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Accident Risk in Polish Farmers' Work Environment

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Abstract: The present paper describes work-related accident risk levels in Polish private farming analysed for men and women of different ages. The accident risk has been determined on the basis of the assumed criteria: share of an individual accident category in the total number of accidents, severity of accidents, share of an individual accident category in the total number of fatal accidents and the probability of occurrence of a fatal accident. Five accident risk levels have been assumed. Men are characterised by very high accident risk levels connected with repairing of tractors and agricultural machines. There do not exist very high accident risk level categories for women in general (regardless of their age), however, such categories do exists for some age groups.
Key words: agriculture, work, accident, risk level, Poland

INTRODUCTION

Previous research papers on work-related accidents in private farming show a significant variety of sources which include different elements of agricultural work environment, types of work and types of particular activities. Moreover, the division of labour in a family farm is the reason why men and women of different ages suffer considerably different accidents (*Cież, 1996, Cież 1997*). Consequently, the accident risk levels for men and women of various ages differ.

The difficulty to assess the actual exposure of farmers to individual types of accident threat is the weak point of the research on work-related accidents in farming. Hence, the assessed risk is the relative risk most often based on the frequency of accident occurrence, (*Gerberich et al., 1998, Lee et al., 1996, McCurdy and Caroll, 2000*) whereas the accident risk should also provide for the severity of accidents.

The present paper aims to determine the accident risk levels including both the quantitative (percentage of individual accident category) and the qualitative (severity of accidents) aspects.

MATERIAL and METHOD

The accident risk levels were based of the set of 25,064 accidents registered in the Polish private farming sector in the years 1997-1998. These constituted approximately 25% of all accidents reported in that period.

Accident risk, both for particular age groups of men and women, as well as separately for men and women analysed against particular elements of agricultural work environment, types of work and different types of performed activities was determined according to five criteria. One of them constituted the basic criterion and the remaining four were the criteria which determined the level of accident risk. A given accident category may be analysed under a determining criterion only after the basic criterion has been fulfilled.

Basic criterion - taking into consideration only those accident categories which constitute at least 1% of the total number of accidents,

Determining criterion I – taking into consideration only those accident categories which (arranged acc. to the Pareto method), when combined, constitute at least 66% of the total number of accidents,

Determining criterion II – taking into consideration only those categories of accidents whose severity measured with the Weighted Accident Severity Index exceeds the average value for the entire agricultural work environment,

Determining criterion III – taking into consideration only those accident categories which (arranged acc. to Pareto method), when combined, constitute at least 66% of the total number of fatal accidents,

Determining criterion IV – taking into consideration only those accident categories for which

the risk of fatal injury (relative share of fatal injuries in the total number of accidents of a particular category) exceeds the average value for the entire agricultural work environment.

In consequence of these assumed criteria, the accident risk levels have been determined according to the following classification:

Very high risk (**xxxx**) – if a given accident category meets all 4 determining criteria;

High risk (**xxx**) – if a given accident category meets any 3 determining criteria;

Average risk (**xx**) – if a given accident category meets any 2 determining criteria;

Low risk (**x**) – if a given accident category meets one determining criterion;

Very low risk (**-**) – if a given accident category meets only the basic criterion and none of the determining criteria.

RESULTS

Table 1 shows accident risk levels related to individual elements of agricultural work environment for women. As for women in general, in the agricultural work environment there is no element associated with a very high accident risk, but such risk exists in the female age group of 55-64 in connection with animals and in the female age group of 65 and more in connection with moving around in farmyards.

High accident risk for women is connected with animals and road traffic (road accidents). As far as work with trailers and axes is concerned, women are characterised with average accident risk. In the case of axes, however, in some age groups, in the light of the assumed criteria, the accident risk is hardly noticeable. The remaining elements of agricultural work environment demonstrate, as for women in general, low or very low risk, although in the case of agricultural buildings and machinery, the accident risk levels in some age groups might reach the average level. For women, the percentage of tractor-related accidents is so small that this accident category does not event meet the basic criterion, even though for particular age groups this percentage may be sufficient to be expressed as a specific accident risk level.

Basically, the accident risk levels related to particular elements of the agricultural work environment for men are quite different (Table 2). For men, tractors and agricultural machinery are the elements of agricultural work environment which have very high accident risk level in many age groups. High accident risk is connected (just as for women) with road traffic (road accidents) and the use of sawing machines. On the other hand, for men, animals, buildings and trailers may be the source of average accident risk. Nevertheless, it must be noted that work in buildings and on trailers performed by elderly men may be the source of very high accident risk. As far as other elements of agricultural work environment are concerned, the accident risk for men is low or very low. Accidents related to electric wiring, plant protection chemicals and farming tools are so rare that for men in general, and in the light of the assumed criteria, they cannot be the subject of the discussion on the accident risk.

Table 3 shows accident risk levels for women in connection with performance of various types of work. As shown in the table, only delivery of agricultural production materials constitutes, for women in general, the type of work associated with possible high accident risk, although in relation to two oldest age groups, there is no (in the light of the assumed criteria) accident risk. Average accident risk level may be associated with attending farm animals and cutting wood. It must be noted that this risk level for women of 55-64 remains high, and even very high for the oldest group. As for the remaining types of work, the accident risk is low (harvest of agricultural produce, running a household, tidying up, sowing and planting) or very low (transportation of agricultural produce, reclamation work). Nevertheless, despite very low, for women in general, accident risk connected with transportation of produce and reclamation work, these types of work may constitute high accident risk for girls younger than 15. The other types of work do not present a noticeable (in the light of the assumed criteria) accident risk level for women in general, however, in individual age groups they may present low or very low accident risk.

Table 1. Accident risk for women in connection with individual elements of agricultural work environment

Element of agricultural environment	Accident risk level for the age of [in years]:							
	<15	15-24	25-34	35-44	45-54	55-64	≥65	Women in general
Animals	x	xx	xxx	x	x	xxxx	x	xxx
Road accidents	xxx	x	xxx	x	xxx			xxx
Trailers	xxx	xx	xx	x	x	-	x	xx
Axes		x	x	xxx	x			xx
Farmyard	x	x	x	x	x	xx	xxxx	x
Buildings	xx	xx	x	x	x	x	xx	x
Agricultural machines	xx	x	xx	xx	x	x	x	x
Stair	-	x	-	x	x	-	x	x
Ladders	x		x	-	x	x	x	x
Circular sawing machines			x	x				x
Heavy objects	-		-	x	x			x

Table 2. Accident risk for men in connection with individual elements of agricultural work environment

Element of agricultural environment	Accident risk level for the age of [in years]:							
	<15	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64	≥65	Men in general
Tractors	-	x	xxxx	xxxx	xxx	xxx	-	xxxx
Agricultural machines	xxxx	xx	xxxx	xxx	xxxx	xx	x	xxxx
Road accidents		xxx	xxx	xxx	xxx	xxx	-	xxx
Circular sawing machines	x	xx	xx	xx	xx	xxxx	x	xxx
Buildings	x	x	x	xx	x	xxx	xxxx	xx
Animals	x	x	x	x	xxx	xx	x	xx
Trailers	-	xxx	xx	x	x	x	xxxx	xx
Workshop machinery and equipment		x	x	xxx	x	x	-	x
Farmyard	x	x	x	x	x	x	x	x
Ladders	x	x	x	x	x	x	x	x
Horse-drawn wagons	-	-	-	-	xx	x	-	x
Cart-tracks, fields, etc.	x	x	xxx	-	xx	xx	-	x

Table 3. Accident risk for women in connection with the performance of particular types of work

Type of work	Accident risk level for the age of [in years]:							
	<15	15-24	25-34	35-44	45-54	55-64	≥65	Women in general
Transportation of produce and reclamation work	xxx	x	xxx	x	xxx			xxx
Attending animals	x	x	x	x	x	xxx	xxxx	xx
Cutting wood		x	x	xxx	x	x		xx
Harvest of agricultural produce	-	-	-	x	x	x	-	x
Running a household	x	x	-	-	x	-	-	x
Tidying		x	x	-	-	x	-	x
Sowing and planting	x	-	x	x	-			x

Table 4. Accident risk for men in connection with the performance of particular types of work

Type of work	Accident risk level for the age of [in years]:							
	<15	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64	≥65	Men in general
Transportation of produce and reclamation work	x	xx	x	xxxx	xx	xx	xxxx	xxx
Harvest of agricultural produce	-	-	xxx	xxx	xxx	xxx	xx	xxx
Delivery of agricultural production materials	x	xxx	xxx	xxx	xxx	xxx	-	xxx
Cultivation of soil		-	xx	x	xxx	xx	xx	xxx
Forest management		-	xxx	-	xx	xxx	xx	xxx
Fertilising		-	xxx	-	xxx	-	xx	xxx
Attending animals	xxxx	x	x	xx	xx	xx	xx	xx
Cutting wood	x	xx	xx	xxx	xx	xx	xx	xx
Repairing technical machinery and equipment	x	xxxx	x	xxxx	xx	xx	x	xx
Repairing and renovation of buildings and construction equipment		x	xx	xxx	-	-	xx	x

Table 4 shows accident risk for men. As in the case of women, there is no one type of work which has a very high accident risk level for men in general. However, there are many types of work (transportation of produce, reclamation work, harvest of produce, delivery of agricultural production materials, soil cultivation, forest management and fertilising) associated with high accident risk. In the case of age group of 35-44 and the oldest farmers, transportation of produce and reclamation work may present very high accident risk. For men in general, attending animals, cutting wood and repairing machinery and equipment may present average accident risk, although it must be noted that the accident risk associated with attending animals (by boys younger than 15) and repairing machinery and equipment (age groups of 15-24 and 35-44 years old) may be very high. For the remaining types of work listed in Table 4, the accident risk is low (repairing and renovation of buildings and construction equipment) or very low (cleaning, running a household, sowing and planting). In the case of nurturing plants, sale of produce and plant protection, the particular accident risk levels apply only to few or several age groups.

Table 5 shows activities performed by women and the associated accident risk. Numerous various activities performed by women do not include any activities associated with very high accident risk, even though for individual age groups such very high accident risk should be considered (driving animals, walking, and walking and carrying). For women in general, driving animals and steering present high accident risk while such activities as walking, walking and carrying, cross cutting and passenger rides may be associated with average accident risk. In the case of other activities, there is low or very low accident risk, with few cases of at most average accident risk level for individual age groups. There exist a number of activities which, for women in general, do not present a noticeable (in the light of the assumed criteria) accident risk, while they may present a particular risk level (virtually only low or very low) for individual age groups.

Table 6 shows accident risk for men. As shown therein, only one type of activity i.e. repairing (technical machinery and equipment as well as buildings and construction equipment) presents very high accident risk for men in general. It should be noted that, having excluded the youngest and the oldest groups, these activities are associated with very high or high accident risk for all male age groups. There are many activities (cross cutting, walking, operating, work at height, steering,

Table 5. Accident risk for women in connection with the performance of particular activities

Activity	Accident risk level for the age of [in years]:							
	<15	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64	≥65	Women in general
Driving animals	x	xx	xxx	x	x	xxxx	xx	xxx
Steering	xxx	x	xxx	-	xxx	x		xxx
Walking	x	x	x	x	xxxx	x	x	xx
Walking and carrying	x	x	x	x	xx	xx	xxxx	xx
Cross cutting		-	xx	xxx	x	x		xx
Passenger rides	xxx	-	-	x	xx	-		xx
Walking down	-	x	x	x	x	x	-	x
Operating	xx	xx	xx	xx	x	x	x	x
Feeding	x	-	x	xx	x	-	-	x
Hand milking		-	x	x	x	x	-	x
Using		-	xx	x				x

Table 6. Accident risk for men in connection with particular activities

Activity	Accident risk level for the age of [in years]:							
	<15	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64	≥65	Men in general
Repairing		xxx	xxx	xxxx	xxxx	xxxx	-	xxxx
Cross cutting	xx	xx	xx	xx	xx	xxx	xx	xxx
Walking	x	xx	xxx	xxx	x	xxx	x	xxx
Operating	xxxx	xx	xxx	xxxx	xxxx	xx	x	xxx
Work at height	x	x	-	xxx	x	xx	xxxx	xxx
Steering	x	xxxx	xxxx	xxx	xxx	xx	xxx	xxx
Acquisition and transportation of wood		-	xxx	-	xxx	xx		xxx
Nurturing				-	xxx	-	xx	xxx
Passenger rides	-	xxx	xxx	xxx		xx	xxx	xxx
Walking down	x	x	x	xx	x	x	x	xx
Walking and carrying	X	x	x	x	x	x	xx	x
Driving animals	x	x	x	x	x	x	x	x
Walking up	x	x	x	x	x	xxx	x	x
Coupling	x	x	x	x	xx	xxxx	x	x
Unloading	-	x	x	x	x	xx	xxx	x
Feeding	-	-	-	x	x	xxxx	x	x
Driving horse-drawn vehicles		-	x	-	xxx	-	-	x
Longitudinal cutting		x	x	xx	-	x	-	x
Processing material		x	x	x	x	-	x	x

acquisition and transportation of wood, nurturing and passenger rides), which present high accident risk for men in general. However, it must be also noted that in connection with the performance of the aforementioned activities, for some age groups there may occur very high accident risk, e.g. in

connection with the operating carried out by boys younger than 15 or the oldest men's work at height. Walking is associated with average accident risk. For men in general, the remaining activities present low or very low accident risk, however, with the potential for higher risk levels in individual age groups. Additionally, there are such activities which, for men in general, do no present noticeable (in the light of the assumed criteria) accident risk, even though such risk may occur for individual age groups.

SUMMARY

The presented levels of accident risk lead to the hierarchy of needs pertaining to preventive measures to curb the number and severity of work-related accidents in farming, identified in connection with the elements of agricultural work environment, particular types of performed work and types of activities carried out by women and man of different ages.

It appears that preventive measures (predominantly educational undertakings) should first of all address these accident categories which present very high and high accident risk for all women and men.

For the elements of agricultural work environment, these categories are: for women – animals and road accidents, for men – tractors, agricultural machines, road accidents and sawing machines.

For the types of performed work, these accident categories are: for women – delivery of agricultural production material, for men – transportation of produce, reclamation work, harvest of produce, delivery of agricultural production material, soil cultivation, forest management and fertilising.

For the performed activities, these accident categories include: for women – driving animals and steering, for men – repairing (technical machinery and equipment, and buildings and construction equipment), cross cutting, walking, operating, work at height, steering, acquisition and transportation of wood, nurturing, and passenger rides.

All the above analyses lead to the conclusion that a very high level of accident risk in Poland, especially for men, exists for tractors and agricultural machines.

For women, agricultural machines constitute low accident risk, and tractors, only for some age groups, constitute low and very low accident risk. Other authors in their research confirm these conclusions. *Lee et al*. (1996) showed that tractor-related accident risk for women was nearly 7 times smaller than for men, and according to *Gerberach et al*. (1998), the accident risk related to agricultural machines for women was nearly 4 times smaller than for men. *Layde et al*. (1995) showed that the accident risk related to agricultural machines for men was 14 times higher (as per the population number) and 5.6 times higher (as per the number of worked hours) than for women.

High accident risk (especially for men) associated with wood sawing machines remains a distinctive feature of Polish farming. As the research in other countries show, elsewhere this problem hardly exists.

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