

EXPERIENCES WITH DATA HANDLING IN MICRO PROCESSOR BASED HERD  
MANAGEMENT SYSTEMS

by

Dr. H. Auernhammer and Dr. G. Wendl

Institute of Agricultural Engineering of the Technical University of Munich  
Vöttinger Straße 36, D-8050 Freising-Weißenstephan  
Federal Republic of Germany

ABSTRACT

On three dairy family farms with loose housing systems micro processor based feed dispensers, milk meters and body-weighing systems in connection with an on-farm computer has been installed. During the time of installation there have been problems with the connection between process computers and on-farm computer. Meanwhile these problems have been solved. The reliability of installed plants is high. Main problems in data collection and data transfer are poor rates of identification and a high loss of data during manually operated data transfer. With the use of a multi tasking operating system at the on-farm computer the data transfer could be automated and the losses of data have gone down rapidly.

INTRODUCTION

In research work examinations are mainly done in experimental stations. In these cases a lot of advantages are possible, for example the isolated analyses of only one parameter, which is important for basic research work on the whole. Nevertheless, there are some disadvantages too. Especially the transformation of the results onto practical farms comes too late and the influences from practical farms are often inadequately considered.

To avoid these disadvantages it has been tried to install new techniques in dairy husbandry on practical farms very early. With it the whole examinations could be done under practical conditions where the whole usage of the technique was done by the farmer himself. Only the installation and alterations were supported by the Institute's staff.

INSTALLED TECHNIQUE

On the farms the technique from table 1 has been installed. The owners of the technique were the farmers by themselves. They bought this technique directly from companies or from the Institute if specifically developed for research work. In all cases they have got some discounts for the pilot function. The advisers have shown great interest too and from the government each farmer got a grant of about 10.000 German marks for the realization.

On each farm the connection between process computers and on-farm computer was an indispensable goal. It was realized by different hard- and software, shown in table 2.

Table 1: Farm data and installed technique

farm data	farm no.		
	1	2	3
farm size (ha)	45	52	34
age of farmer (years)	40	24 + 65	28
number of cows	44	60	37
year of installation	1983	1985	1985
member of breeding association	no	yes	yes
milk quota in 1987 (1)	173.000	281.000	208.000
distance from farm to institute (km)	60	80	32
number of concentrate dispensers	2	2	2
cow identification in the parlour	at the entrance	at each stall	at each stall
size of parlour	2 x 4	2 x 6	2 x 4

## EXPERIENCES

Since the installation a lot of experiences have been collected. They refer to

- problems at the time of installation
- reliability of plants
- data quality
- special problems for the farmers.

Time of installation

On all three farms the technique was bought as a total from one company (full line). There have been different kinds of problems as follows:

Farm no. 1 has been the first farm with such an installation in the southern part of Germany. At that time the company was not yet able to connect the process computers to the on-farm computer. This task was taken over by the institute. The following problems came from the very rapid development of electronics in which a lot of parts had to be changed for getting the plant to an actual situation.

Table 2: Hard- and software on the farms

farm data	farm no.		
	1	2	3
type of on-farm computer	IBM-XT	NIXDORF	SIEMENS PC-X
operating system	MS-DOS	MS-DOS	UNIX
size of hard disk	10 MB	---	10 MB
data storage	SQL-DMS (ORACLE)	single files	SQL-DMS (INFORMIX)
activation of data transfer	manually and time watch clock	time watch clock	multi tasking operating system
interface type to process computers	RS 232 C	RS 232 C	RS 232 C
type of protocol	byte, echo <i>block</i>	byte, echo	byte, <del>block</del> <i>echo</i>
video text to mainframe	yes	no	yes
herd monitoring	yes	yes	yes
cow calendar <i>on PC</i>	yes	no	no
dry matter intake estimation	yes	yes	yes
budgeting	yes	no	(no)

Farm no. 2 and no. 3 installed the equal technique from another company. At this time problems with the connection were solved by the company, so that no additional problems were realized at the time of installation.

The body-weighers for cows in farm no. 1 and no. 3 have been installed during the last two years. With those the whole situation on the farms have now the lay-out of figure 1.

#### Reliability of installed plants

In consideration of the reliability there have been two main problems. They were detected in the parlour only and concerned the identification of cows and the accuracy of the milk meters. There were no problems with the concentrate dispensers.

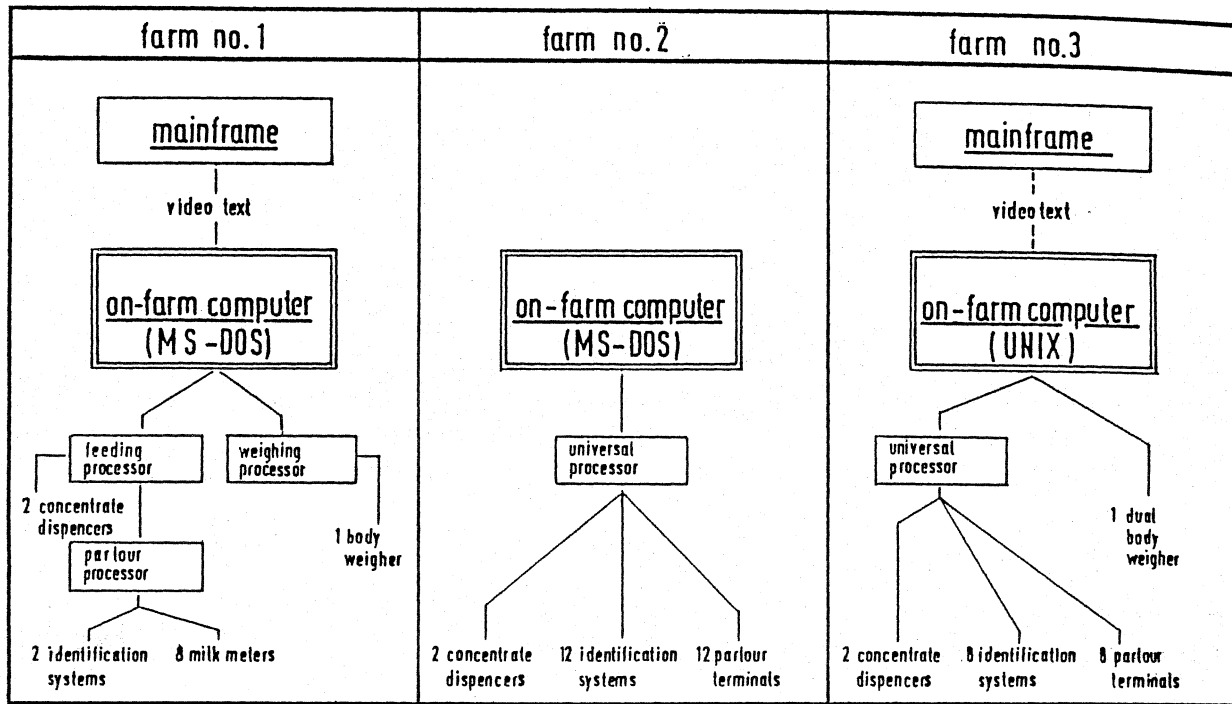


Figure 1: Diagram for the installed technique in three dairy farms

Table 3: Reliability of plants

farm data	farm no.		
	1	2	3
plant use (month)	39	23	5
number of crash downs (unknown reasons)	0	0	0
damages by lightening	2	0	0
milk meter accuracy			
satisfying	7	11	7
unsatisfying	1	1	1

Total crash downs of the whole plant have not taken place, but there were two damages caused by lightening in an interval of only twelve months at farm no. 1. On farm no. 3 some crash downs were caused by mices chewing the cables between the body weighing equipment and the process computer.

#### Data quality

The data quality is based on the rate of identification and on the security of data transfer between process computers and on-farm computers.

Farm no. 1 has put out the most data. From figure 2 can be realized that the main problem of the whole plant is the unsatisfactory data transfer rate to the

on-farm computer. Nearly 70 % of data losses are caused by the necessary manual start of transfer during the first twelve months of installation. A better situation could be reached by installing a time watch clock for a more automatized data transfer. An improvement is also seen with the ongoing installation time, which is to refer to the farmer's habituation to the new technique.

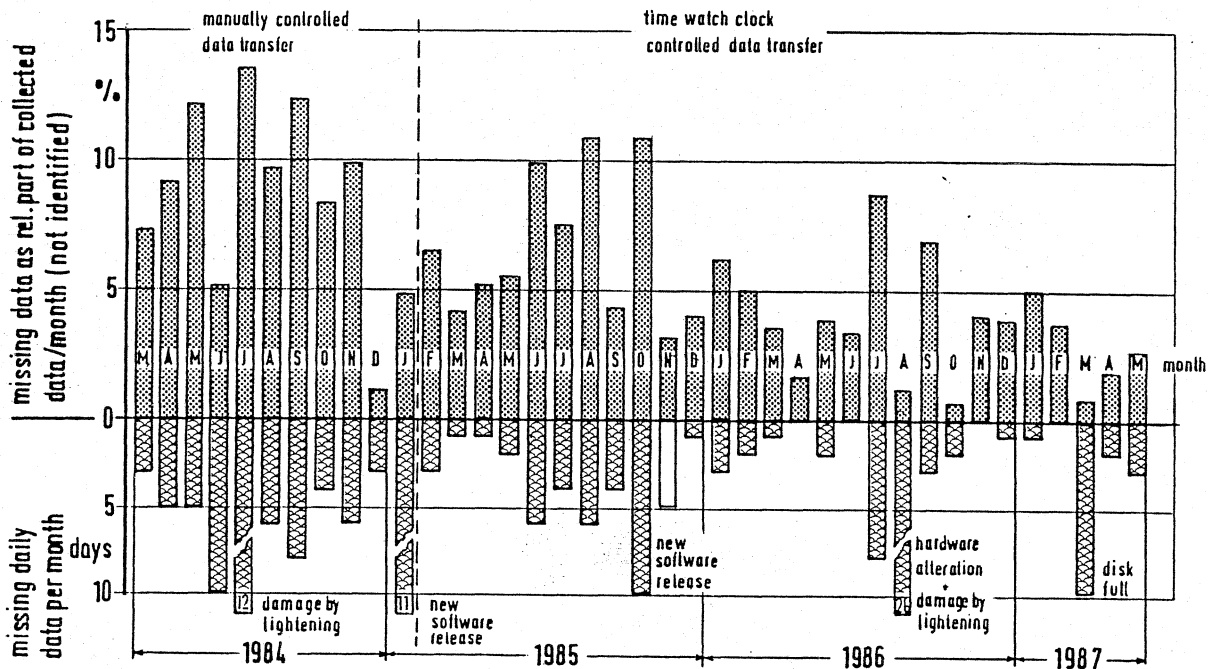


Figure 2: Data losses caused by misidentification and inadequate data transfer on farm no. 1

Very questionable is the tendency of data losses across the year. There is a correlation between data losses and increasing stress of the farmer caused by the fieldwork with maximum data losses in June, July and August. Consequently there is a better data quality during the quieter months in wintertime.

Farm no. 2 had to be automatized as much as possible, because the farmer had no interest in the connection of the process computer and the on-farm computer. Looking at the results on figure 3 two important points are to be seen.

There is a very high rate of not identified cows. In this connection only a small number of cows has been manually identified, so that in an average data of 15 % of cows are unusable. On the other hand there are very high data losses during the summer months. Also high data losses can be realized in times where a great number of cows is calving and therefore another high stress situation for the farmer is given.

Farm no. 3 is not evaluable at this time. Also it takes a special position because the installed on-farm computer is using a multi tasking operating system and engaged for process control directly. Nevertheless, there is to realize that on this farm the highest data quality is reached and this result is an additional point for an automatized data transfer between process computer and on-farm computer. Only then it will be possible to use the automated collected but in the same way very expensive and very important informations from the

and software houses.

3. The identification of cows is not quite satisfactory. An antenne at the entrance of the parlour enables better results than antennes on each stall in the parlour if there is no concentrate dispensing.
4. Absolutly dissatisfying is the situation by the data transfer from process computers to the on-farm computer. Only an automized multi tasking operating system can solve these problems and store in a secure way the highly valuated data from process control for a better management in the on-farm computer.
5. A better and on the same rules based user surface for process computers and on-farm computers is necessary. Only then the new technique will be included in the daily farmwork without problems.

#### REFERENCES

1. Auernhammer, H.:  
Hofcomputer und Prozeßsteuerung in der tierischen Produktion  
DLG-Manuskript Nr. 067, Frankfurt a.M. 1985
2. Auernhammer, H. (Editor):  
Rechner-Rechner-Schnittstellen für den landwirtschaftlichen Betrieb  
Weihenstephan: Inst. für Landtechnik 1986
3. Auernhammer, H., H. Pirkelmann und G. Wendl (Editors):  
Prozeßsteuerung in der Tierhaltung - Konzepte, Datenerfassung  
Kommunikation  
Schriftenreihe der Landtechnik Weihenstephan, Vol. 4,  
Weihenstephan 1983
4. Auernhammer, H., H. Pirkelmann und G. Wendl (Editors):  
Prozeßsteuerung in der Tierhaltung - Erfahrungen mit der Milchmengen-  
erfassung, Tiergewichtsermittlung und B5reitstellung von Management-  
daten  
Schriftenreihe der Landtechnik Weihenstephan, Vol. 2,  
Weihenstephan 1985
5. Royal Agricultural Society of England:  
Farm Electronics and Computing  
Monograph Series No. 4, Stratford upon Avon 1985