

AnGR Biobanks – Genomics research and breeding perspective

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Tomorrow's breeding in livestock, fish and plant species will increasingly be based on a combined knowledge from quantitative genetics and modern biotechnology. The field of biology and new methods utilising this knowledge is rapidly expanding, and in the breeding industry it is a special interest in mapping genes affecting health, quality and production, as well as implementation of new breeding tools like genomic selection. This technology requires systematic storage of individual biological samples. The Norwegian breeding companies Norsvin (pig breeding), Geno (cattle breeding) and AquaGen (fish breeding) have stored biological samples for a long time that pro forma may be categorised as bio banks, all though they were not organised and defined as such. BioBank Pty Ltd, was therefore established as a subsidiary of Aqua Gen AS, Geno and Norsvin, each owning 1/3 of the shares. BioBank Pty Ltd was created to organize the samples in a proper way, create a high-through-put pipeline of sample handling, and analysis, to utilize the exceptional opportunity to link the phenotypic characteristics with molecular analysis of the samples, and to be able to create new breeding schemes due to increased efficiency of the flow of data- and analysing. A biobank can be a research and development hub and create a basis for using modern biotechnical tools in a modern breeding scheme.

Historical data in Norwegian breeding organizations

By means of selective breeding and R&D, the owners have been gathering phenotypic (between 30-70 traits per breed) and kinship information on their breeding populations for more than 40 years. All this information is integrated into the respective breeding organizations databases. For cattle, Geno established a "health-card", following the individuals throughout life, for all cows already from 1975. This card gives an extremely valuable database for looking at genetics of all kind of health traits (currently 68 altogether) over generations. Biological samples are stored from AI bulls in the same period. For salmon, AquaGen has collected and stored tissue samples from all brood stock individuals the last 20 years, and currently they are also storing samples from almost all the challenge-tested individuals. Also for pigs (Norsvin) biological samples have been collected from all AI boars since late 90's and all boar testing boars (3000 Landrace and Duroc boars/year) the last ten years. During this period we have been able to use these samples in a number of scientific experiments in Norsvin and in collaborating research centers.

The BioBank Ltd in Norway

To meet the future need for genomic research and efficient breeding, the three largest breeding organizations in Norway decided to make a common central facility for sample logistics, storage and processing. BioBank Ltd (“- storage for the future”) was established in 2005 as a Norwegian national biobank for storage of biological material from fish, domestic animals and plants. The owners of the company are the swine breeding association Norsvin, the salmon breeding association Aqua Gen AS and the cattle breeding company Geno. BioBank Ltd is the leading animal biobank in Norway, and provides access to quality lab facilities and scale storage. The main purpose is to pool expertise within gathering, systematising, storing and treatment of biological samples. A professional logistics system has been established to ensure efficient and precise extraction of samples and data.

At present, BioBank stores more than 180.000 samples, a number that increases by approx. 15.000 yearly. Clients using BioBank own all rights to their own samples and data; retain all property rights to their stored material as well as rights related to commercial exploitation using information derived from analysis of this material. Typical BioBank customers are either working with genetic selection or genetic traceability or are involved in preservation of biodiversity - public institutions, breeding companies and R&D companies.

BioBank serves to:

- Operate the logistics and handling of routine tissue sampling as well as specific projects, including sampling for example from experimental animals at the abattoir.
- Operate a safe and robust system for storage of biological material and appurtenant information
- Operate and develop database systems for quality-controlled storage and retrieval of material and associated information
- Operate DNA-extraction from all kind of biological samples
- Operates the procedures for Paternity control in case of lost identifications of animals, uncertain heritage etc. These tests are based on either blood samples or on hair root samples administrated by the farmer directly to BioBank
- Establish a user friendly interface between the customer and analysis results

- Operate a system for safe retrieval and distribution of samples to customers or customer partners

To make information easily accessible to users, BioBank uses a database available for costumers. This includes overviews of all samples registered, analyses of selected samples and the possibility to connect data to other relevant databases on request.

Biobank in genomic research and breeding

Establishment of the BioBank gave new opportunities in R&D as well as on operation of a modern breeding scheme:

- Unique platform to establish projects with different research environments, both in Norway and other countries.
- Constitutes a platform for confirming pedigree information by means of DNA fingerprinting and biological traceability of products in the animal/fish breeding value chain.
- Increased possibilities to generate new knowledge and increase our possibilities to be in the forefront in implementation of genomic selection and up-coming new technologies in animal breeding.
- Gives possibilities for patents / intellectual property rights /exclusive commercial rights from inventions obtained by using biological material or data from the biobank.

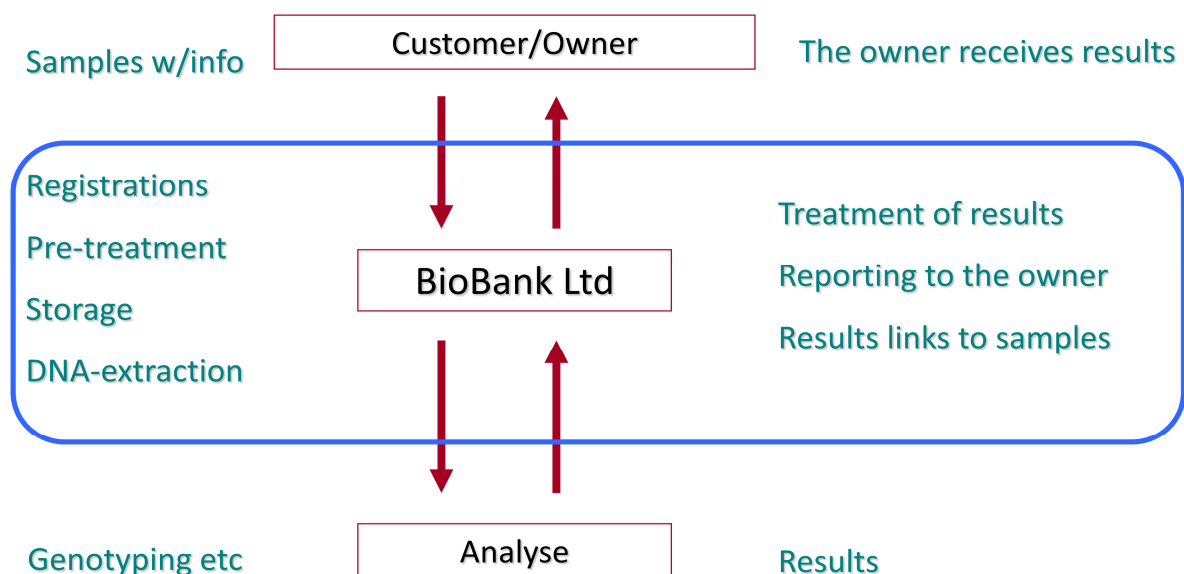


Figure 1: Sample/data-flow in the BioBank