Work Ability Index among Finnish Dairy Farmers

J. P. Karttunen, R. H. Rautiainen

ABSTRACT. *Full-time farmers and particularly dairy farmers who plan to expand their production have voiced concerns about their physical and mental work ability in recent studies. The objectives of this study were to characterize the work ability of dairy farmers and to identify demographic groups at risk of disability and in greatest need of interventions to promote work ability. We conducted a postal survey using the Work Ability Index (WAI) questionnaire. The WAI of 399 dairy farmers (245 female and 154 male) was analyzed (response rate 41.5%). The mean WAI score was 36.0 among female and 39.0 among male respondents (scale: 7 = worst to 49 = best). The WAI decreased with age. The WAI was systematically better among males compared to females in all age groups, and the difference was greatest among those over 45 years of age. About one-fourth of females and one-tenth of males over 45 years of age were at an imminent risk of disability (poor WAI). The WAI of farmers in our study was similar to farmers in previous studies where entrepreneurs and salaried workers had better WAI compared to farmers. This study indicates that interventions are needed among older dairy farmers, particularly females, to help them improve their work ability. The first question (of seven) in the WAI questionnaire correlated well with the complete questionnaire-based WAI. The first question could be used in surveys as a condensed version of the WAI, if the same correlation is found in future studies. Based on this study, we recommend using the Work Ability Index questionnaire for assessing the health of those working in agriculture.*

Keywords. *Age, Dairy, Disability, Farm, Gender, Hazard, Health, Occupational health, Risk, Work ability index.*

Since the early 1960s, the structural change in Finnish agriculture, particularly in dairy production, has been very rapid. In 2002, approximately 20,700 farms were engaged in dairy production while in the fall of 2007, there were only 13,000 dairy farms remaining (Tike, 2007). The polarization of dairy production is also notable. Most small dairy farms have discontinued milk production or are considering it in the near future. On the other hand, increasing numbers of family farms are expanding their herd size to 100 cows and beyond.

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Studies and statistics indicate that dairy producers have both the highest annual working hours and the heaviest daily workload among full-time farmers (Kolstrup, 2008; MTT, 2009; Perkiö-Mäkelä and Hentilä, 2005; Manninen, 2004; Karttunen, 2003). In particular, dairy farmers who plan to increase their production substantially have voiced concerns about their physical and mental work ability (Simola, 2006).

According to Ilmarinen (2006), the most important asset for employees in their working life is their work ability. Work ability is based on a balance model, where individual resources match the work demands in a safe and healthy way. High physical demands of work, hazardous work environments, and poorly organized work significantly deteriorate the work ability of people as they age (Ilmarinen and Tuomi, 2004). All these factors are present in agricultural work.

Certain elements of the farmers' work ability have been addressed in recent Finnish studies (Simola, 2006; Peltoniemi, 2005; Perkiö-Mäkelä, 2007, 2000). A work ability study by Saarni et al. (2008) used the Work Ability Index (WAI) questionnaire and included a modest group (n = 129) of full-time farmers. Perkiö-Mäkelä (2007) used a substantially larger study group (n = 1182) that included dairy farmers. That study used only part of the WAI questionnaire.

According to Winn (2004), the WAI has not been commonly used in the U.S. to date. Although the WAI questionnaire has been translated into at least 24 languages (Ilmarinen, 2007) and used widely in various industries, the number of peer-reviewed WAI studies of farmers is limited.

The objectives of this study were to characterize the work ability of Finnish dairy farmers and to identify demographic groups of farmers at risk and in greatest need for interventions to promote work ability. This study connects to a larger research project that aims to determine risk factors for disability in agriculture.

Materials and Methods

Subjects

The target population in this study consisted of all Finnish-speaking dairy farmers operating a mid-sized or larger farm, defined as at least 30 ha (74 acres) of cultivated land. In 2002, there were about 15,800 farmers on 9,100 farms in this farm size category (fig. 1). It is common for spouses to operate dairy farms and have equal social insurance coverage for their farm work. A stratified random sample of 500 male and 500 female farmers was taken from the insurance records of the Finnish Farmers' Social Insurance Institution (Finnish acronym: Mela). Mela administers mandatory workers' compensation and other social insurance plans for all farmers with at least 5 ha (12.4 acres) of farmland. Hired employees have coverage from other insurance systems and were excluded from our study population. Thirty-eight Swedish-speaking farmers were excluded from the sample because the study material was only in Finnish.

A mail questionnaire consisting of two separate forms was sent to a stratified random sample of 962 dairy farmers, one operator from each farm. The first form was the Work Ability Index (WAI) questionnaire developed by the Finnish Institute of Occupational Health (FIOH) (Tuomi et al., 1998). The second form contained additional questions about demographic and farm characteristics potentially affecting the WAI.

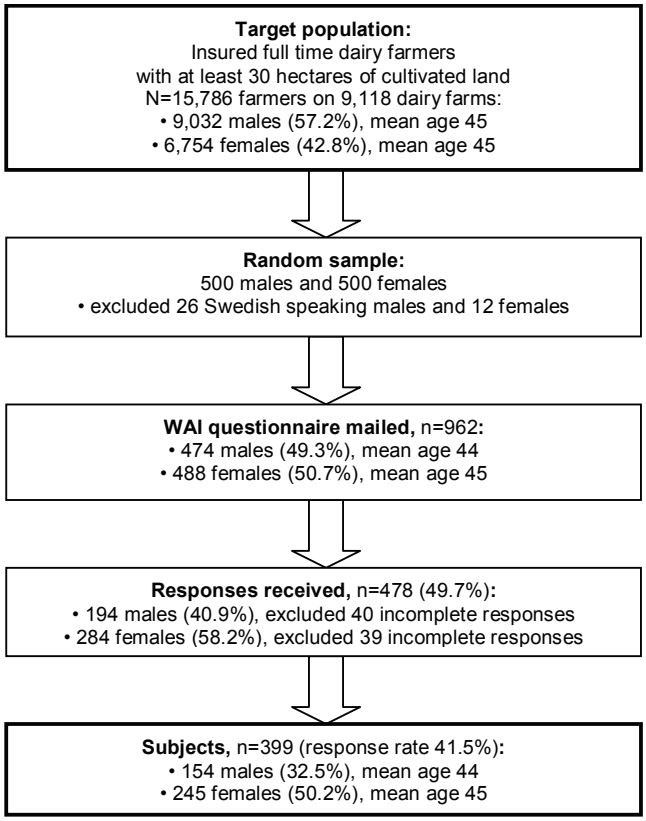

Figure 1. Administration of the Work Ability Index questionnaire.

The results related to these background questions will be reported separately in future publications. One reminder without the forms was sent to those who did not respond within two weeks.

The mail questionnaire was administered by Mela to ensure confidentiality and to avoid providing identifiable information to the research team. The response rate was nearly 50%, but 66 responses were excluded due to missing WAI questionnaires or incomplete information in parts of the questionnaire. Thirteen of the respondents had discontinued their milk production and were therefore also excluded. Thus, the final response rate was relatively low (41.5%).

Work Ability Index Questionnaire

The self-administrated WAI questionnaire assesses an individual's work ability. It can be used as a screening tool, referring those individuals or groups of people with reduced work ability to appropriate medical care and to activities promoting work ability. The WAI has good test-retest reliability (de Zwart et al., 2002). It has multiple questions under seven main themes or items (table 1). Most questions are multiple-choice. The WAI score uses a scale from 7 (worst) to 49 (best) to indicate overall work ability.

Table 1. Items addressed in the WAI and range of scores per item (Tuomi et al., 1998).

Item	Range of Scores[a]
1. Current work ability compared with the lifetime best (CWA)	0-10
2. Work ability in relation to the demands of the job	2-10
3. Number of current diseases diagnosed by a physician[b]	1-5, 7
4. Estimated work impairment due to diseases	1-6
5. Sick leave during the past 12 months	1-5
6. Own prognosis of work ability 2 years from now	1, 4, or 7
7. Mental resources[c]	1-4

[a] The scores are calculated from responses to multiple questions under each item. Scoring is described by Tuomi et al. (1998).

[b] Item 3 refers to a count of diseases and injuries (outcomes listed in 14 main categories and 51 sub-categories).

[c] Item 7 refers to the worker's life in general, both work and leisure time.

Table 2. Work ability categories and recommended measures (Tuomi et al., 1998).

Points	Work Ability	Objective of Recommended Measures
7-27	Poor	Restore work ability
28-36	Moderate	Improve work ability
37-43	Good	Support work ability
44-49	Excellent	Maintain work ability

The WAI score is classified into four categories: poor, moderate, good, and excellent (table 2). Measures directed toward restoring work ability are needed for those whose work ability is poor. For those whose work ability is moderate, measures to help improve work ability are recommended. Subjects with good WAI scores should receive instructions on how to maintain their work ability. Those whose work ability is excellent should also be informed about those work and lifestyle factors that maintain work ability and those factors that weaken it (Tuomi et al., 1998).

Statistical Methods

The WAI scores of the male and female dairy farmers were calculated according to the instructions of FIOH (Tuomi et al., 1998). For the calculation and interpretation of the responses (table 1, item 2), dairy farm work was considered both physically and mentally demanding. The continuous variable "age" was categorized into four groups. The basic data analysis comprised calculation of means, standard deviations, medians, minimums, and maximums of the WAI for both genders and the four age groups. The Pearson correlation coefficients were calculated for continuous variables. The differences in means were assessed using the t-test. The differences in proportions of responders in WAI and age groups were compared using the chi-square test. The statistical analyses were conducted using SAS (version 9.1, SAS Institute, Inc., Cary, N.C.).

Results

Work Ability Index scores by Gender and Age

A total of 399 dairy farmers returned a usable WAI questionnaire; 245 of them were female and 154 were male. The mean age of females was 44.5 (range 25-64), and the mean age of males was 44.4 (range 23-64). The mean WAI score was higher among males (39.0) compared to females (36.0) (table 3). The proportion of females in the poor work ability category was twice as high compared to males. Conversely,

Table 3. Work Ability Index (WAI) and age by gender.

		Male (n = 154)	Female (n = 245)	Total (n = 399)
Work ability group	Poor (7-27)			
	Number	11	34	45
	Percent	7.1	13.9	11.3
	Moderate (28-36)			
	Number	38	74	112
	Percent	24.7	30.2	28.1
	Good (37-43)			
	Number	59	96	155
	Percent	38.3	39.2	38.8
	Excellent (44-49)			
	Number	46	41	87
	Percent	29.9	16.7	21.8
WAI	Mean	39.01	35.98	37.15
	SD	6.71	7.65	7.44
	Median	40	38	39
	Min.-Max.	15-49	9-49	9-49
Age in years	Mean	44.36	44.49	44.44
	SD	9.53	8.24	8.75
	Median	45.5	44	44
	Min.-Max.	23-64	25-64	23-64

Table 4. Work Ability Index (WAI) of dairy farmers by age and gender.[a]

		Age Group				
		<35	35-44	45-54	55-64	All
Males	Number	27	48	56	23	154
	Mean	42.85	39.52	38.45 a	34.83 b	
	SD	4.23	6.85	6.42	7.15	
Females	Number	29	97	90	29	245
	Mean	41.07	37.92	34.37 c	29.45 d	
	SD	4.74	5.92	8.04	8.33	

[a] Both mean comparisons (a to c and b to d) were significant, $p < 0.05$.

the proportion of males in the excellent work ability category was twice as high compared to females. Overall, the differences in the proportions of males and females in the four WAI groups were statistically significant (chi-square test, $p = 0.006$).

Age was significantly and negatively correlated with WAI ($r = -0.39$, $p < 0.001$). Both genders experienced a decrease in WAI with age. This decrease was more prominent among females than males. On the average, the decline was 0.40 points/year for females and 0.24 points/year for males. The decline was relatively consistent among males but progressive with age among females. The WAI was systematically better among males compared to females in all age groups. The WAI was significantly lower among female farmers in the two oldest age groups (t-test, $p < 0.05$) (table 4).

The standard deviation (SD) of the WAI scores increased with age for both genders, particularly females (table 4). This indicates greater individual variation at older age in general, and especially among females.

The WAI of both males and females had a significant decline ($p < 0.05$) between each consecutive age group with one exception: males in age groups 35-44 and 45-54 years did not differ significantly. The decreasing WAI with age can clearly be

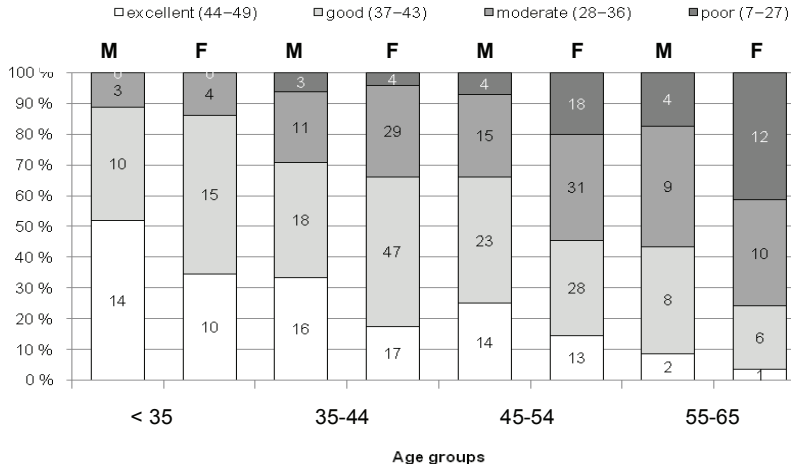

Figure 2. Number and proportion of male (M) and female (F) dairy farmers by age and WAI group.

seen in figure 2. The high number and percentage of females in the lowest work ability category in the oldest age groups is striking. About one-fourth of female farmers and one-tenth of male farmers in the two oldest age groups had poor WAI.

The association of the age of the respondents and the WAI score was studied using linear regression analysis. Age explained about 12% of the variation in work ability index among males and 20% of the variation among females (figs. 3a and 3b). The WAI decreased with age, but this decrease was clearly stronger among females.

Seven Items of the Work Ability Index

Male dairy farmers received significantly higher scores for six out of seven items of the WAI (table 5). The difference between the genders was very significant ($p < 0.001$) on items 3 and 5. Only the seventh item, mental resources, had no significant difference between the genders.

The first item in the WAI questionnaire, "[Rate your] current work ability compared to your lifetime best" (scale of 0 to 10, where 0 = completely unable to work and 10 = work ability at its best), had a high positive correlation (males $r = 0.84$, $p < 0.0001$; females $r = 0.83$, $p < 0.0001$) with the WAI calculated from the whole questionnaire (table 6).

Table 5. Means and standard deviations (SD) of the seven items of the WAI by gender.[a]

Seven Items of the WAI (scale, highest score is best)	Male (n = 154) Mean (SD)	Female (n = 245) Mean (SD)
1. Current work ability (0-10)	7.85 (1.65)*	7.41 (1.79)*
2. Work ability in relation to the demands of the job (2-10)	7.54 (1.35)**	7.11 (1.38)**
3. No. of current diseases or injuries diagnosed by physician (1-5,7)	5.11 (1.77)***	4.13 (2.19)***
4. Estimated work impairment due to diseases or injuries (1-6)	4.82 (1.14)**	4.43 (1.21)**
5. Sick leave during the past 12 months (1-5)	4.36 (0.95)***	3.93 (1.24)***
6. Own prognosis of work ability two years from now (1,4,7)	6.32 (1.35)*	5.93 (1.72)*
7. Mental resources (1-4)	3.02 (0.84)	3.00 (0.85)

[a] Differences between the genders (t-test): * = $p < 0.05$; ** = $p < 0.01$; *** = $p < 0.001$

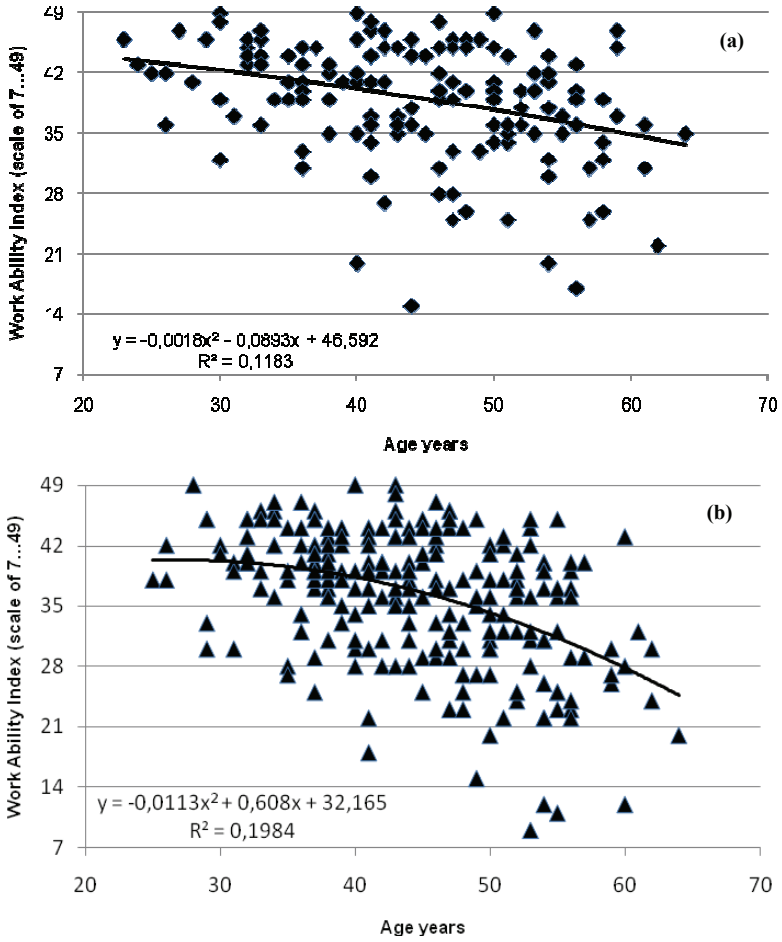

Figure 3. Work Ability Index and age among (a) male and (b) female dairy farmers.

Table 6. Work Ability Index (WAI) and current work ability (CWA) among dairy farmers by age and gender.

		Age Group			
		<35	35-44	45-54	55-64
Males	Mean WAI (scale 7 to 49 = best)	42.85	39.52	38.45	34.83
	Mean CWA (scale 0 to 10 = best)	8.37	8.06	7.68	7.22
Females	Mean WAI (scale 7 to 49 = best)	41.07	37.92	34.37	29.45
	Mean CWA (scale 0 to 10 = best)	8.48	7.82	6.91	6.52

Item 2 asks about the respondent's current work ability in relation to the demands of the job divided into physical and mental demands, each on a scale from 1 (very poor) to 5 (very good). More than half of males (55.1%) and 44.1% of females reported their current work ability as rather good or very good.

Item 3 is a count of current diseases or injuries diagnosed by a physician. The specific questions address 14 main and 51 sub-categories of diseases or injuries. The proportion of those reporting at least one disease or injury was 62.3% among males (mean

1.28, SD 1.43, min 0, and max 6 diseases or injuries) and 73.5% among females (mean 2.43, SD 2.47, min 0, and max 10 diseases or injuries). In addition to diseases or injuries diagnosed by a physician, the WAI questionnaire also includes self-diagnosed diseases and injuries. Males (20.8%) reported more self-diagnosed outcomes compared to females (14.3%). Only 16.9% of males and 12.2% of females reported no current diseases or injuries.

Item 4 asks if the current diseases or injuries are a hindrance to the current job of the respondent. The responses include six options on a scale from 1 (entirely unable to work) to 6 (there is no hindrance). Over one-third of males (34.4%) and 21.6% of females reported that there is no hindrance from diseases or injuries.

Item 5 dealt with the amount of sick leave (time away from work) resulting from a disease or a health examination during the past year (12 months). The categories were the following: no sick leave, up to 9 days, 10-24 days, 25-99 days, or 100-365 days. These categories (consistent with higher points for better work ability) received five, four, three, two, or one point, respectively (table 5). A greater proportion of males (59.1%) compared to females (47.4%) reported no sick leave during the past year.

Item 6 asks if the respondent will be able to do his/her current job two years from now. There are three options, scored 1 (unlikely), 4 (not certain), or 7 (relatively certain). Over three-quarters of males (78.6%) and 69.4% of females reported their own prognosis as relatively certain.

Item 7 addresses areas of mental resources in three areas (enjoyment of regular daily activities, being active and alert, and being full of hope for the future). The scores range from 1 (worst) to 4 (best). There were no significant differences in responses between males and females.

Discussion

The work ability of farmers and their family members is vitally important for the success of the farm. Farm work in general and livestock farming in particular requires constant attention and exposes the farmers to weakening work ability, occupational diseases, and injuries at work.

We conducted a postal survey using the Work Ability Index questionnaire to characterize the work ability of dairy farmers and to identify demographic groups at risk and greatest need for interventions to promote work ability.

We found that approximately one in four female farmers and one in ten male farmers over 45 years of age had poor WAI and were at an imminent risk of disability. When an individual's work ability has fallen to moderate or poor level on the WAI scale, mere educational methods are not considered sufficient. Urgent measures aiming to restore the work ability are needed.

Nearly two-thirds of the males and three-fourths of the females had at least one current disease diagnosed by a physician. In addition, both genders reported self-diagnosed diseases, males slightly more than females. Self-diagnosed diseases may diminish the work ability as well, and only a small proportion of farmers considered themselves disease free (16.9% of males, 12.2% of females).

There were more females than males among those who had ten or more days of sick leave during the past 12 months. There were also more males among those who reported nine or fewer sick leave days. These findings indicate that females experience more disabling conditions. It has been suggested that males seek medical care less

readily than their female peers. Green and Pope (1999) found that female gender was an independent predictor for higher health services utilization, even after controlling for self-reported health status, mental and physical symptom levels, health knowledge, illness behaviors, health concerns, and interest in the long-term use of health services. In another study by Claussen and Dalgard (2009), Norwegian women had a higher rate of disability pensions than men (OR 1.41); however, after controlling for self-reported health, mental distress, occupation, working conditions, and income level, there were no differences between genders. The associations of gender and health conditions and health services utilization have not been studied in our population. Traditionally, females have contributed primarily to household and animal care work, while males have contributed to field and forest work, and increasingly animal care work. Currently, dairy farm work is assumed to be divided relatively evenly between genders. Cattle farming in general, and dairy farming in particular, require constant attention, management, and animal care work. Lapses in optimal care of animals may lead to great financial losses. Therefore, farmers have a high tendency to work, even if they are seriously injured. Based on the available information from our study and previous studies, we are not able to offer clear explanations for the differences in work ability decline between genders. This issue would require further study.

Comparison with Previous Studies

The mean WAI among dairy farmers in our study was 37.2, and the WAI was systematically better among males compared to females in all age groups. These results are in accordance with the findings of Saarni et al. (2008) and Peltoniemi (2005). Saarni et al. (2008) found that the mean WAI of farmers (37.9) was 6% to 7% lower than the WAI of entrepreneurs (40.8) and salaried workers (40.3). Peltoniemi (2005) found similar results for the same occupation groups (mean WAI 37.7, 42.0, and 41.7, respectively). He also found that regardless of the line of business, males receive systematically higher WAI scores than their female peers.

Our study confirmed the findings of Saarni et al. (2008) and Perkiö-Mäkelä (2007) indicating that full-time farmers and especially older female farmers have poor work ability when compared to other entrepreneurs or salaried workers. Older female farmers are at highest risk of disability, and therefore need urgent intervention to restore their work ability. Our study had a larger population of farmers than Saarni et al. (2008) (n = 399 vs. 129). We also reported the results by gender unlike Peltoniemi (2005), and we used the whole WAI questionnaire in contrast to Perkiö-Mäkelä (2007). We also found that the first question in the WAI questionnaire correlated well with the complete questionnaire-based WAI and could potentially be used in surveys as a condensed version of WAI. However, it would be important to confirm this finding in further studies.

Peltoniemi (2005) found that over 70% of the farmers consider farm work both physically and mentally demanding. This finding supports our determination, considering farm work as physically and mentally demanding in the WAI scoring system. Item 2 of the WAI questionnaire (table 1) addresses the work ability in relation to job demands directly.

Saarni et al. (2008) suggested that farmers with poor health may continue working because they find it mentally difficult to retire and sell their inherited farm, land, and cattle. Our findings are in accordance, as over 10% of the full-time dairy farmers in our study farmed despite of poor work ability. Furthermore, we hypothesize that the

poor work ability of one spouse leads to increased work burden on the other spouse, and thus gradually weakens his/her work ability as well. However, since all farmers in our study were from different farms, this hypothesis remains to be confirmed in future studies.

Strengths and Limitations of the Study

The strengths in this study include use of the Work Ability Index questionnaire, which has been validated and is commonly used. The strengths also include access to a large and representative base population of active dairy farmers in Finland. The response rate (41.5%) was lower than desired, and a limitation, but typical for recent surveys among farmers, reflecting the high record keeping and reporting burden in farming. Nearly 30% of the final responses were obtained after one reminder. The response percentage could potentially have been better if an additional reminder and new WAI questionnaires were mailed out. The respondents had an age distribution (average 44.5) very similar to that of the target group (average 45) and the general farming population in Finland (average 46). Females were slightly over-represented in our stratified random sample. Females also had a higher response rate.

We selected larger farms, at least 30 ha of farmland in our population and 29.9 ha on the average among all farms (Tike, 2009). As small dairy farms are rapidly discontinuing production, we aimed to use a sample that represents those dairy farmers who will likely continue their production in the coming years. The larger farm size may introduce some biases to our results. Confounding from the number of working hours per day and numbers of years worked on dairy farms may also affect the results. We did not address these potential biases and confounders in our analyses, which is a limitation of our study.

It is possible that our study includes a self-selection bias, and it is unknown which way it affects the results. On one hand, those with lower physical or mental work ability, or both, may have greater barriers to responding to surveys. On the other hand, those with physical and mental conditions may be more knowledgeable and more interested in responding to such surveys. We have no clear indications from our data regarding biases from self-selection.

Conclusions and Recommendations

We conclude that the decrease in work ability with age, particularly among females, may force farmers to discontinue dairy operations or to make costly changes in production well before the usual retirement age. Farmers may also continue operating with health conditions that reduce their quality of life in general.

This study indicates that interventions are urgently needed among older farmers, particularly women, to help them improve or restore their work ability. Early interventions to maintain and support work ability include health examinations and recommendations for healthy lifestyle and working methods, given by the farmers' occupational health service centers, which are commonly utilized by dairy farmers in Finland. Later stage interventions to improve and restore work ability include specifically designed courses for farmers in rehabilitation centers, improvements in working conditions funded by the social insurance systems, and personal consultation. Disability pensions are available if the working ability cannot be restored.

Dairy producers who are less than 45 years of age and who plan to expand their operations are also in need of activities for maintaining their work ability. They have many working years ahead and, in most cases, excellent or good work ability, which should be maintained by increasing their awareness of risks and providing activities to maintain their work ability. Young farmers, who expand their farm operations, should also receive guidance regarding mental work ability, as they have frequently voiced their concerns about the mental strain caused by their work. Further research on factors such as sufficient rest and leisure and organization of farm work is needed.

The first question in the WAI questionnaire correlates well with the complete questionnaire-based WAI in this study. Further studies may be conducted to determine if this question alone can be used in surveys in general as a condensed version of the WAI. Based on this study, we recommend using the Work Ability Index questionnaire in future intervention studies in agriculture.

Acknowledgements

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