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Work organisation in pork production

Preliminaries and objectives of the study

Reforms enacted since the change of economic regime in the early nineties, the restructuring of ownership, and changes in agricultural policy have made it difficult for Hungarian agriculture to adapt to a changing international environment. Economic establishments operating under new proprietary and organisational structures need to consider the aspects of market-economy and need to produce effectively. Job bating, redundancy, and unemployment have become everyday realities. In most agricultural production units, new aspects of production management and incentives of performance can be seen.

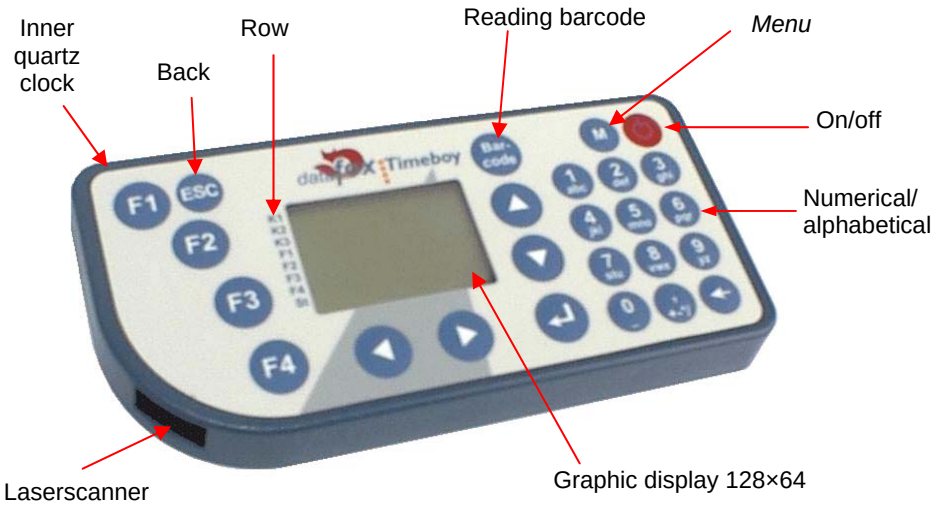
In the course of our research, we endeavoured to examine the most important issues of management from the employers' points-of-view in order to identify the labour efficiency of represented employees and the working time structure and to create a database for a following rationalisation process.

Material and method

In the course of an individual working day registration on pig farms, popular international methodology was used to reveal time-loss. The time periods of work elements were recorded with the Datafox-Timeboy tool (*Figure 1*).

Figure 1

Datafox-Timeboy tool



Firstly a code-39 format was prepared in order to use the Datafox–Timeboy device. Therefore, barcodes (*Figure 2*) were created for each activity to make data recording easy for each activity; the device reads the codes.

Figure 2

Barcode

e.g. *ironing*

A barcode is read by a scanner and it creates an electronic sign to be transferred into a mobile data collector together with the exact time of the reading. At the end of data recording, the data is transferred to a computer in ASCII format and is analysed with MS Excel.

Mainly full days were examined in the course of working day registering. For periodically repeated activities, samples were taken in certain cases. It was reasonable to register the work activities at the level of work elements. This level provides a suitable depth to classify the activities into any of the following groups: main time, by-time, and time-loss, or basic time, productive time, and norm time.

The registration period was focused on the morning and afternoon shifts because of the number of employees and the complexity of work activities. Due to the protection of personal data, none of the workers' personal data was recorded except for their Christian names; these were not, however, used later on in the processing phase. The widely used Hajós type time coding was applied in the analysis.

Introduction to the analysed pig farm

The Mezőgazdasági Zrt was founded in 1970 it is still one of the most significant actors in agriculture in County Somogy. It produces and trades its own produced crops and animals. The main sector of the business is pig production with 340 sows. It operates in a KAHYB system with installation of pavilions, its main profile is end product production. Artificial and natural inseminations are applied simultaneously.

The cross-breeding process in criss-cross breeding is: *KAHYB large white* × *Danish and Norwegian landrace*.

Mating of individuals from two different breeds most importantly results in the so called “hybrid vigour,” heterosis. In alternate generations, the genome of parents can be found in one third: two third ratio.

Results and discussion

Production performance

The most important indicators of production performance, are summarised in *Table 1* and the main indicators of breeding performance can be seen in *Table 2* and *Table 3.*

Table 1

Main indicators of pig production, 2005-2008

Denomination	2005	2006	2007	2008
Number of sows (pc)	320	320	320	330
Number of sows per worker (pc)	17.77	17.77	17.77	18.33
Feed per kg weight growth (kg)	**3.71**	**3.84**	**4.14**	**4.14**
Live piglet per litter (pc)	9.00	10.00	10.00	10.00
Average number of fattening pigs (pc)	1760	1690	1830	1650
Production cost per kg live weight of fattened pig (HUF/kg)	275	280	295	313
Average market price of fattened pig (HUF/kg)	310	315	275	264

The conception rate varied between 65 and 75 percent, which is much lower than that of previous years. This can be explained by the exactness and expertise of the inseminator; when artificial insemination is being introduced, that becomes a risk factor. The average number of farrowing per year at the herd level was 2.2, although it can be even 2.3–2.4 for certain sows if they became pregnant at the first insemination. The average litter size (12 piglets per sow) and the average number of weaned pigs per sow (10) are moderate figures. The mortality rate was around 4 percent up to weaning, which data refers to only piglets older than 24 hours. If younger piglets were also considered, the mortality rate would be 8 to 10 percent. The causes of mortality can be genetic or caused by human error. The former can be easily counteracted with the application of suitable technology. Environmental risks, though, depend on human workers. According to managers, this percentage mortality could be improved if they were able to employ workers who have better skills in animal care giving and who are well-disposed toward animals.

The level of concentrated feed used to gain one kilogram live weight was between 3.71–4.14 kg/kg. This figure is higher than it is in countries with developed pig production because of feed wastage and other human factors. The old sows need to be culled, because these fat sows give birth only to smaller number of piglets or face hard farrowing. Piglets from such mothers are weak and often die, if the sow is able to be impregnated at all. In order to assess effectiveness, it is necessary to analyse labour productivity. These kinds of analyses are timely due to the fact that wages and contribution have both increased. *Table 4* shows the labour demand of the pig farm.

Table 2

Main indicators of breeding performance, 2004-2008

Denomination	2004	2005	2006	2007	2008
Conception rate %	75-80	70-75	75-80	78-85	75
Average litter size at birth per sow	9-11	9-11	9-12	10-12	12
Average number of weaned pigs per sow	9.5-10.5	9.5-10	9.5-11	10-11	10
Number of farrowing per year	2.2	2.2	2.2	2.2	2.2
Mortality rate up to weaning (%)	5-6	5-6	3-5	3-5	4
Sow culling rate (%)	25	25	25	35	10

Table 3

Indicators of breeding performance, 2005-2007

Denomination	2005	2006	2007
Average number of sows (pc)	320	320	320
Number of litters per year	5 litters in 2 years	5 litters in 2 years	5 litters in 2 years
Average rearing proportion (%)	85-95	85-95	85-90
Litter at age 28 days:			
Average size (number)	8.8	9.2	9.2
Litter weight (kg)	52-53	55-56	55-58
Average piglet weight (kg)	6-7	6-7.2	6-7.2

Table 4

Labour need of farm

	Nomination of jobs	Number of workers employed in 24 hours of the working day (person)	Number of working hours per day (hour per day)
1	Herdsmen	8 persons/2 shifts	8
2	Repairer	1	8
3	Tractor driver	2	8
4	Feed mixer	1	8
5	Driver	3	8
6	Guard	2	8

According to the above data, the analysed farm has significant labour reserves compared to a similar sized farm; at the moment of the survey three managers supervised the work of six people. In my opinion, the rationalisation of labour use will be one of the farm's most important tasks in the future.

Results of labour management analyses

Farrowing stable

Table 5 shows the proportional structure of work elements of working days. Looking at the overall data, it can be seen that basic time represents (T_1+T_2) 61.35 percent of the total time. Compared to references for agricultural works, this figure is fair (higher than 60 percent). It is important to mention, though, that sustained or improved performance can be achieved by management or logistical models at a moderate extra cost.

Further review is necessary on the service time T_{31} with 6.11 percent at local level. Practically, this means a 17.05 minute decrease in basic time. Service time can be reduced by continuous maintenance or replacement of self-feeders and self-drinkers. T_{33} time (0.72 percent) – time used for daily task allocation and order-giving along working is hypothetically similar to expectations. At first glance T_5 time – for rest and private needs – may seem high (8.23 percent), but considering the quarter-hours at the beginning and at the end of the working day, the remaining 23 minutes suits both local and legal

requirements. T_{62} time is used for movements among buildings. The 6.03 percent share registered here is not unreasonably high, but this time could be reduced if a bicycle would be provided for travelling on the farm.

Table 5

Structure of working day by work elements in farrowing stable

T	11-08-2009	20-08-2009	21-08-2009	mean		%
1	2:06:57	2:27:28	3:07:19	2:33:39		
21	0:00:00	0:00:00	0:00:00	0:00:00		
22	0:05:15	0:12:01	0:12:20	0:09:18	**Basic time**	
23	0:19:25	0:02:30	0:07:56	0: 09:23	**2:53:43**	**61,35**
3	0:00:00	0:00:00	0:00:00	0:00:00		
31	0:15:23	0:25:15	0:11:58	0:17:45		
32	0:10:10	0:10:20	0:30:45	0:17:05		
33	0:01:28	0:00:00	0:04:55	0:02:07		
41	0:00:00	0:00:00	0:00:00	0:00:00		
42	0:00:00	0:00:00	0:00:00	0:00:00	**Productive time**	
43	0:00:00	0:00:00	0:00:00	0:00:00	**3:30:28**	**74,20**
5	0:17:19	0:09:27	0:44:12	0:23:52		
61	0:00:00	0:00:00	0:00:00	0:00:00	**Norm time**	
62	0:07:21	0:21:11	0:25:17	0:17:23	**4:11:30**	**88,07**
71	0:00:00	0:00:00	0:00:00	0:00:00		
72	0:00:00	0:00:00	0:00:00	0:00:00		
73	0:00:00	0:00:00	0:00:00	0:00:00		
8	0:37:45	0:23:12	0:38:52	0:33:16	**0:33:03**	**11,93**
Total	**4:01:46**	**4:11:16**	**6:03:34**	**4:45:48**		

Fattening stable

The proportional structure of work elements per working day is seen in *Table 6*.

The data call our attention at the low level of basic time (T_1+T_2), with an average of 51.43 percent. I believe that this can be explained by the applied work-time system at the farm. Years ago, working shifts were introduced by the management to meet the demands of a much higher number of animals. Initially, this system seemed to work well, but by today the number of animals has decreased to such an extent that the use of shifts is no longer reasonable. I want to emphasise that the use of shifts *is* reasonable at larger farms (farms with around 600 sows). On the working day examined, the workers finished their work about one hour before the end of the workday, and only quasi-activities were seen after that time. The above data and observations indicate that the best option for reducing time-loss would be a change in work time. In my opinion, all of the necessary tasks can be carried out in 8 hours of working time. Further analysis of the data reveals the startlingly high proportion of T_{32} 6.77 percent (preparation and termination time), which requires further consideration at the local level. Nearly 25 minutes were spent in preparation and termination, including, of course, the starting and terminating routine activities, but including the service time, as well, registered at the place of work. Also, further consideration of T_{41} (19.41 minutes) is necessary. This time reflects the fact that the manure remover continuously malfunctioned. This high figure is

also connected with T_{32}, which calls the attention at the physical state of the building and the necessary and unavoidable reconstruction of the machinery and equipment.

Table 6

Structure of working day by work elements in fattening stable

T	13-08-2009	18-08-2009	14-08-2009	Mean		%
1	3:23:57	3:05:21	2:34:43	3:01:33		
21	0:00:00	0:00:00	0:00:00	0:00:00		
22	0:11:15	0:00:00	0:19:18	0:10:11	**Basic time**	
23	0:00:00	0:00:00	0:00:00	0:00:00	**3:11:44**	**51,43**
3	0:00:00	0:00:00	0:00:00	0:00:00		
31	0:04:30	0:18.00	0:14:41	0:12:37		
32	0:17:00	0:26:33	0:34:07	0:25.20		
33	0:04:26	0:06:32	0:05:32	0:05:43		
41	0:19:21	0:17:31	0:21:31	0:19:41		
42	0:00:00	0:00:00	0:00:00	0:00:00	**Productive time**	
43	0:00:00	0:00:00	0:00:00	0:00:00	**4:14:12**	**68,44**
5	0:19:53	0:35:54	0:30:10	0:28:52		
61	0:00:00	0:00:00	0:00:00	0:00:00	**Norm time**	
62	0:13:13	0:11:47	0:08:24	0:11:08	**4:54:12**	**79,02**
71	0:00:00	0:00:00	0:12:23	0:04:07		
72	0:00:00	0:00:00	0:00:00	0:00:00		
73	0:00:00	0:00:00	0:00:00	0:00:00		
8	1:27:16	1:04:49	1:01:49	1:11:18	**1:11:18**	**21,98**
Total	**6:20:51**	**6:15:05**	**6:02:38**	**6:12:18**		

Sow and boar stable

The proportional structure of work elements in the boar and sow stable per working day is seen in *Table 7*. The proportion of basic time (59.40 percent) within working time is rather acceptable. Yet this figure can be improved with only small managerial effort. For example: the average time, 19.32 minutes, spent on preparation of tools and tiding up can be reduced with better organization and care. Similarly, times T_{32} and T_{33} can be easily reduced by more rational management. At first examination, the 8.28 percent of T_5 within working time is not really significant, but considering that the workers have enough time to rest during the pigs' mating, the aggregate sum of 31.15 minutes is a rather significant time expenditure.

It is important to point out T_8 (time-loss), which originates in a poorly managed working time structure. The solution is once again in the replacement of shifts with an eight-hour working day.

Competitiveness of analysed pig farms

From the aspect of efficiency of fattened pig production, it is reasonable to examine the performance of analysed farms in an international context (*Table 8*). According to the data, the mortality rate is relatively favourable at both the pig rearing and fattening stage. It even

proved, in a few cases, to be better than in countries with developed pig production. On the other hand, the number for feed used per kilogram weight gain was rather bad.

Table 7

Structure of working day by work elements in sow and boar stable

T	17-08-2009	19-08-2009	26-08-2009	Mean		%
1	3:16:56	2:42:02	3:46:59	2:55:19		
21	0:00:00	0:00:00	0:00:00	0:00:00		
22	0:06:44	0:10:54	0:11:03	0:19:47	**Basic time**	
23	0:46:26	0:26:15	0:02:57	0:35:12	**3:46:45**	**59,40**
3	0:00:00	0:00:00	0:00:00	0:00:00		
31	0:18:03	0:12:08	0:09:08	0:13:06		
32	0:20:25	0:18:46	0:24:58	0:19:23		
33	0:34:08	0:09:48	0:25:55	0:23:17		
41	0:00:00	0:00:00	0:00:00	0:00:00		
42	0:00:00	0:00:00	0:00:00	0:00:00	**Productive time**	
43	0:00:00	0:00:00	0:00:00	0:00:00	**4:44:16**	**73,10**
5	0:34:11	0:20:30	0:19:04	0:31:15		
61	0:00:00	0:00:00	0:00:00	0:00:00	**Norm time**	
62	0:15:51	0:35:20	0:17:26	0:19:45	**5:31:20**	**87,02**
71	0:11:13	0:00:00	0:00:00	0:02:04		
72	0:00:00	0:00:00	0:00:00	0:00:00		
73	0:00:00	0:00:00	0:00:00	0:00:00		
8	0:43:56	0:40:35	0:23:40	0:39:03	**0:48:22**	**12,98**
Total	**7:11:24**	**5:36:18**	**6:01:10**	**6:16:17**		

Table 8

Productivity of fattened pig production

	Somogysárd	Farm I	Farm II	HU	DK	NL	E
Fattened pig per sow per year (pc)	14.45	-	21.45	16.8	22.5	23.2	21.9
Mortality in farrowing stable (%)	4	5	5.71	9	14.0	12	11
Mortality in pig rearing stable (%)	4.5	2	3.82	5	5	2	4
Mortality in fattening phase (%)	7	5	6.44	7	4	3	7
Feed use in fattening phase (kg/kg)	4.14	3.3	2.81	3.7	2.69	2.65	2.71
Daily weight gain (g/day)	666	600	602	659	835	774	638
Live-weight at slaughtering (kg)	112.5	110	109.9	109.4	102	113	103.2

Source: Authors' data collection and *Danish bacon and Meat Council* (2004)

Extreme figures can be seen for feed use per kg weight-gain at certain farms compared to the international references (2.81-4.14 kg/kg). Though this figure at farm II was 5 percent better than the Hungarian average, it was still 10 percent behind that of countries with developed pig production. This can be explained by out-of-date technology, feeding practice, and the role of human resources ("disappearing feed"). It is also eye-catching that the daily weight gain was below the Hungarian average figure at farms I and II. In case of the So-mogysárd farm, which boasted the best figures, the daily weight-gain was 5 percent higher than the average of Spanish farms, but 21 percent lower than the Danish average and 14 percent lower than the average at Dutch farms. Knowing the current Hungarian situation, the improvement of efficiency is primarily dependant on improvement in the number of slaughtered pigs per sow per year. The number of litters per sow per year is a strong efficiency indicator of breeding performance. It is around 2.2 and 2.4 for countries with developed pig production, which is similar to my findings at the analysed farms, showing that Hungarian pig farms are able to perform at the same level. The number of reared piglets is, however, far behind at the analysed farms and in Hungary generally; improvement in this is one of the most important elements of enhancing efficiency. In order to evaluate this figure, we need to consider that the annual feed consumption per sow is 1.4-1.5 tons (*Magda*, 2003), and that other costs accompany the price of feed. The cost per piglet will be smaller if the sow continuously produces. Human resources have an important role here, as well. The most urgent problems of pig production in Hungary are the number of slaughtering pigs per sow, the kilograms of feed used per kilogram of weight gain, the length of the fattening period, and the number of litter per year per sow. From the aspect of efficiency, it is important to analyse labour productivity. Such analyses are especially important nowadays, as labour costs have increased. According to the literature on this, taxes on labour are 42.5 percent in the EU15 and OECD countries; this number is 54.5 percent in Hungary (*Udovecz and Nyárs*, 2009). The number of sows per worker is seen in *Table 9*. The data shows that Hungarian pig production has significant reserves for the improvement of labour productivity.

Table 9

Number of sows per worker at the analysed farms

Denomination	Number of sows per worker
Somogysárd	18
Farm I	33
Farm II	45
Farm III	12
Hungarian average	18
English farms	70
USA farms	88

Source: Authors' data collection and *Fejes*, 1996

At the analysed farms the number of sows per worker exceeds the Hungarian average, but even the best farm (II) is far behind the English and USA farms. The labour force structure on farm III is worth mentioning (Annex 24); there three guards are employed for 184 sows. Considering that the guard costs represent 0.5 percent of the total annual

revenues (*Udovecz and Nyárs*, 2009), this seems to be rather wasteful**.** It is also important to mention the number of managers at the farms. According to the analyses, the number of workers per manager was between 6 and 8. Solutions can be provided by technological investments, but considering the low rate of profitability in the sector, it is hardly possible at an entrepreneurial level.

The comparative analyses of work management led to the conclusion that productive time was most favourable in the boar and sow stable, followed by farrowing stable, and worst in the fattening stable. In the course of the data analysis, more work management mistakes were revealed. On the Somogysárd farm, using shifts causes high time-losses at all workplaces, while the high number of workers resulted in basic time, productive time and high time-losses at farm III.

Conclusions, recommendations

1. Analysis of workplace organisational systems can be achieved only by a system-based approach of enterprises as cybernetic systems. Therefore, *we suggest* that this approach be used for the systematic analysis of other animal producing sectors. The use of the Datafox–Timeboy working time recording and analysing tool represents part of this method; it serves primarily the achievement of organisational management objectives and activities. Kalmár et al. (2005) report on using this tool in other sectors of agriculture, as well.
2. Selection of breeding animals with high genetic value and good keeping technology are equally important to profitable production. Our findings reveal that the pig farms involved in the analyses have low levels of technical and skilled labour and do not meet the requirements for high performing breeding and fattening animals. Genetically valuable livestock cannot be reared profitably in stables aged 20–25 years. *The solution begins with* antiseptic treatment of the fattening stables and should extend to the external and internal reconstruction of buildings.
3. Following the change of regime, the restructuring of economic organisations was accompanied by reduction in the redundancy of employees. Despite this, in case of many farms an unreasonably high number of employees work, making labour less efficient. We suggest the rationalisation of labour-use along with the optimal harmonisation of workplace-management.
4. Review and evaluation of activities may contribute to more effective work. The results obtained show that the structure of working hours needs reconsideration. *We recommend* managers reduce the number of jobs where possible. Through this, waste time can be reduced significantly and the system be made more effective.

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