Marker assisted selection (MAS): Overview of the research done with German Brown

Development Association for Biotechnology Research (FBF) e.V.

Overview

1. Research on the Initiative of Industry
2. The FBF
3. Projects: Genome Analysis in Cattle
4. Summary and Perspectives

Research on the Initiative of Industry

- Research in the fields of **Genome Analysis on Cattle and Pigs** is done for several years.
- These projects were initiated and financed (third-party funds) by german industry (Umbrella Associations of Cattle and Pigs: ADR and ZDS).
- The aim of these projects was gathering of information about the genetic disposition of relevant traits and its location on chromosomes.
- The knowledge resulting from one of these projects is already realised in practice (MAS in Cattle, VIT Verden)

Research on the Initiative of Industry

- Approval of the support measure **FUGATO** (in 2004)

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Breeding and insemination organisations from

- Germany (Cattle and Pigs)
- Austria (*Cattle* and Pigs)
- Switzerland (Pigs)

joined in the FBF.

- FBF is the so-called „Research Department“ of the organisations

The FBF - structure

The FBF - tasks

What are the tasks of FBF?

- Combining of (economic) forces of members for participation in research projects as industry partner
- Administrative processing of projects (incl. contracts, patent-applications, allocating of samples etc.)
- Support in realising research results in practice (technology transfer)

Projects: Genome Analysis in Cattle

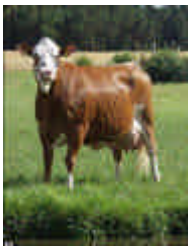
Long-term objective: Development of marker-assisted selection

1. Project (ADR)

- *1995 – 1998*
- ***Granddaughter – Design:***
  16 families German Holsteins
  3 families German Simmental
  1 family German Brown
- *Genome – wide **screening of QTL** (Microsatellite-marker, 20 cM)*
- *Establishment of a central **genome database***
- *Disequilibrium analysis identified **economic relevant traits** (milk performance, milk contents, SCS, exterieur)*

Projects: Genome Analysis in Cattle

Long-term objective: Development of marker-assisted selection

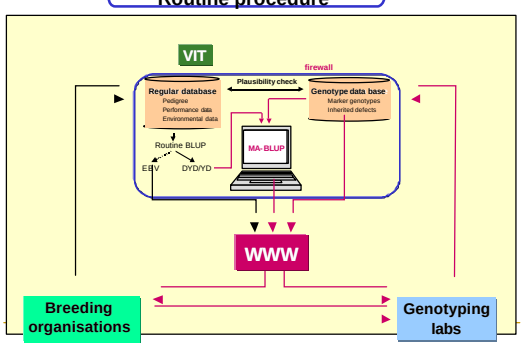


2. Project (ADR)

- *1999 - 2004*
- ***Granddaughter – Design:***
  Additional families: German Simmental (32)
- ***Validation study**: Are the QTL found in Holsteins segregating in Simmental, too?*
- *Fine mapping of QTL*
- *Development of **MA-BLUP***
- *Development of **infrastructure** for MAS*

Routine procedure

Routine procedure



Marker assisted selection in dairy cattle Source: C. Kühn

Projects: Genome Analysis in Cattle

Long-term objective: Development of marker-assisted selection

3. Project (FBF)

- *2004 - 2006*
- *Fine mapping of important QTL*
- *Characterisation of chromosomal regions*
- *Special emphasis on identification of candidate genes for milk contents in German Brown and Simmental*

Research is continued in FUGATO

FUGATO

Project 1

M.A.S.-Net

Marker Assisted Selection – Mastitis

Functional analysis of genetic mechanisms determining variability of protective ability against mastitis in cattle

Coordinator: Prof. Manfred Schwerin, FBN Dummerstorf

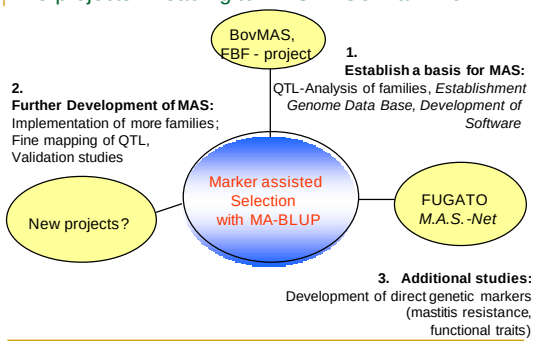
Functional Genome Analysis in Animal Organisms

BovMAS Projekt

- Basic information for marker assisted selection in ‚German Brown' are investigated in the EU- financed project BovMAS:

  - Segregating QTL and
  - informative marker in families

The projects – leading to MAS in German Brown



Summary and Perspectives

By

- merging research results from BovMAS and FBF (ADR) – projects as well as FUGATO (and others?),
- using the model of infrastructure and software developed in FBF (ADR)- projects and
- joining of populations from different countries in a common breeding value estimation,

MAS in German Brown might be a reachable goal!

FBF-Übergangsprojekt „Genomanalyse Rind – MAS“

Die Forschungsschwerpunkte:

- Weitere Feinkartierung der identifizierten QTL-Regionen aus den ADR-Projekten
- Identifizierung von positionellen und funktionellen Kandidatengenen
- Nachweis merkmalsassoziiert auftretender Varianten der potentiellen Kandidaten-gene / Assoziationsstudien / Funktionelle Charakterisierung / Gentest

Forschungsansatz bei Braun- und Fleckvieh:

- Identifizierung Milchinhaltsstoff-assoziierter Haplotypen bei Braun- und Fleckvieh (129 Fleckviehbullen, 57 Braunviehbullen in der Analyse).
- Ergänzung der bestehenden Familienstrukturen notwendig, um Haplotypen mittels Mikrosatellitenanalyse ableiten zu können.
- Assoziationsstudie: Effekte der Haplotypen auf Milchinhaltsstoffe
- Charakterisierung von Kandidatengenen – Identifizierung von SNPs
- Funktionelle Charakterisierung von SNPs / Genvarianten
- Entwicklung von Gentests

Finanzierung

FBF-Übergangsprojekt:

Gesamtkosten: 260.000 Euro
Kosten Verbände: **117.000 Euro**

FUGATO (MAS.Net)

Gesamtkosten: 1.400.000 Euro
Kosten Verbände: **187.000 Euro**

Grundlage 4,5 Mio Erstbesamungen, 2,3 Mio Herdbuchkühe

Finanzierung

ADR I

Gesamtkosten:	1.800.000 Euro
Kosten Verbände:	**1.100.000 Euro**

ADR II

Gesamtkosten:	1.600.000 Euro
Kosten Verbände:	**960.000 Euro**

Grundlage 3.5 Mio Erstbesamungen (nur Holstein)

Es wird seit 11 Jahren geforscht

Investition der Verbände:
2.360.000 €