An organic perspective on Animal reproduction and breeding

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Reproduction

➢Organic possibilities:

- Growing interest in natural mating
  - Support in breeding program farm level
  - Save housing of bulls
- Supply of ET/AI free breeding stock
  - Special selection and publication
  - Organic breeding programs

Reproduction

➢ **Examples:**

- ET free bulls in Switzerland
- ET free bulls and natural mating in Bio Dynamic
- Natural mating in small populations (native breeds)
- Rotation breeding in pigs (for sows)
- Farm based breeding (cattle, poultry, pigs)
- Organic breeding program Org-AI based on young bulls

Type of animal

➢ For **low input** (organic) production

This means:

- Production land connected
- Ruminants ≥ 60% roughage[1] and local concentrates
- In Switzerland: ≥ 90% roughage and 26 days /month pasture in summer[2]
- Pigs & Poultry fed by local feed stuff
- Production depends on location soil type, environment)
- Animals are flexible/robust (fluctuations in environment)
- Animals can adapt (low input of medicines)

[1]EU-Regulation on organic agriculture Nr. 1804 / 1999 and EC 834 / 2007;
[2]Bio Suisse-Regulation / Demeter-Regulation D / CH

Type of animal

➢Conventional **high input** production

This means:

- High input feed → high output animal
- Production not soil/land connected (foot print, GHG)
- Animals uniform
- High input medicines
- Housing and feeding adjusted
- Mutilations (horns, tails, teeth, beaks)

Type of animal

➢Conventional **high input** production

And for breeding:

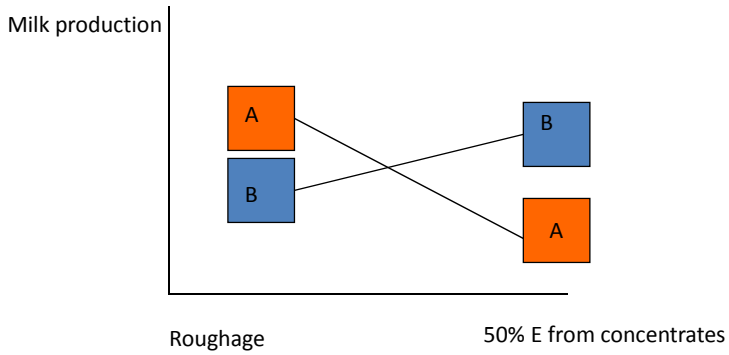
- Large breeding programs
  - Faster genetic progress
  - Increased selection intensity (data)
  - Testing schemes, genomics
  - Higher heritability
- Open market - competition
- Genetic erosion, inbreeding

Type of animal

➢ **Problems:**

- Breeding goals differ (traits, weight)
- More breeding goals/breeds (divers populations)
- GxE effects productions and health/functional traits
- Animals can not be fed for such high production
- Less variation in supply
- Animal welfare and health
- Biodiversity at stake

Use of conventional EBV



Genotype x environment

Use of conventional EBV

$r^2 = (0{,}25 \times n \times h^2) / (1 + 0{,}25 \times (n-1) \times h^2)$.

			Aantal dochters nodig per kenmerk		
Gen. Correlation	r^2	Real reliability EBV at 90 en 80% conv. reliability	Milk $h^2 = 0{,}35$	SCS $h^2 = 0{,}10$	CI $h^2 = 0{,}07$
0.70 0.80 0.90 1	0.49 0.64 0.81 1	44% (39%) 58% (51%) 73% (65%) 90% (80%)	9 (7) 15 (11) 28 (20) 94 (42)	31(25) 54 (41) 105 (72) 351(156)	44 (36) 78 (59) 152 (105) 505 (225)

** Low genetic correlation → low reliability

Type of animal

➢ **Possible solutions:**

- Organic breeding programs and goals/traits (new traits like roughage conversion, BCS, feed intake, use of feed)
- International cooperation (larger populations)
- Young bull system (no testing, no waiting period)
- Selection based on life time production (less environment)
- Farm based breeding (also possible with AI)
- Support of genomic information and sexed sperm?

Since farm sites are different, it is important to preserve and promote a great diversity of cow types and –breeds; this is a political task




Dual purpose: Dutch Friesian

HF/FH farm based breeding

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Groninger white face

Meuse-Rhine-Yssel (MRIJ)

Swiss Original Braunvieh (OB)

Study on aptitude of Original Braunvieh (OB) versus Brown Swiss (BS) on organic dairy farms in Switzerland (Bachelor thesis S. Wagner, SHL / FiBL)

Effects of OB-blood (an old Swiss breed) on relevant health traits were estimated with linear models from 66'109 Lactations (over 4 years) on organic farms

Higher OB-blood-percentages showed a positive effect on functional traits like persistency, udder health (SCC and SCS) und longevity on organic farms, but they showed a negative effect on production traits.

Swiss Simmental Breed (Si)

Reproduction techniques

Why is the discussion of reproduction techniques in organic breeding important?

- Great advances in biotechnologies which are tangent to organic breeding, because most breeding animals or their ancestors originate from conventional agriculture
- Naturalness is important for organic agriculture, but: where are the limits? What is natural?
- Some techniques are a matter of course for producers, but are refused by consumers

Criteria to assess reproduction methods for organic animal breeding

- Do animals get harmed / treated in an unnatural way?
- Are breeding goals promoted that do not align with the basic principles of organic agriculture?
- Is gene transfer involved?
- Is soil-/land connected production still possible?
- Are there negative environmental impacts?
- Are there negative impacts on variety / gene pool?
- Consumer acceptance
- Issues related to property rights?

Results of discussions among organic stakeholders

- **«Organic Animal Breeding Network» (NÖTZ, 2007; Beat Bapst)**
- **FiBL-Survey (2007: Beat Bapst)**

  10 Interviews (non-representative):
  5 professionals in organic lifestock production
  5 non-professionals (consumers)
- **IFOAM breeding diversity converence, 2009 (Anet Spengler and Frank Augsten)**

1. Natural mating

Consumers believe: On organic farms natural mating is normal

Org. farmers/advisors: It would be ideal to practice natural mating:

- The only natural method of reproduction
- Higher genetic variety, because individual bulls are not used often
- Environment of bull's ancestors is known
- Better fertility of female animals

But:

- Risk of keeping bulls
- No progeny testing
- Corrective pairing is difficult
- Risk of spreading mounting diseases

Natural mating

2. Artificial insemination (AI)

Consumers: AI is an unnatural technique: both sperm production and artificial service

Org. farmers/advisors: AI is a technique, without which modern breeding would be unthinkable (also organic):

- Progeny testing
- No danger, injuries, mating diseases
- Faster breeding progress
- Possibility to save semen from endangered breeds

But: Participants from Africa / India: AI causes problems, because not well known semen is used; non-adapted breeds are introduced, facilities for semen storage are not good enough; quality of semen is too low. AI is unnatural; better refuse to use it in organic agriculture

3. Embryo transfer (ET)

Consumers: refuse it, because it can be a pre-amplifier for embryo manipulation; because it is unnatural

Org. farmers/advisors from Europe: refuse it, because

- of no economic value for organic farms
- use of hormones
- breeding with infertile animals is possible
- Use of ET-bulls: different opinions

Org. farmers/advisors from USA: ET should be allowed in organic agriculture because very good female lines can be promoted (should be carried out without use of hormones)

4. Ovum pick up / in vitro fertilisation (IVF)

Consumers: refuse it, because it can be a pre-amplifier for embryo manipulation; because it is unnatural

Org. farmers/advisors: refuse it, because it is too far away from natural process:

- Fertilization outside of the body
- Use of hormones in surrogate animals (like ET)
- Danger of a narrowing of the gene pool

5. Sperm sexing

Org. farmers/advisors: different opinions:

Sperm sexing should be allowed, because:

- possibility to promote very good and rare female lines
- faster breeding progress
- waste of male dairy calves can be stopped
- method is not affecting animals more than AI

Sperm sexing should not be allowed, because:

- difficult to explain to consumers
- one-sided breeding is promoted (leading to more health problems)
- risk of inbreeding is increasing

6. Genomic Selection (GS)

Org. farmers/advisors: different opinions:

Interesting option because:

- breeding for health traits can be promoted faster
- method is not affecting animals more than AI, no gene transfer

Should be refused, because:

- Gene-centred thinking: health traits are highly influenced by environment (h^2 is usually low): it would be more reasonable to focus on environment-related breeding
- One-sided breeding for production traits is promoted (h^2 is usually high); leading to more health problems and narrowing of gene pool
- To shorten generation intervals ET and waste of embryos / young calves is inevitable
- Breeding structures re being redefined: Performance testing on farm is getting irrelevant: farmers won't participate in breeding process on a population scale; problem of patented methods

But: rejection is very difficult

7. Cloning techniques

Org. farmers/advisors:

Refused because:

- Cloning paves the way for genetic manipulation
- Would not be accepted by consumers
- Progress through breeding cannot be made by cloning

Summary / Conclusions:

- Use of reproductive techniques is not unproblematic.
- All techniques, except AI have been negatively evaluated, fully or partly, by organic professionals
- Non-professionals are generally „shocked“ about techniques and about their use in organic agriculture

Conclusions:

- We should continue to allow AI in organic agriculture
- We should refuse other breeding techniques
- Clarification on GS is necessary
- Natural mating and family breeding are to be promoted in organic agriculture

What we need:

- **Animal welfare** friendly breeding
- Support for **different developments**: farm based breeding, organic breeding programs.
- Support of **policymakers, regulation, institutions**
- Support of **farmers**
- Cooperation with **low input** farming
- Cooperation with **native breeds** breeders

LowInputBreeds

Development of integrated livestock breeding and management strategies to improve animal health, product quality and performance in European organic and 'low input' milk, meat and egg production

In cooperation with

ECO AB European Consortium for Organic Animal Breeding

Symposium/workshop on ethical aspects of Low Input Livestock systems

15-16 March 2011, Wageningen, The Netherlands