# WORKING TIME EXPENSES AND DEGREE OF DIFFICULTY OF PIG TENDING

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***ABSTRACT.*** *The selection of farm technologies and fixtures is usually made on the basis of the assessment of the technical-economical indicators (reliability, working time and operating expenses) thereof. Upon the comparative assessment, it is also important to accord consideration to the energetic workload of the human being by the working environment. The article presents the data received in the pig farms in relation to feeding the pigs, cleaning the pens, removing the manure and the working time expense of feeding the animals and the degree of difficulty of the pigtender's work. The pig farms under observation were those where in the pig groups of different sizes young, fattening pigs, pregnant sows and sows with piglets were kept. The animals were fed using the dry or liquid feed that was delivered either mechanically or manually.*

***Keywords:*** *pigtender, keeping technology, litter spreading, feeding, wheelbarrow, automatic feeding line, watering, manure removel, chain scraper conveyor, scraper device, chronometric research, working time expense, pulse tester, degree of difficulty of work.*

## Introduction

At the moment Estonia is facing a situation in case whereof the plant of the pig farms has become obsolete and is in need of replacement. But in the situation of little experience and lack of scientifically substantiated recommendations the farmers find it difficult to select a proper technology for carrying out the work that would be effective and ensure harmless working environment (Reppo *et al.*, 2000; Veinla, 1987).

Few studies have been conducted on the working time expenses and the energetic workload of the pigtenders upon feeding and watering the pigs as well as removing the manure. These depend, at the same time, considerably on the size of the farm (the number of animals). Before recommending or selecting rational technologies a research into the technological lines in use and the comparative assessment thereof have to be carried out.

In order to compare the most wide-spread technologies upon keeping the pigs a research on the working time expense and the degree of difficulty of human beings upon tending work was carried out in pigsties of different size.

## Material and Methodology

In order to study the working time expense and the degree of difficulty of the pigtender's work farms of different size (860…6200 pigs) and feeding, manure removing, litter spreading and animal watering technologies were used wherein in the pig groups of different size youngs, fattening pigs, pregnant sows and sows with piglets (Tables 1 and 2) were kept. The research involved five farms with more or less the same feed portion, but with different feeding technologies (liquid or dry feed). All the five farms used sawdust in a small amount as a litter, the manure was cleaned with the chain scraper conveyor (in case of groups of 1,000 fattening pigs with the scraper device) and removed from the animal keeping room by pumping into the tank machine.

The pig tenders were mostly women whose principal work duration consisted of the time necessary for loading the dry feed (concentrated feed, meal) into the feed deliverer (barrow), the transportation and delivery, cleaning the pens and tendering passages, loading the litter into the barrow and the delivery thereof, watering the pigs and working with some devices. The mechanical time of the devices was not included in the human working time expense. The daily working time expense was determined by the chronometric research of the pigtender's work with the precision of a second. The actual daily working time of the employee was calculated on the basis of the structural scheme (Maatalouden …, 1988; Reppo *et al*., 2000), in accordance wherewith the tending time consists of the permanent help time (10 minutes in a shift spent on dressing, washing, *etc*.) and the time spent on the performance of the production duty. The latter includes the principal work time and the preparation-conclusion time. The working day was photographed by fixing, describing and entering in the chronological order the time spent by the employee on each working operation, break, etc. in the observation diary. A more comprehensive overview can be obtained, however, if the working time special expenses are fixed per a pig, but the method more-widespread in the world determines the same in case of every ten pigs (KTBL 94/95; Maatalouden …, 1988). The daily working time expenses were determined per ten youngs, fattening pigs, pregnant sows and one sow with piglets (Tables 1 and 2).

Along with the chronometric research of the work a simultaneous measurement of the pigtender's pulse rate was carried out. The degree of difficulty of the pigtender's work was determined in accordance with the average and high pulse rate by using the qualification of the World Health Organisation (WHO) (Tuure, 1991) and the data of the authors (Andersen *et al*., 1978, Hettinger *et al.*, 1983), according consideration to the fact that at the pulse rate of up to 100 beats per minute the degree of difficulty of the work of a human being is light (L) and at inbetween 100…124, 124…150 and at more than 150 beats the degree of difficulty of the work is moderate (M), heavy (H) and very heavy (VH), respectively.

In order to measure the pulse rate the "Polar Sport Tester" kit, consisting of the transmitter (sensor) and the receiver (tester) was used. The transmitter was fixed onto the body of the employee in the heart area and onto the hand of the receiver. The receiver saved the pulse rate at the intervals of 5 seconds. The measured pulse rates were saved from the tester into the computer and upon processing the data in the programmes "Polar" and MS Excel, the statistical rows and diagrams of the tenders' pulse rates and the minimum, maximum and average values of the pulse rate were received. The diagrams of the pulse rates were supplemented by an additional scale in order to determine the degree of difficulty of the pigtender's work upon tending animals during different works (Figures 1 and 2).

## Results

Upon determination of the working time expense, it became evident (Table 1) that smaller working time expenses were incurred upon the mechanised delivery of feed with the automatic line "Pellon", "Roxell" and with the battery wheelbarrow EK-2 into the feed trough for 0.24; 0.35 and 0.56 minutes respectively per 10 fattening pigs daily. The size of the herds was 500, 700, 730 and 1,000 animals, respectively.

**Table 1.** Working time daily expenses in minutes per 10 pigs

| Technology | Material kg pig/day | Pig group and number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Young pig (10...40 kg) | | | Fattening pig (40...100 kg) | | | | | | |
| | | 250 | 300 | 650 | 300 | 500 | 700 | 730 | 850 | 1000 | 1000 |
| 1. Feeding with dry feed (storage-transportation-delivery): | | | | | | | | | | | |
| – bin-scoop-barrow-bucket-trough | 3.5 | | 1.06* | 0.58* | | | | | | | |
| – bin-scoop-barrow-bucket-trough | 2.5 | 1.61* | | | | | | | | | |
| – filling hopper-battery barrow-trough | 3.5 | | | | | | | | | | 0.56 |
| – filling hopper/barrow/bucket/ self-acting fodder "Groba" | 3.5 | | | | | | | | 0.70 | 0.64 | |
| – filling hopper/mixer/barrow/ bucket/ trough/self-acting fodder | 3.5 | | | | 2.57 | | | | | | |
| – filling hopper/ self-acting automatic fodder "Roxell" (mechanical time) | 2.8 | | | | | | 0.35 | 0.35 | | | |
| 2. Feeding with liquid automatic feeder "Pellon" (mechanical time) | 2.1 | | | | | 0.24 | | | | | |
| 3. Cleaning pens and tending passages: | | | | | | | | | | | |
| – manual cleaning of pens (with a rake) | 5 | 1.25 | 1.15 | 0.60 | 1.76 | 1.24 | 0.84 | 0.63 | 0.53 | 0.47 | 0.47 |
| – cleaning feeding passages | | | 1.27 | 0.42 | 0.17 | 0.41 | 0.27 | 0.16 | 0.27 | 0.17 | 0.17 |
| – removing manure with the conveyor (mechanical time) | | 0.68 | 1.02 | 0.46 | 0.68 | 0.59 | 0.51 | 0.43 | 0.22 | 0.14 | 0.14 |
| 4. Transporting and spreading litter (sawdust) | 0.8 | | 0.75 | 0.28 | 0.86 | 0.60 | | 0.28 | 0.34 | 0.15 | 0.15 |
| 5. Watering: | | | | | drinker | drinker | drinker | drinker | drinker | drinker | drinker |
| – with the bucket from the barrow into the trough | 10.0 | 0.54 | | 0.45 | | | | | | | |
| – from the hose into the trough | 15.0 | | 0.36 | | | | | | | | |
| TOTAL: | | 3.40 | 4.59 | 2.33 | 5.36 | 2.25 | 1.11 | 1.07 | 1.84 | 1.43 | 1.35 |
| Incl. feeding | | 1.61 | 1.06 | 0.58 | 2.57 | – | – | – | 0.70 | 0.64 | 0.56 |

* – feeding once a day

Upon feeding with the automatic line, the human working time is practically zero as the device works in a timely programmed manner.

Upon manual feeding, the working time expenses were lower in case of 650 youngs and 1,000 fattening pigs upon feed delivery with a bucket from the wheelbarrow into the feed trough and the feed machine "Groba", 0.58 and 0.64 minutes respectively per 10 animals (Table 1). Upon feeding the fattening pigs, the wheelbarrow was filled from the filling hopper, in case of the youngs a single feeding was used.

In order to clean the fattening pigs' pens 0.47…1.76 minutes was spent per 10 animals; the indicator was the largest in case of a group of 300 animals (Table 1).

In order to transport and spread the litter the most time (0.86 minutes per 10 fattening pigs) was spent in case of the group of pigs consisting of 300 animals. Comparing the obtained result with this given in literature (KTBL, 1994/95), *i.e.* 0.47 minutes per ten fattening pigs, the larger working time expense can be explained by longer transportation distances.

In relation to the daily working time expenses per feeding one sow with piglets the largest was the working time special expense (2.14 minutes daily) in the group of 48 sows and 220 piglets where the dry feeding technology from the barrow – with the bucket – to the trough was used (Table 2).

**Table 2.** Working time daily expenses in minutes per sow with piglets

| Technology | Material kg pig/day | Number of pigs | | | |
|---|---|---|---|---|---|
| | | 36 sows + 160 piglets | 48 sows + 220 piglets | 100 sows + 560 piglets | 100 sows + 450 piglets |
| 1. Feeding with dry feed (storage-transportation-delivery): | | | | | |
| – filling hopper-mixer-barrow-bucket-trough | 3.2 | | | | 1.43 |
| – bin-scoop-barrow-bucket-trough | 3 | 0.70* | | 0.40 | |
| – filling hopper-barrow-bucket-trough | 3.2 | | 2.14 | | |
| 2. Cleaning pens and tending passages: | | | | | |
| – manual cleaning of pens | 12 | 0.88 | 0.81 | 0.54 | 0.66 |
| – cleaning feeding passages | | 0.09 | 0.33 | 0.15 | 0.09 |
| – removing manure with the conveyor (mechanical time) | | 0.55 | 0.43 | | 0.17 |
| 3. Transporting and spreading litter | 0.9 | 0.28 | 0.53 | 0.21 | 0.35 |
| 4. Watering: | | | | | |
| – with the bucket from the barrow into the trough | 30 | 0.65 | 1.11 | drinker | drinker |
| TOTAL: | | 2.60 | 4.92 | 1.30 | 2.53 |
| Incl. feeding | | 0.70 | 2.14 | 0.40 | 1.43 |

* – feeding once a day

The degree of difficulty of the work was determined in case of the pigtender who tended 500 fattening pigs and 100 sows with piglets (Table 3), hereinafter referred to as Tender 1 and Tender 2, respectively. The main tending work included feeding with dry feed, cleaning pens, spreading litter, cleaning the passageways. It became evident (Table 3 and Figure 1) that the tender encumbered more with spreading litter and cleaning the passageways was Tender 1 whose average pulse rate was 107 and the largest 160 beats per minute. During the shift the average degree of the pigtender's work was moderate (M), but during the cleaning work it became very heavy (VH) with the pulse rate of up to 160 beats per minute.

**Table 3.** Pigtender workload rate

| Parameters | Tender 1 | Tender 2 |
|---|---|---|
| Number of pigs | 500 fattening pigs | 100 sows+560 piglets |
| Tending time, min | 112.50 | 130.0 |
| Working time expenses in min per pigs | 0.23 | 1.30 |
| Tender: | | |
| sex | Woman | Woman |
| age, years | 27 | 48 |
| height, cm | 170 | 156 |
| weight, kg | 68 | 49 |
| Pulse rate (beats/min): | | |
| average | 107 | 86 |
| highest | 160 | 130 |
| Work intensity * | M → VH | L → H |

* – Work intensity (for the average → biggest load rate): L – light; M – moderate; H – heavy; VH – very heavy

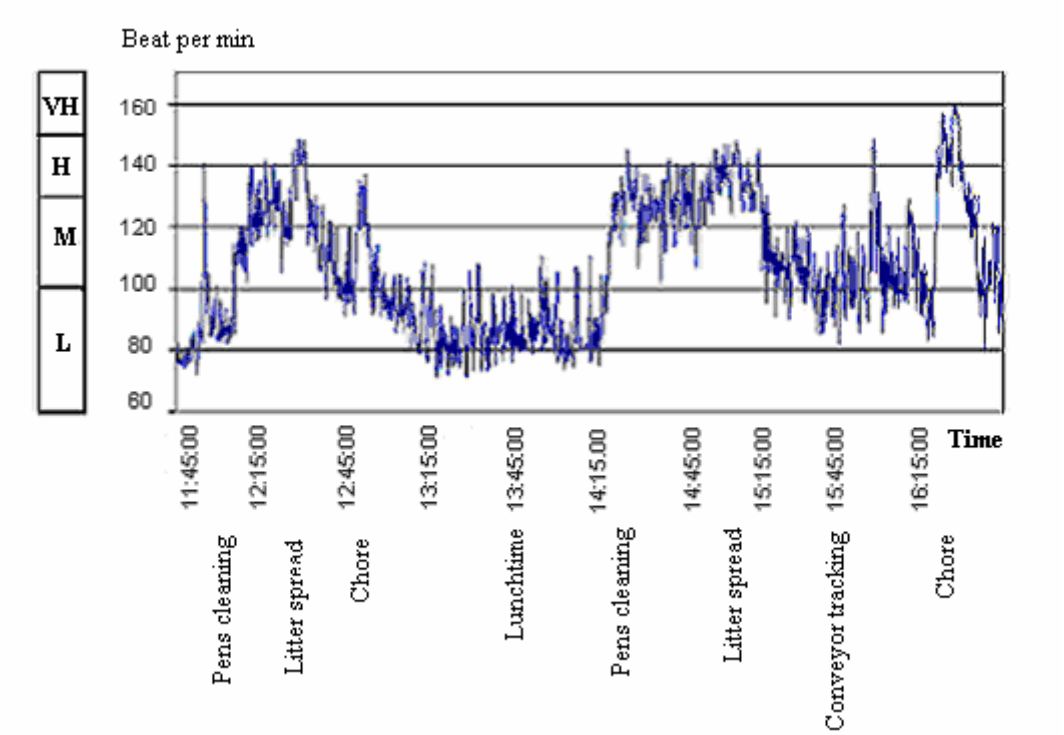


**Figure 1.** Tender 1 pulse rate and degree of work difficulty: L – light; M – moderate, H – heavy, VH – very heavy

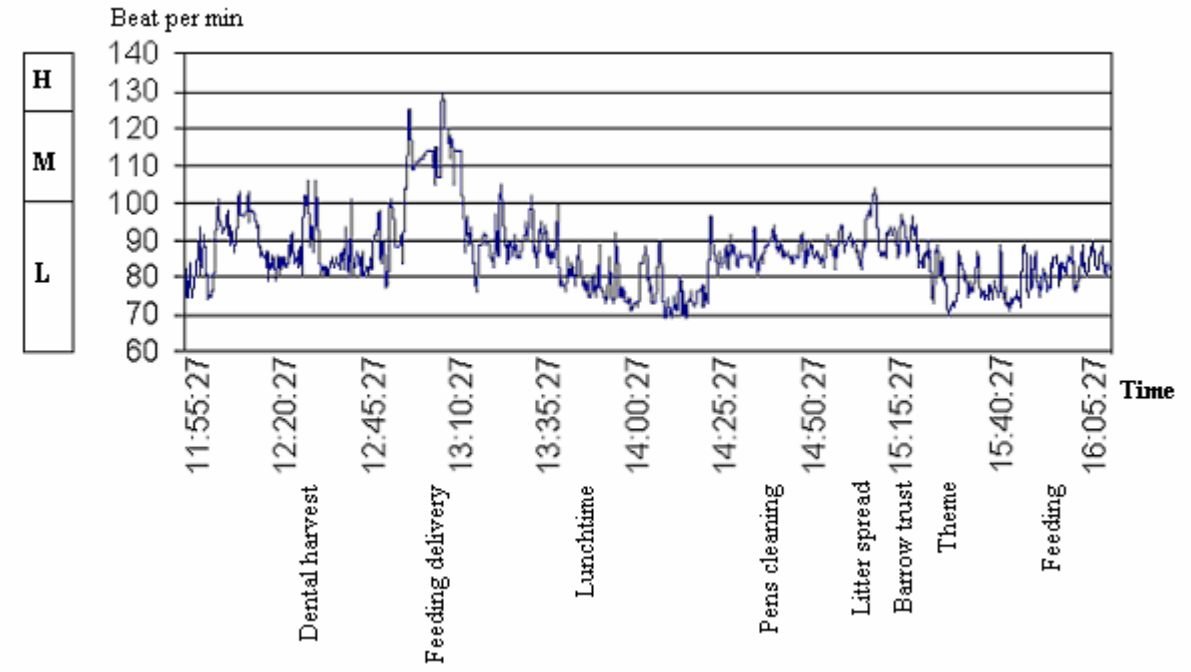


**Figure 2.** Tender 2 pulse rate and degree of work difficulty: L – light; M – moderate, H – heavy

The work of the Pig Tender 2 included feeding 100 sows with piglets, cleaning the pens and passageways, cutting the teeth of the piglets and injecting vitamins to them. The degree of difficulty of the Tender was moderate (Table 3 and Figure 2), but during filling the feeding machines with the feed the pulse rate increased up to 130 beats per minute, *i.e.* the work became heavy.

## Conclusion

Working time expense in case of different keeping technologies is different due to the technologies used, the group and number of the pigs both in the group as well as in the pen, the layout of the pens and rooms in a pigsty, the amounts of feed, the existence of the litter, the arrangement of work and the physical capacity of the tenders and other circumstances.

It became evident that in case of the mechanised feed delivery and cleaning the manure the working time expense related to keeping the pigs was lower as due to using the devices the human working time expense is practically zero. A smaller mechanical time (0.24 minutes per 10 fattening pigs) was in the pigsty with 500 fattening pigs upon feeding them with liquid feed using the automatic line "Pellon" and the mechanical time of 0.35 and 0.56 minutes per 10 fattening pigs was spent in pigsties with 700, 730 and 1,000 fattening pigs feeding them with dry feed, using the automatic line "Roxell" and the battery wheelbarrow EK-2.

Upon manual feeding the smaller working time expenses incurred in delivering the feed to 1,000 fattening pigs from the feed barrow to the feed machine "Groba" and in feeding 650 youngs to the trough, 0.64 and 0.58 minutes per 10 pigs, respectively. Larger working time expense 2.14 minutes per a sow a day was in the pigsty where the dry feed was delivered using the technology filling hopper – wheelbarrow – bucket – trough (Table 2).

The working time special expense of cleaning the pens (1.76 min per 10 pigs a day) existed in case of a herd of 300 fattening pigs. Upon a mechanised removal of the manure, the smaller working time special expense (practically the mechanical time) was in bigger farms and pigsties where the wing scraper (1,000 fattening pigs) was used.

The degree of the work difficulty depends on the work to be carried out, the intensity of the performance of the work, the technologies used, the human capabilities. The research conducted into different technologies revealed that the work being done upon keeping the pigs was light, heavy as well as very heavy for the pig tenders. The latter included, for example, manual delivery of the dry feed into the troughs, cleaning the manure from the pens into the manure channels and spreading the litter.

**Acknowledgments**
This research was funded gy the Estonian Science Fondation (Grant 5428).

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