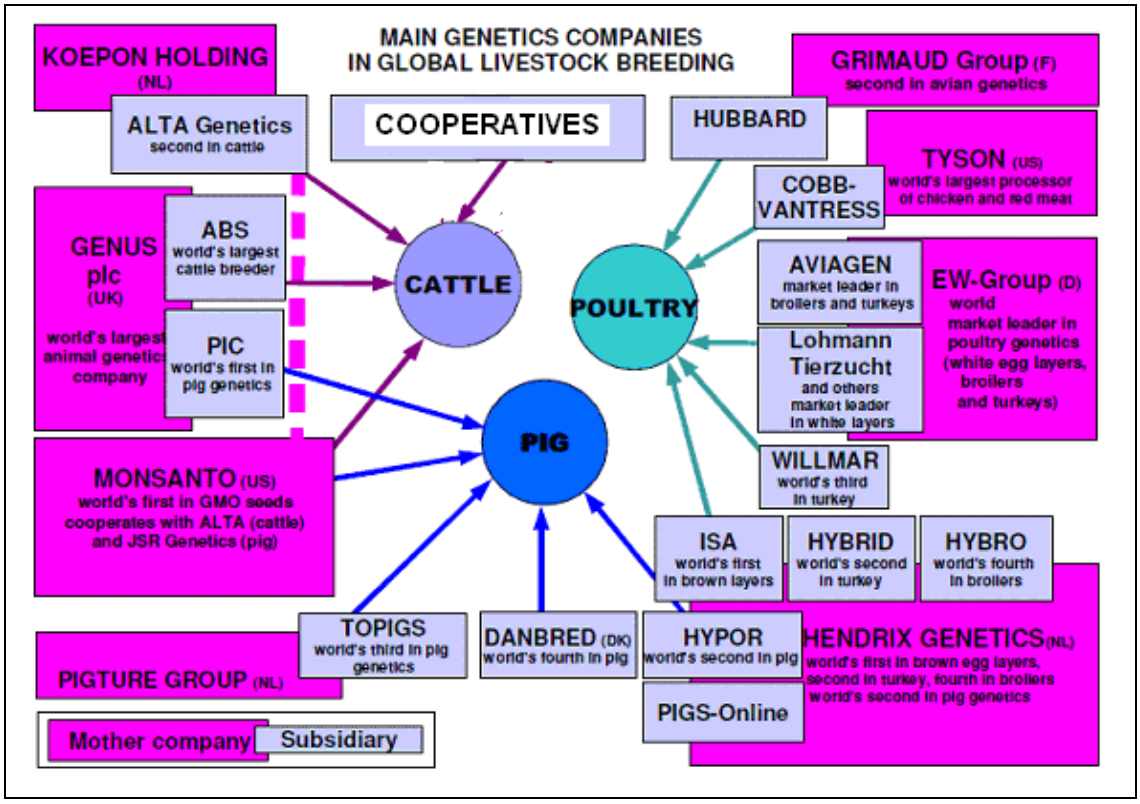

Figure 1. Concentration of livestock genetic companies (mod. from Gura).

Gura, 2007, also showed with the implementation of breeding programmes based on gene technology (genomic selection) that companies, which so far had focused on only one species, started to get interested in others. This was obvious for GENUS plc. which "merged" the cattle and pig companies PIC and ABS. Another limited company, MONSANTO, has according to Gura, 2007, a leading role in livestock genetics (*Quote: Monsanto may soon dominate gene markets not only with regard to plants but also livestock, thanks to an aggressive policy of acquisition, cooperation and patent policy in cattle and pig genetics. Quote, ended).*

Practical cattle breeding in the future

Talking about the future of cattle breeding will always be a guess. My guess is as follows:

So far, data from milk recording has been owned either by farmer cooperatives or government controlled organizations. The high concentration of cows in fewer herds (e.g. in the US) will make access to data and other information easier for private owned companies. As a result the development of new breeding tools can be more commercialised in the future.

Artificial insemination

The advantages of artificial insemination will still be unique. Preserved semen and embryos are easy to use and trade. The disadvantage of artificial insemination is a “non-pregnant” cow or heifer after one insemination. A “return” is non-satisfactory for the dairy farmer. It takes extra time for heat detection, costs of day open, semen and service price.

Lower fertility rates are influenced by several factors: New and better ways for preserving semen, heat detection tools and genetics programmes for better fertility. Heat detection has become an increasing problem with larger farms and more extensive production. Systematic hormone synchronization in conjunction with AI does not seem to be the right way in future. Due to ethics and animal welfare we cannot expect that the consumers will accept milk from systematically hormone treated cows in the future. From a genetic point of view we will also remove the cows natural heat signs by synchronization. The natural selection for clear signs of heat will disappear. However, selection for better fertility – male and female - is and still will be an important issue for future genetic programmes.

Sexing of semen

An old dream for many dairy cattle breeders came true with sexed semen. Sexed semen will also be a very important tool for more efficient breeding plans in the future, both in the dairy and beef sector.

Sexing of semen is an example of the development of a modern breeding tool. The XY method was developed by the universities. The method was patented, sold and is now owned and controlled by private investors. In respect of this, it is certain that further development of course will be carried out for the benefit of the investors, and with IPR (International Patent Rights), the development of new and perhaps more efficient methods will be controlled by the existing or new IPRs.

Genotype, SNPs and genomic selection

Many universities and their partners, which can be cooperatives or private A.I. organizations, have carried out very intensive research on marker assisted breeding programmes during the last decade. Thousands of animals have been genotyped, and this has accelerated with the development of the SNP set. The SNP set is already patented and the same will be the case with the discovery of new markers and single genes. Genomic selection is a new, emerging tool and so far all cooperatives and private AI companies are competing to be the first to find the goldmine.

However, in doing so, all of us are raising the same questions: How do we get a more reliable GEBV? How do we get a SNP set with a higher density? How do we get access to more reliable data?

Within the practical breeding programmes and the AI organizations we have very high numbers of test bulls, bulls in waiting and proven bulls. Together we have far too many bulls and with this also too high costs. This year and in the years to come all of us must raise the same questions: How many bulls do we need in the future? How many bulls can we slaughter? How do we pay the breeders for their genetics? How big reference groups are needed?

Another question is: Will genomic selected natural breeding bulls take over in some herds instead of artificial insemination, partly or totally? Solving and answering all these questions call for further cooperation.

Cooperation

Working together or cooperating is a challenge. All of us want to stay in business or at least be a part of cattle breeding in the future, and we also want expansion. Expansion can be possible in many different ways. No matter which way we choose, we must take the respective culture of our partners into consideration.

The main part of the data processing centres, milk recording societies and A.I. organizations are still cooperatives. Looking closer in figure 2, the four corners of the diamond: Structure, tasks, technology and individuals, are very similar for all genetics cooperative companies and to some extend also for many genetics departments at the universities. From this point of view cooperation is obvious.

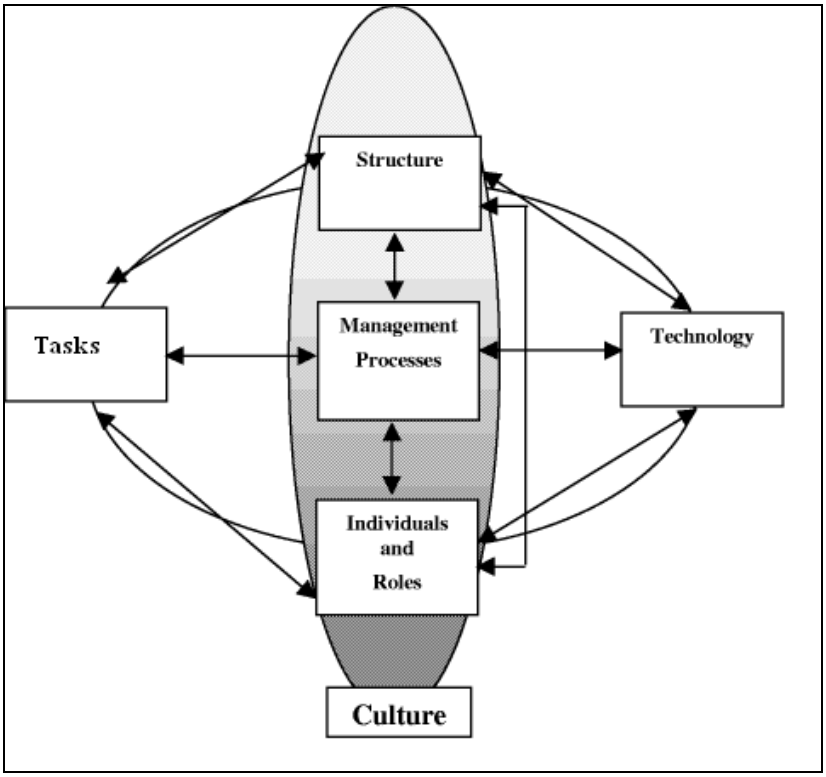

Figure 2. Organization structure and culture (mod. from Lewitts).

A fifth parameter in figure 2 is a grey shadow illustrating the culture of the organization. However, I do not think that our culture is that different within the cooperatives. When looking at cattle breeding organizations in different countries, the vision and mission statements are also very similar for many of the organizations.

In figure 3, different company organization cultures are described from the very powerful company culture to the more autonomous organization culture.

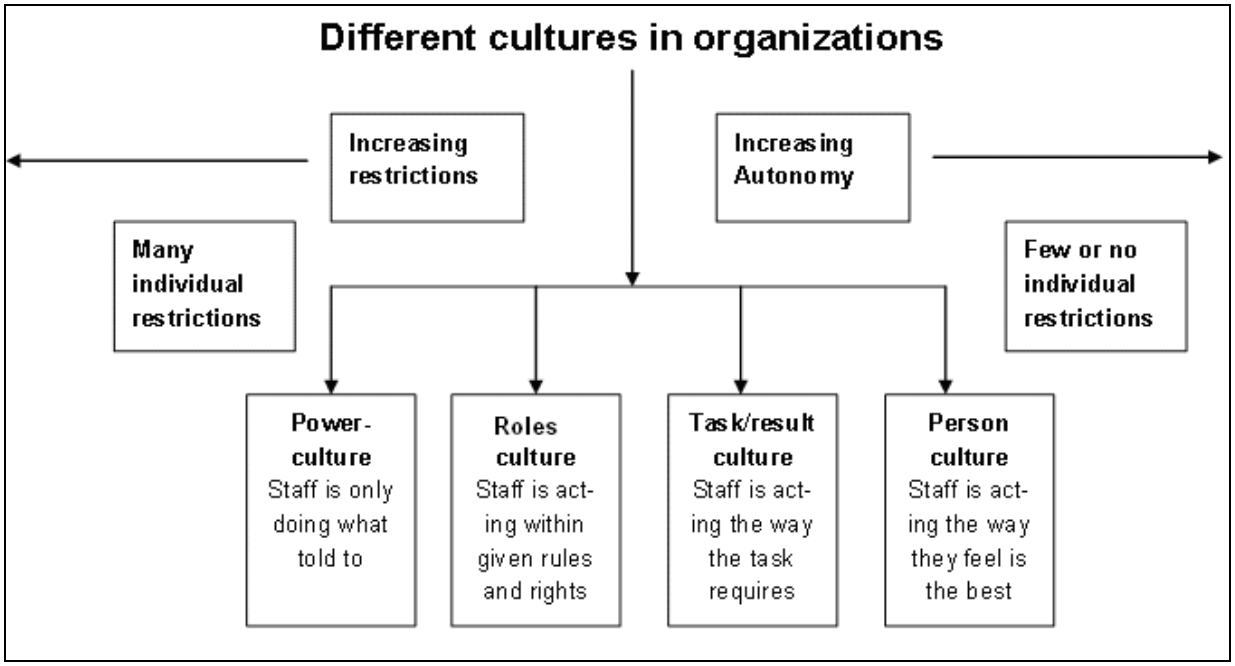

Figure 3. Different cultures in organizations.

Selecting a new and the right partner for cooperation is very important. Figure 4 shows that the closer the cultures are, the more successful the merger or collaboration will be.

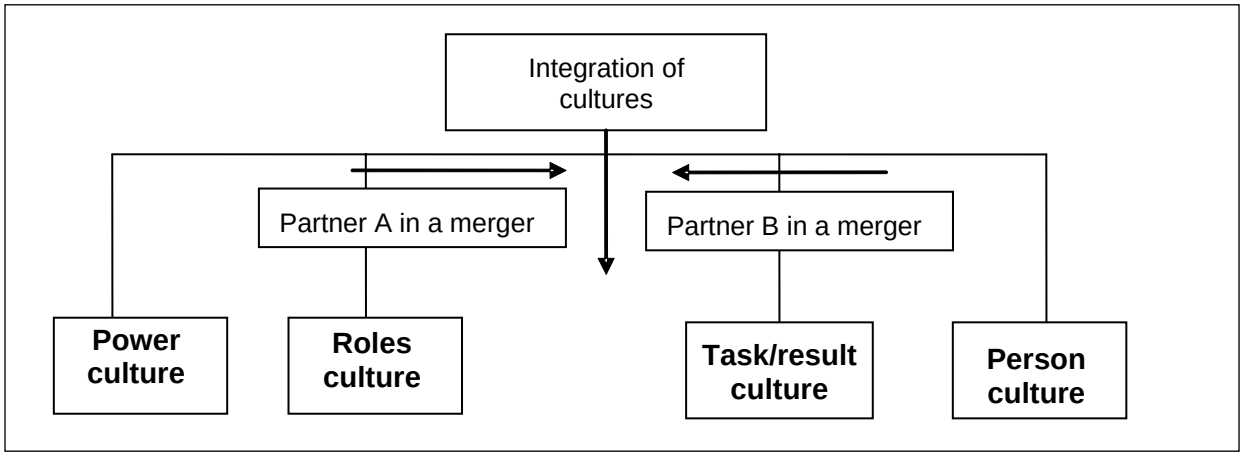

Figure 4. Mergers are easier the closer the cultures are in the merging organizations.

Whether we have mergers, acquisitions, joint ventures or alliances the criteria of a successful expansion will rely on:

- An obvious win-win situation for all parties
- Loyalty, respect and trust
- Long-term horizon for results (objective and measurable results)
- Patience

Figure 5 shows examples of different ways to go in order to change organizations. No matter which path or way we choose, we must develop new competences, products, joint ventures, etc.

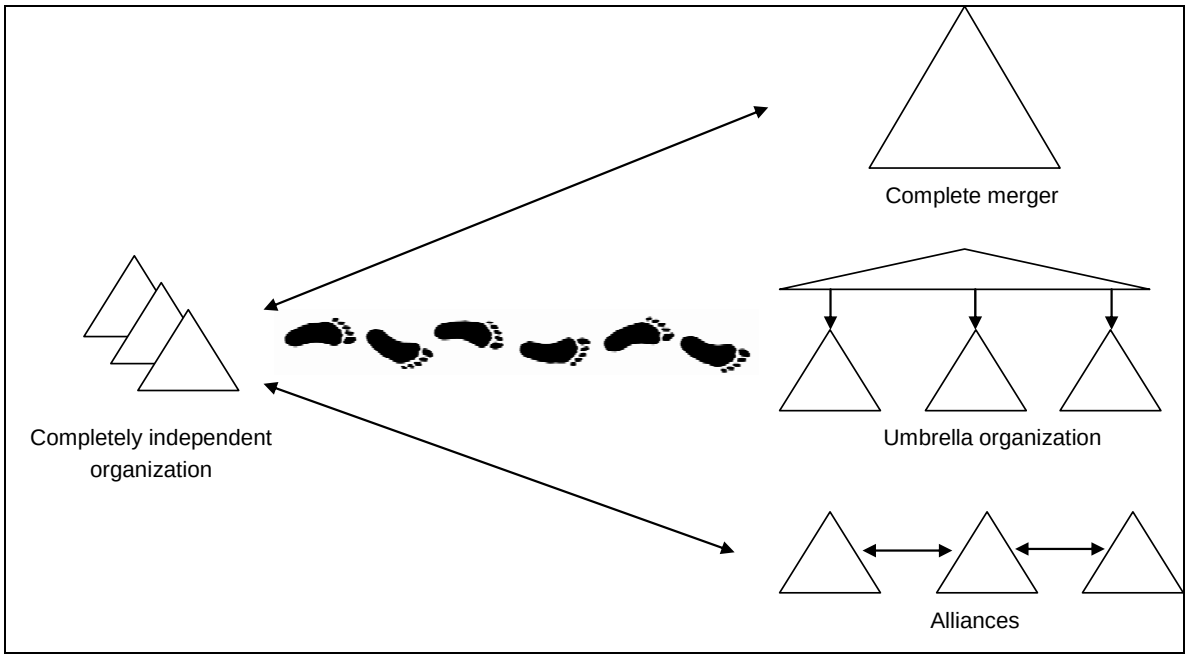

Figure 5. Different forms of organization and form of collaboration.

Why do we need further cooperation? We need further cooperation to avoid takeover by private industries and that private industries will control the future development in cattle breeding by many different wide patent rights.

For the last 10-15 years, projects have become confidential to a much higher extent than previously. Today we use many resources in writing confidentiality agreements, applications for IPRs, etc. before working together. I do not think we should or can avoid this, but we have a common goal, so we need to go for this goal in common instead of spending time on internal fights. Working together and founding new alliances, mergers or other kinds of organizational changes will be a question of balance and compromises. So finally, we must go for closer and better cooperation for the benefit of the dairy farmers!

Literature

Danish Cattle, 2009. The Danish Agricultural Advisory Centre. Figures on Danish Cattle.

Gura, S. 2007. Livestock Genetics Companies. Concentration and proprietary strategies of an emerging power in the global food economy. League for Pastoral Peoples and Endogenous Livestock Development, Ober-Ramstadt, Germany.

Lynch R. 1997. Corporate Strategy, Pitman Publishing, London.

Miglior, F. 2004. Overview of different breeding objectives in various countries. *Proc. 11th WHHF Meeting*, Session 4:7-11. Guelph, Ontario Canada..

Wilson, D. 2009. Personal information Doug Wilson, CRI, USA.