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Labour Input for Documentation in Arable Farming

Due to legal requirements and trade agreements, accurately documenting the single working steps in arable farming is gaining in importance. Using an existing farm as an example, the labour input and resulting costs of various documentation systems are analyzed.

The food scandals in the recent years have caused a deep uncertainty of the consumers about food safety in Europe, which has forced the legislator and the food industry to react. One result is that food production is considered as a chain from the farmer to the food industry, to the retailer and to the consumer. To make this chain successfully not only goods but also information will have to be exchanged between the single members of the chain. To gain this in-

To demonstrate the single working steps and costs, one field with an area of 0.73 hectares has been chosen. The farm has 2.9 AWU (annual work units). The branch of plant production includes the cultivation of sugar beet, winter rape seed, grain maize, peas, winter wheat, spring barley and winter barley. The outdoor work is done nearly completely with own machines.

The duration of the single working steps corresponds to the respective working time on the area. Setting-up and transport times are not included, because at the moment they have no direct influence on the documentation.

The documentation covers the basic data - field data and history, machine data and employee data - and the process data for winter wheat production - working time, working costs, operating inputs and executor of the single working steps.

Data is recorded with different methods which are comparable to the standard of similar farms. The process data for the combine harvester are recorded automatically in the combine harvester itself and transferred via plug in card into the plot index of the farm computer. All other data of the outdoor work is recorded manually by the employees with PDAs and are then transferred. Data about transport and storage is documented on paper and entered manually into the plot index after the work is finished.

Time analysis documentation

On the examined farm the labour input for the documentation is about 29 minutes for the analyzed winter wheat plot.

The analysis shows the differences in working time for the single sections (Table 1). For the documentation of the grain harvest there is the lowest labour input, because in this section most of the data recording was done automatically. Working steps which require a PDA for data recording like cultivation, fertilization and plant protection lie in the intermediate rank concerning the labour input.

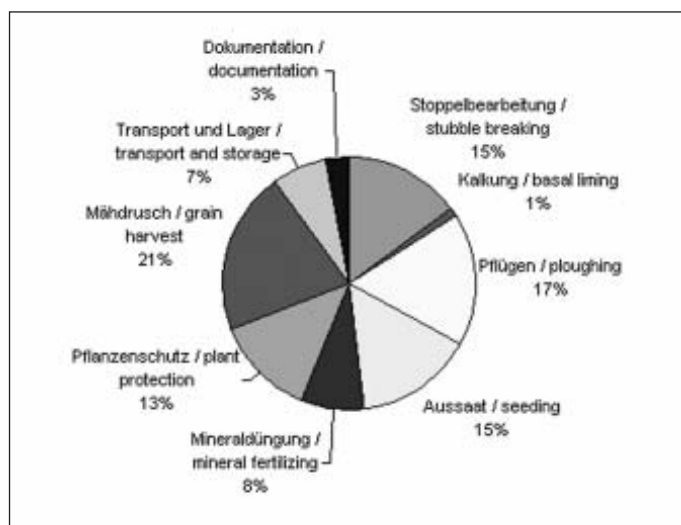


Fig. 1: Documentation costs

formation an adequate documentation system is necessary.

Material and Methods

The main questions, which are the result of this trend for the agricultural sector, are the required working time and the costs for the necessary documentation systems. To answer these questions the corresponding data are recorded on a Hessian arable farm and analyzed for the example of the winter wheat production.

In the analyzed farm year (2005/2006) the farm cultivates 190 ha agricultural area, distributed in 142 fields.

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Keywords

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Especially for working steps which require operating inputs like fertilization and plant protection the labour input for documentation rises due to the fact that all data have to be recorded manually. In the area of logistic the labour input was extremely high in comparison to the recorded data, since all data for documentation has to be recorded via handwritten notes.

As the use of a PDA plays a more and more important role in the agricultural production the labour input for data entry into the PDA and for transfer and revision in the plot index were examined separately (Table 2).

This shows that with an increasing frequency of operating inputs the labour input for documentation rises. In the area of sowing the time spent for data transfer rises significantly, since in this step the combination with the basic data of the plot is carried out. The differences between the total time spent for documentation of the single processes compared to the sum of the two single values are the result of the required time for entering new basic data and preparation of work orders.

With 306 minutes total labour input per hectare the part for documentation amounted 9 %.

Cost analysis documentation

The total costs for all operations concerning winter wheat cultivation on the examined plot amount to 506.72 /ha. 3 % (16.46 /ha) were for documentation (Fig. 1). The total costs for the whole operational documentation are 6.72 /ha (41 %) for labour costs and 9.74 /ha (59 %) for soft- and hardware.

Table 2: Data input PDA

	data input PDA (min)	data transfer PC (min)
tillaging	0.88	0.67
seeding	1.25	1.58
mineral fertilizing	1.22	0.80
plant protection	2.39	0.95

Discussion

With the use of computer and DGP supported data acquisition systems with standardized data sets resp. automatic data recording, the required working time for the acquisition can be reduced like the comparison between the labour input for the documentation of the combine harvester part and the logistic part shows. The strength of this effect depends among other things on the amount of data and the circumference of the subsequent data processing. This can be demonstrated especially in the area of plant protection, where an extensive documentation of the used pesticides is necessary.

With automatic data acquisition systems important production data can be recorded, secure against manipulation and possible mistakes caused by delayed data recording can be avoided. This aspect is important if a legally utilizable documentation in case of a procedure according to the Product Liability Act is necessary.

One problem of the automatic data acquisition is the security against a breakdown. If data recording is done manually with a PDA, breakdowns of the appliance can be recognized fast. If data recording is completely

done automatically especially in times with a high work load it can happen that the data memory is readout unsteadily. So a breakdown might be recognized very late.

To solve the conflict between total automation in order to reduce the work load and a thorough control of data security, a system which works largely automatic but anyhow is geared to the workers should be aspired.

One main factor for the correct function of an agricultural documentation system is the proper operation by trained persons. When an automatic data system is introduced, it can be observed that in the beginning the costs for machine usage rise while the labour costs for documentation decrease in the course of time. The experiences on the examined farm have shown that a thorough and permanent training of the employees is necessary for the exactness of the data.

A main advantage of the documentation, which the farmers grasp in the course of time, are the resulting data which they can use for management decisions. Especially, when they do not only record the data for the legal and trade documentation, but also economic data for management purposes.

The examination shows that one goal, which should be reached is the improvement of the automatic data recording to reduce more working time. Especially during times like harvest and transport which are time-critical anyhow. Therefore AgroXML and ISO-BUS are positive developments.

One point with need for development is the automatic detection of operating inputs in the field of fertilization and plant protection to avoid mistakes in documentation.

Action	working width (m)	working time tionszeit (min)	part documenta- tion time (min)
stubble breaking	5	29	1.6
basal liming	12	(contractor)	2
stubble breaking	5	24	1.6
ploughing	1.75	60	1.6
seeding	3	75	2.8
mineral fertilizing	21	9	2
plant protection	21	14	3.3
mineral fertilizing	21	8	2
plant protection	21	12	3.3
mineral fertilizing	21	11	2
plant protection	21	11	3.3
grain harvest	7.5	29	1.4
storage	10	7.2	0.6
relocation	10	9	0.8
removal from storage	10	8	0.7
total		306.2	29

Table 1: Required time for the documentation of single working steps