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# Working time and investment requirement for pasture equipment

Pasture management is very important, especially for extensive livestock production methods such as suckler cow, sheep or goat husbandry. Organic farming requires the use of outdoor exercise areas as an alternative to pasture for all farm animals. Some of the data available for calculating the working time and investment requirement associated with grazing and for determining the process costs are out of date or have been processed in such a way that there is hardly any correspondence between them. Moreover, little account is taken of the greatly changed basic conditions of agricultural practice in terms of increasing plot sizes, the trend for extensive stock keeping or greater use of mobile fences (Baumgartner and Näf 1996, KTBL 2006, Schick 2001, von Korn 2001).

## **Keywords**

*Work, working time requirement, pasture, investment, model calculation, time measurement*

## **Abstract**

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In the ART project "pasture equipments - investment and working-time requirements, costs" in the framework of the KTBL Working Programme Calculation Standards were determined the investment needs for complete fence systems on the basis of costs for individual elements and for pasture equipments as well as the working-time requirements of work processes like erection, dismantling, maintenance and control of fences and pasture equipment. By the example of different types of mobile electric fence the results for different fence lengths are presented.

## **Working time requirement**

For the recording of the working-time data, the farm data, the pasture systems, as well as their impacting factors were grasped on 31 farms in Baden-Württemberg, Thuringia and Brandenburg

with help of questionnaires. Besides, data could be taken up to the dairy and suckler cow husbandry, horses, sheep, goats, laying hens and poultry. On the farms, the questionnaires were filled with the managers before or after the working-time measurement. Apart from general data about the farms, the questionnaire contained data of individual working processes. For example, the number of conductors of the fence, the drinking procedure, the number of commonly used workers and information about feeding and handling equipments at the pasturage were recorded.

The working times were measured for different variations of fence construction on working-time element level. To perform the time studies work models were produced previously. The models were essentially based on experiences and already carried

out work process observations and contained finished working-time elements and/or work part processes standing in connection with the working procedures. The measuring points for the respective work part process and working-time elements were also fixed here. The times were grasped over a Pocket PC with special time recording software. An expired period (measured in cmin = 1/100 min) could be assigned in each case to the associated working-time element. These were for example "to take angle steel posts from trailer", "to drive in angle steel post, manually, soft ground", "to hang up wire/polywire/tape into insulator". In the framework of the examinations, 152 working-time elements and work part processes were grasped. If an element was missing in the work model, the suitable time span was assigned to a free position and the missing working time element was defined after the data recording. In addition on the farm all relevant impacting factors were collected which matters to the target time production (number of post or wires, distances, frequencies).

The first evaluation of the working-time studies already took place during the surveys. For cyclic measuring segments the arithmetic means were calculated continuously. Also the Epsilon value and the standard deviation could be already determined at that time as a skill score of the sample of the cyclic measuring segments. The suitable relation amounts of non-cyclic working routine segments could be also given during the measurement. The first processing and evaluation of the collected single data had occurred already with the end of the time studies.

These primarily prepared data of all time-studies were summarized according to working-time elements in table sheets. On this level, the individual values for the different working-time elements were appraised further statistically. From the repetition measurements of the individual processes, it was possible to calculate measures of location, dispersion and association and to compare individual farm situations with each other.

After the evaluation of the collected data followed the input into a target time data base. The corresponding target times were updated in the data base. To determine working-time requirement the modular developed model calculation system PROOF was created, in which in different modules the working-time requirement of different types of fences, drinking and feeding equipments as well as handling equipments and other work processes in con-

nection with further pasture equipment can be calculated (figure 1). By using buttons one get into the different modules to arrange easily and quickly individual settings.

**Investment requirement**

To calculate the investment requirement catalogues widespread in practice and internet sites were used to collect describing data and prices of single components of pasture fences und pasture equipment. These information were stored in a data base.

Following the model calculation system PROOF a similar modular developed calculation system was created to calculate the investment requirements. In two modules different types of fences can be seen and the investment requirement can be calculated. In the modules three price categories (highly, middle, low) can be set. The different fence versions are defined by data to the post distance, kind of the used posts, kind and number of the conductors, kind of the insulators, gates and energizers. Results of the model calculation are the total investment requirement and the investment requirement per running meter of pasture fence.

**Exemplary results of model calculation**

An exemplary use of the model calculation systems to calculate working time and investment requirement shows three different mobile electric fences.

The working time requirement for the erection and dismantling of mobile electric fences is depending on the used materials. Moreover, main impacting factors are the post distance and the number of conductors. Table 1 shows the most important impacting factors on the working-time requirement of three electric fence versions.

Version 1 shows a mobile fence typical used for dairy cows, version 2 is to be found on suckler cow farms frequently. Version 3 is used with geese. With these procedures of building of fences supposed two workers use in the version 1 and 2 a reel attached at the tractor, in version 3 a hand reel. The distances between farm and the plot are not considered in the present calculation. Figure 3 shows that with increasing length of the fence working-time requirements decreases per running metre fence, however is another decrease hardly to be ascertained from about 1500 m



Two-strand electric fencing in pasture prevents both cows and their calves from straying.

Table 1

Main impacting factors of some selected types of mobile electric fences.

Name of impacting factor	type of fence		
	version 1	version 2	version 3
distance between posts	8 m	10 m	6 m
type of post – posts between tension posts	plastic	angle steel	plastic
type of post - tension posts	wood	angle steel	plastic
number of tension posts	6	6	6
number of conductors	1	2	2
type of conductors	polywire	polywire	tape
gate	gate with gate handle with tension spring		
energizer	battery energizer with vandal-proof box		

Fig. 1

**Module: Weideeinrichtungen**

Module	Zeitbedarf pro Tag [ArbMin]	Zeitbedarf pro Jahr [Arb]	Zeitbedarf pro Jahr [Arb-Tier]	Zeitbedarf pro Jahr [Arb/ha]	belastende Arbeitszeit [BAArbeitsVorgang]	belastende Arbeitszeit [BAArb]
Mobilzaun, Elektro	Modul 1	49,9		0,05	50	
halbstationärer Zaun, Elektro	Modul 2	8,5		0,01	106	
Festzaun	Modul 3	39,7		0,04	918	
Knotensplitter	Modul 4	73,7		0,07	2042	
Kontrolle, Wartung, Reparaturen	Modul 5	20,4	73,0		0,07	8,7
Netze (Schafe, Ziegen, Geflügel)	Modul 6	22,8	45,6		0,30	2
<b>Tränken / Füttern</b>						
Tränkeinrichtungen	Modul 7	12,2	43,9	0,7		17,0
Fütterungseinrichtungen	Modul 8	16,9	7,9	0,1		3,3
<b>sonstiges</b>						
Behandlungseinrichtungen	Modul 9	0,8	3,0	0,1		0,5
Schutzeinrichtungen	Modul 10	1,7	6,0	0,1		3,0
Komforteinrichtungen						

PROOF Bildschirm EXCEL Bildschirm

*PROOF model calculation system menu for determination of working-time requirement for pasture fencing and pasture equipment.*

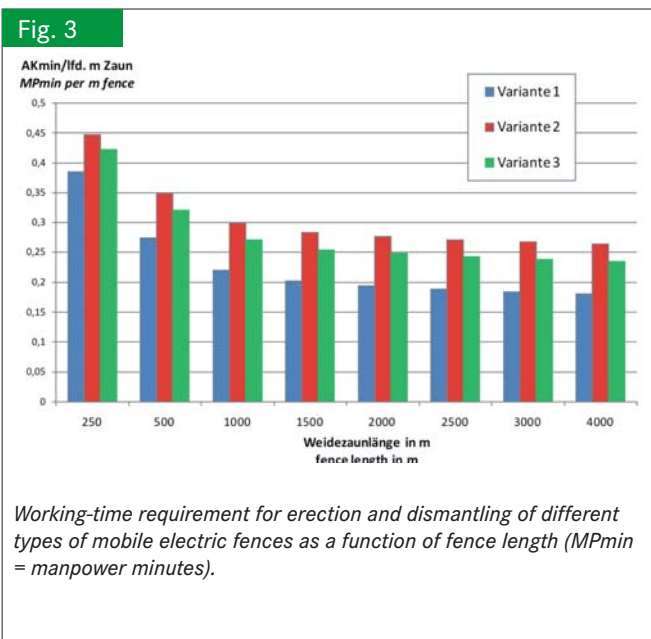
fence length. Obviously the preparation times do not affect from this fence length any more.

Also with the investment requirement, the requirement per metre fence falls with rising fence length. From a fence length of about 2000 m only a small decrease is noted. Obviously kind and number of used posts, the energizer and the pasture gate have a lower and lower influence on the total investment requirement (figure 4).

**Conclusions**

The working-time requirement with pasture fences consists of the parts erection, dismantling, controls and maintenance/repair. The working-time requirement values of different fence versions can be calculated with a modulelike built up calculation system. Using the individual modules, the working-time requirement can be determined for the erection and dismantling of

Fig. 3



fence systems for different animal species and needs. A similarly built calculation system enables this also for the investment requirements.

The use of these model calculation systems shows that with rising fence length the working-time requirement as well as the investment requirement sinks, but from a certain fence length this decrease effect dwindles. By the example of mobile electric fences no other decrease is noticeable from a fence length of about 1500 m or 2000 m because with the working-time requirement the preparation times lose influence, with the investment requirement the expenditure for posts, pasture gates and energizers.

**Literature**

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Fig. 4

