IT-Solutions for Animal Production
vit informs

Use of Data Warehouse in Animal Husbandry and Animal Breeding

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IT solutions for Animal Production (vit), Verden/Germany
Germany: Data processing in dairy cattle

- Traditionally some organizations processed their ‘own’ data in house
  - Some share software development, run it on different sites

- In the Holstein regions most organisations have joined forces in their data centre vit:
  - 12 breed organisations with dairy breeds (100%)
  - 9 milk recording associations (75% of all Holstein cows recorded)
  - 8 A.I. organizations
  - Luxembourg (CONVIS) processes data at vit, too
  - All regions (incl. LUX, AUT) → genetic and genomic evaluation for dairy breeds

- On farm data increasingly important
  - Average herdsize
    - Eastern Germany: 260 cows
    - North-Western Germany: 75 cows
  - Since 1997 50% share of a specialised company (VIT-PCS) providing on farm herd management software (‘Herde’) → 70% market share
vit: the organisation

vit = Vereinigte Informationssysteme Tierhaltung w.V.

(IT solution for Animal Production)

- Organized as association (non-profit)
  - Founded 1965 in Western Germany (Verden) immediately as a private organisation
  - Founded 1965 in Eastern Germany (Paretz near Berlin) as state organisation → 1990 privatisation, 1994 merger to vit with Western Germany
  - Members are agricultural organizations from Germany and Luxembourg

- Most important sector is dairy breeds (ca. 50 % of turnover) including:
  - Data processing for milk recording → 1.700.000 cows
  - Data processing for herdbook keeping → 1.800.000 cows
  - Data processing for artificial insemination → 2.650.000 inseminations
  - Genetic and genomic evaluation

- Financing
  - 95% service fees
  - 3% development grants
  - 2% member fees
Services for dairy breeding in summary

Milk recording organization

Herd-Book association

A.I. stud

Authority respons. for I&R

Identification

Milk recording
Registration

Classification
Animal sales

A.I. service
natural service

Identification

Monthly report
Yearly report

Pedigee info
Sales info

A.I. data
Accounting data

Genom data

Performance data

Pedigree data

Mating data

Accounting data

Breeding values

26 May 2014
Use of this huge, komplex data pool with ~ 800 users

- Joint data pool (~80 mio animals) enables all clients to have optimal data quality
  - Immediate cross checks even with movements across regions possible
  - Corrections of data content immediately available

But

1. How to share sensitive data → solved by access rights to the database

2. How to integrate additional data (eg ERP) with the data that belongs to animals / farms

3. Individual queries / requests / reports on the 'own' data set, for
   - R&D work
   - Few herds

   - Solutions so far
     a. Individual software tools developed by vit
     b. extract of data and analysis with tools within the organisation
Migration process

- Analysis showed that future needs require IT architecture which is close to Internet application → migration from mainframe to new platform
  - Other main aspects
    → new (young) staff expect graphical front end
    → availability of programmers (no PL1, Natural, etc. any more)

  Solution
  - Linux operating system
  - Oracle database
  - Java software development

- Experience showed that software development with Java is only slightly 'cheaper' than with previous languages

- Problem remains that for ad hoc questions of individual customers the complex database and complex data structures is a challenge

  Solution
  - Integration of a Data Warehouse
Data Warehouse (DWH)

- Is an IT system that
  - Extracts, 
  - Transforms, 
  - Loads complex source data into a dimensional data store
  - And then supports and implements querying and analysis for the purpose of decision making

- Compared to other means (HQL, SQL) to extract information from complex data structures the use of a DWH does not require this expert know how

  → moves decision support systems from the IT department to the users / responsible staff

- The in memory technology guarantees high performance

  → vit has chosen QlikView as the reporting and analysing tool
vit analysis server

vit-departments develop applications

analysis and output
vit / members and customers

timed data updates

specific data marts

health data and test herds/ features

Milk recording and annual accounts

Artificial insemination billing

... other applications

DWH - Custom

DWH - customer

... more

integration of external customer data possible

ETL-process (Extraktion, Transformation, Load)

Data Warehouse (DWH)
(Replikation serv.it RIND)

serv.it RIND
(operational System)

further operative sytems and databases...

vit database server
Case study 1

- Contract herds for use as cow reference population
  - Two regions in Eastern Germany record additional health and performance data
    - 87 herds (av. herdsize 700 cows) → ~ 60,000 cows
    - Disease diagnoses
    - Weight at calving
    - Hoof trimming
    - Conformation on all heifers
    - ...

Aims:
- a. Have an optimal infrastructure for R&D questions to use data in genomic evaluation
- b. Quarterly reports to farms (for management decisions → motivation to collect data for a continuous period)

→ front end to the farmer
Case study 1 → report to farms (health data)

### Quartalsbericht: Calving Trails

<table>
<thead>
<tr>
<th>Merkmal</th>
<th>Quartal</th>
<th>Vorg Quartal</th>
<th>RBB Quartal</th>
<th>RMV Quartal</th>
<th>Rangierung RMV</th>
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</thead>
<tbody>
<tr>
<td>Anzahl (t)</td>
<td>782</td>
<td>820</td>
<td>8.920</td>
<td>7.180</td>
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<tr>
<td>Totgeburten (%)</td>
<td>6.4</td>
<td>8.8</td>
<td>8.1</td>
<td>5.5</td>
<td></td>
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<tr>
<td>KV schwer (%)</td>
<td>6.2</td>
<td>5.4</td>
<td>3.8</td>
<td>7.0</td>
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<tr>
<td>Geburtsgewicht (kg)</td>
<td>443</td>
<td>433</td>
<td>417</td>
<td>42.3</td>
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</tbody>
</table>

### Färsenkalibungen

<table>
<thead>
<tr>
<th>Merkmal</th>
<th>Quartal</th>
<th>Vorg Quartal</th>
<th>RBB Quartal</th>
<th>RMV Quartal</th>
<th>Rangierung RMV</th>
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<tbody>
<tr>
<td>Anzahl (t)</td>
<td>301</td>
<td>300</td>
<td>3.933</td>
<td>3.403</td>
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<tr>
<td>Totgeburten (%)</td>
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<td>16.6</td>
<td>9.4</td>
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<tr>
<td>KV schwer (%)</td>
<td>12.0</td>
<td>9.1</td>
<td>4.7</td>
<td>10.4</td>
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<tr>
<td>Geburtsgewicht (kg)</td>
<td>42.4</td>
<td>41.1</td>
<td>39.6</td>
<td>40.2</td>
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### Kükalibungen

<table>
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<tr>
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<td>Geburtsgewicht (kg)</td>
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<td>46.5</td>
<td>42.7</td>
<td>43.3</td>
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### Calving Ease & Birth Weight

**Herd**

**Region**

**% Stillbirth**

- **Heifers**
- **Cows**

**All**

**Heifers**

**Cows**
Case study 2

Statistics within DHI organisation

- Once a year an annual report is provided to each farmer
- Numerous statistics for the individual DHI organisation
  - So far relative static reports
- Estimation to program these in Java
- Estimation to do it with the DWH (20% of resources Java)

- Clear advantage for the DWH solution to get the standard reports

- Now additional (in house) analysis of data is possible
  - Requires training in using the DWH but no special IT know how
### Case study 2 → DHI report

**Leistungssteigerungen zum Vorjahr und Streutabellen**

<table>
<thead>
<tr>
<th>Betriebs-</th>
<th>Jahresschluss</th>
<th>Anzahl</th>
<th>Mg</th>
<th>F_%</th>
<th>Kg</th>
<th>F_%</th>
<th>Kg</th>
<th>F_%</th>
<th>Kg</th>
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<th>Kg</th>
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<tr>
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<td>Kreis</td>
<td>Vorjahr</td>
<td>nach</td>
<td>Milch</td>
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</table>

**Gesamtwert für Milch/kg-Steigerung**

- Min: -5,988
- Max: -1,996
- Median: 1,688

**Grenzwert für Milch/kg-Steigerung**

- Untergrenze: 1,000
- Obergrenze: 2,000

**Auswahlstatus**

- Jahresschluss: 2013

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Case study 3

- Larger AI centres use IT system of vit for all of their AI data processing
  - Lab → semen storage etc. → distribution → recording → accounting
  - DWH application is a very powerful tool to analyse this data for various purposes
Case study 3 → use within AI centre
Summary

- Introduction of a Data Warehouse System is a complex project

- Requires large initial investment
  - Technical infrastructure
    - ETL process
    - Server → In Memory Technique
    - Developer licences
    - User licences
  - Training of experts for implementation of projects
    - Analysis of the business rules
    - ETL
    - Development of reports

- Very positive Feedback from those customers that take the time to learn about new features and apply it
Thank you for attention!