New Ways of Data Recording and Genetic Evaluation for Functional Traits

S. Rensing, Vereinigte Informationssysteme Tierhaltung (VIT), Heideweg 1, D-27283 Verden, Germany

Abstract
The importance of functional traits within the breeding goals for Holsteins in most countries has increased. At the same time the data base for functional traits didn't increase. Additional data are already existing mainly outside the traditional data collecting systems of official milk recording and conformation scoring. This includes the herd management systems as well as other sources like professional hoof trimmers and veterinarians. The big challenge is to make this data available for systematic evaluation. In Germany projects using this extra data on different traits are initiated. The Holstein breeding industry should be aware, that more investments in this field are necessary. The possibilities of getting extra data on functional traits as by-product from other data collecting schemes like official milk recording (e.g. SCS) are limited.

Introduction
Functional traits are defined as traits that increase profitability in dairy production by reducing costs. Important are health and fertility traits but calving and workability traits as well. Functional herdlife can be considered as a combined trait including many of these functional traits.

In various countries the importance of the functional traits within the breeding goal increased significantly. Modern Total Merit Indices include up to 50% non-production traits and the composition has become more similar in the main Holstein countries.

Data Sources for Functional Traits
Data for functional traits are mainly based on traditional milk recording systems. Beside that conformation scorings are used as (prediction-)traits for functionality.

Table 1. Actually used data sources for functional traits

Trait complex	Recording trait(s)	Source
Udder Health	SCS (Milking Speed) (Udder Conformation Traits)	Official Milk Recording, (Milk Recording/Linear Description) (Linear Description)

Reproduction
    -Fertility
 	
    -Calving Ease
    -Calf Mortality
	
	 Interval Calving-1.Insemination
	 Non Return Rate
	 Calving Ease
	 Stillbirth 48h
		
		 Official Milk Recording
		
		 Official Milk Recording
		 Official Milk Recording

Milkability	Milking Speed (kg/min) Milking Speed (% high/low) Milking Temperament	Official Milk Recording Linear Description Linear Description
Feed Efficiency	Body Conformation Traits Persistency/Maturing rate	Linear Description Milk Recording
Feet & Leg Health	F&L Conformation Traits	Linear Description

The increased importance of functional traits in the breeding goals was not followed by more/better data. The economical pressure even leads to cheaper and simplified milk recording systems

- Unsupervised/owner sampler milk recording systems
- Alternated milk recording schemes

With new technical developments official milk recording may be replaced by (only) herd based milk recording.

New sources of data
The official milk recording system still includes extra data that may be used for improving functional traits.

- **Urea concentration is available for each test day**

Up to now this information is only used for feeding advice (energy deficiency), but no routine genetic evaluation is applied. First investigations including this information in German routine evaluation are made.

The data recording system for conformation traits actually is extended for:

- **Locomotion**
- **Body Condition Score**

Whereas the target of Locomotion is to get a better description of F&L, BCS is a new trait especially included as predictor for fertility.
The mentioned extension of the data base for functional traits is still within the existing data collection system and causes relatively low extra costs and logistics.

The next step is to establish new systems of data recording/collection. Outside the traditional systems, data already exist which are not included in systematical national evaluations, yet.

- **Feet traits from own performance of young A.I. candidate bulls**

Central rearing of young A.I. candidate bulls is very common for veterinary reasons. In Germany the use of additional recorded objective feet traits (e.g. density of hoof, other measured hoof parameters) was tested. To use this data systematically, an agreement on standardized data recording schemes across A.I. programs is necessary.

- **Field data recorded by others**
    - professional hoof trimmers (diagnosis of pathological symptoms, claw injuries)
    - veterinarians (diagnosis, treatments)
    - inseminators (strength of heat, …)
    - …………

Veterinarians, inseminators as well as e.g. hoof trimmers may have useful data on functional traits. Form of data recording and exchange of data still have to be defined. In Germany in a new project with professional hoof trimmers has started to examine standardized data recording and exchange for kind of hoof trimming, injuries and abnormalities.

- **Data recorded by herd management programs, e.g.**
    - injuries, treatments
    - heat detection data
    - milking time/speed
    - culling information 48h – 1. calving

-   ……..

The farm management computers store many data according to functional traits. This starts with detailed data around calving, includes heat detection and inseminations as well as treatments, feeding groups, etc. The general problem is missing recording standards and interfaces because the data are collected and processed only for in-house purposes up to now.

The Challenge

The challenge is to implement standards for data recording and exchange. To establish new standards it needs big efforts from the breeding industry because neither the management software suppliers nor the milk recording organizations have interests to invest in this field.

An important point to motivate farmers collecting and sending these data to computing centers for genetic evaluation is to provide them with current and continuous analysis of these data for herd management purposes. For day-by-day motivation this may be more effective than financial incentives.

In Germany a new internet based herd management system, NetRind, including milk recording and herdbook data gives the technical platform for such a system. Besides the common features of herd management programs it has the opportunity to integrate e.g. the herd veterinarian. All cow treatments and use of drugs can be documented by one booking for both sides (enforced by law) with minimum input.

Genetic evaluation

Most functional traits are characterized by low heritability, caused by low genetic variation and/or high residual variance. Through more detailed information on herd environment the residual variance and therefore heritability could be enhanced.

Multitrait analysis using correlated traits and information sources is an additional possibility to get a higher accuracy in genetic evaluation. The use of prediction traits is very common for functional herdlife, udder health index or fertility. But there are much more useful genetically correlations. So the optimum way of combining all traits to complex indices and finally the Total Merit Index would be an overall multitrait model using all information at the same time.

In several countries research projects are set up to identify quantitative trait loci (QTL) or linked genetic markers describing a significant part of genetic variation in functional traits. Many projects are focusing on udder health and meanwhile are introduced into routine genetic evaluations like in Germany. For other health traits, fertility or feed conversion this is still has to be realized. An essential precondition for investigation of further QTL is proper data recording (yields and environmental factors) for the target trait.

The Holstein breeding industry should be aware that more investments in data recording and processing for functional traits are necessary to meet the demands of the markets and to assure the leading position of the Holstein breed for milk production around the world.