

Farmers are at risk for anxiety and depression: the Hordaland Health Study

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Aims	To examine whether, and why, farmers and non-farmers differ regarding levels of anxiety and depression.
Methods	The study encompassed 17 295 workers age 40–49 years, including 917 farmers, from the population-based Hordaland Health Study 1997–99 (HUSK). Levels of anxiety and depression were assessed by the Hospital Anxiety and Depression Scale (HADS-A and HADS-D, respectively). Self-reported information on various work-related factors, demographics, lifestyle and somatic health problems was included. The main analytical methods were univariate analysis of variance (ANOVA) /Kruskal–Wallis test, χ^2 /Fisher's exact test and logistic regression.
Results	Compared with non-farmers, farmers had higher levels and prevalences of depression, particularly the male farmers, who also had higher anxiety levels. Among men, farmers reported longer work hours, lower income, higher psychological job demands and less decision latitude compared with non-farmers. Farmers had physically heavier work and a lower level of education than non-farmers. Generally, the differences were largest between full-time farmers and non-farmers. Differences in anxiety and depression levels between male full-time farmers and non-farmers could be explained by the farmers' longer work hours, physically harder work and lower income.
Conclusions	Farming is associated with increased levels of anxiety and increased levels and prevalences of depression. As regards depression, preventative measures and screening for cases in need of treatment should be strongly considered.
Key words	Anxiety; depression; farmers; Hospital Anxiety and Depression Scale (HADS)
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Introduction

Although a number of studies have shown that farmers in general are healthier than the average working population [1–4], some studies indicate that this advantage may be

decreasing [5]. Proposed explanations for this trend include the considerable mechanization, rationalization, financial strain, and social isolation that have taken place in agriculture in the Western world over the last years. Recently, *Occupational Medicine* devoted an issue to agriculture and health, out of concern for occupational health in British agriculture [6]. In a large population-based study of anxiety and depression in relation to occupations, we found that male agricultural workers had the highest level of depression of all occupational groups [7]. Also, the level of anxiety in male farmers was significantly higher than the average level among all working male participants. These findings are in accordance with Roberts and Lee [8], who, based on data from the Epidemiologic Catchment Area (ECA)

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Program, found 'farming, fishing and forestry' to have the highest lifetime risk for major depression. Other studies have shown increased suicide rates among farmers [9,10]. While knowledge of risk factors for anxiety and depression in farmers may facilitate preventive actions, such knowledge is scarce. The aim of this study was to examine the levels of anxiety and depression in farmers (full- and part-time) compared with working non-farmers. It was carried out in a large Norwegian population-based sample of men and women living and working in both urban and rural settings. The following research questions were posed:

1. Do levels of anxiety and depression (and prevalences of anxiety disorder and depression) differ between farmers and non-farmers, and between subgroups of farmers?
2. Do farmers (full- and part-time) and non-farmers differ regarding psychosocial work place environment, work hours and other work-related factors, demographics, lifestyle and somatic health problems?
3. To what extent do possible differences found in (2) explain the eventual differences found in (1)?

Material and methods

Study population

The Hordaland Health Study 1997–99 (HUSK) was conducted as a collaboration between the National Health Screening Service, the University of Bergen and local health services. The study population included the 29 400 individuals born between 1953 and 1957 who resided in Hordaland county (Western Norway) on 31 December 1997. A total of 8598 men and 9983 women participated, yielding a participation rate of 57% for men and 70% for women. The study also included a sample of 4849 individuals born in 1950–1951 who had participated in an earlier study conducted in 1992–1993. This cohort had participation rates of 73 and 81% for men and women, respectively. Thus, a total of 22 293 (65%) of those invited participated in the study.

The present study encompassed only those participants who were defined as workers (i.e. those who worked at least 100 income-giving hours the preceding year) and who also had valid Hospital Anxiety and Depression Scale (HADS) ratings. These selection criteria gave a total sample of 17 295 individuals, who constituted 85% of the 20 293 participants who had registered as workers. Of the 17 295, 330 (204 men and 126 women) were full-time and 587 (369 men and 218 women) part-time farmers. Because the proportion of the source population (34 249 individuals) which was employed is not known, response rates cannot be calculated.

Data collection for the HUSK was performed in two

steps. The first, which was identical for all participants, included a self-administered questionnaire and a health examination. In the second step, the two age cohorts, 1950–1951 and 1953–1957, were given different questionnaires. The analyses of research question (3) were carried out without those born in 1950–1951. In addition, 'psychological demands' and 'decision latitude' were omitted from these analyses because only half of the 1953–1957 cohort were asked about them. Thus, the number with valid information on all variables except 'psychological demands' and 'decision latitude', constituting the sub-sample used to analyse research question (3), was 11 134 (5505 men and 5629 women). This sub-sample encompassed 81% of the men and 73% of the women in the main sample who were born in 1953–1957. It did not differ significantly from the main sample as to the HADS scores (Table 1).

Measurements

Anxiety and depression

Levels of anxiety and depression were assessed by the HADS, which has been found to perform well in assessing symptom load and caseness (i.e. 'possible cases') of anxiety and depressive disorders in somatic, psychiatric and primary care patients, as well as in the general population [11]. Valid HADS scores were defined as having answered at least five of seven items on both the anxiety (HADS-A) and the depression (HADS-D) sub-scales. Each item was scored on a four-point scale from 0 to 3, and the item scores were added, giving sub-scale scores from 0 (minimum symptom level) to 21 (maximum symptom level). The scores of those who filled in five or six items were based on the sum of completed items multiplied by 7/5 or 7/6, respectively.

Caseness was defined as a score of ≥ 8 on HADS-A and/or HADS-D, as this cut-off level has been shown to give an optimal balance between sensitivity and specificity on receiver operating characteristic curves [11].

Work-related variables

The self-administered questionnaires included an open-ended question of main occupation, manually classified according to Standard Classification of Occupations, ISCO-88(COM) [12]. ISCO-88(COM) has a four-level hierarchical structure, and is divided into 10 major groups (e.g. 6: 'agricultural, forestry and fishery workers'), 31 sub-major groups (e.g. 61: 'agricultural workers'), 108 minor groups (e.g. 612: 'animal producers') and 353 unit groups (e.g. 6121: 'dairy and livestock producers').

An additional question specifically asked whether the participants were farmers 'full-time or part-time'. This enabled the categorization of participants into full-time

farmers (having farming as their main occupation), part-time farmers (having their main work outside of the farm and farming as part-time job) and non-farmers (neither full- nor part-time farmers). Part-time farmers included individuals presumably running a farm, or working on a farm, as well as farmers' spouses who contributed to the work on the farm.

A 10-item version of a questionnaire developed by Theorell *et al.* (11 items) based on the Demand–Control Model by Karasek and Theorell, covered psychological demands and decision latitude (control) in the workplace [13,14]. The psychometric properties of the 10-item version have been found to be satisfactory (B. Sanne *et al.*, submitted for publication). Other work-related questions included number of paid work hours per week, the opportunity to use one's abilities at work and level of physical activity at work (mainly sedentary/work demanding much walking with or without much lifting/heavy manual labour).

Demographics, individual lifestyle and somatic health problems

Information concerning the following was also collected: level of education, the household's total income, marital status, parity, daily smoking, alcohol consumption (alcohol units per fortnight, categorized into teetotallers/low-risk consumption/high-risk consumption, the latter defined as consumption above 21 units per week for men and 14 units per week for women), leisure time physical activity [categorized into three groups: 1–2 points/3–5 points/6–8 points, using a scale from 1 point (no exercise) to 8 points (three or more hours per week of both heavy and light exercise)], perception of having 'enough good friends', musculo-skeletal problems (pain and/or stiffness in the last 12 months, at least 3 months continuously, as well as resulting in reduced work capacity or sick leaves), chronic somatic diseases (having or having had one or more of the following: myocardial infarction, angina pectoris, hypertension, stroke, asthma, chronic bronchitis, diabetes mellitus or multiple sclerosis) and the physical composite score (PCS) of the quality-of-life scale SF-12 Health Survey (the higher the score, the better the reported physical health) [15]. Body mass index (BMI, weight in kg/height in m²) was calculated from measured height and weight.

Statistics

All analyses were stratified by gender, due to different mean HADS scores and a considerably different distribution pattern of occupations between genders [7].

Univariate analysis of variance (ANOVA) was used to test the hypothesis of no differences in mean HADS scores between farmers and non-farmers, and between subgroups of farmers. As Levene's test of equality of

variances showed that the variances differed between the groups for mean HADS-D scores in most of the tests performed, these analyses were repeated using the non-parametric Kruskal–Wallis test. Unless otherwise stated, the two methods gave equivalent levels of significance. The significance level was set to $P = 0.05$ with two-sided tests. All HADS-A and HADS-D scores throughout the article refer to mean HADS scores for the current groups.

Cross-tabulations and χ^2 -test/Fisher's exact test were used to examine if and how the groups differed regarding prevalences of anxiety and depressive disorders and regarding work-related factors, demographics, lifestyle and somatic health problems. Possible differences in anxiety and depression caseness were also examined by logistic regression.

ANOVA was used to adjust the HADS-A and HADS-D scores for possible confounders, primarily by using two-way ANOVA. Then, for the differences in HADS scores that could not be explained by a single variable, different models were made for the simultaneous adjustment of several explanatory factors. The models were based on themes ('work-related', 'demographics', 'individual lifestyle' and 'somatic health problems'), the different variables' explained variance (in one-way ANOVA with the corresponding HADS score as the dependent variable) and on variables that differed most between farmers and non-farmers (Table 3).

The analyses were performed by means of SPSS for Windows, version 11.0.

Ethics

The study protocol was cleared by the Regional Committee for Medical Research Ethics of Western Norway and approved by the Norwegian Data Inspectorate.

Results

HADS scores

Men, both farmers and non-farmers, had significantly higher HADS-D scores than women. Farmers (both full-time, part-time and all farmers) had significantly higher HADS-D levels than non-farmers in both genders, and significantly higher HADS-A levels in men (Table 1). Compared with part-time farmers, both male and female full-time farmers showed higher HADS-D scores, but these differences were not statistically significant.

Examination of full-time agricultural workers on the 3rd and 4th digit levels of the ISCO-88(COM) identified male 'animal producers' (code 612) as the group with the highest HADS-D level. All but three of the 82 men were 'dairy and livestock producers' (code 6121).

Table 1. HADS^a scores (mean and 95% confidence interval) in farmers and non-farmers in the Hordaland Health Study

	Men			Women		
	<i>n</i>	HADS-A ^b	HADS-D ^b	<i>n</i>	HADS-A ^c	HADS-D ^d
1. Non-farmers	7508	4.30 (4.23–4.37)	3.38 (3.31–3.44)	8870	4.76 (4.69–4.83)	2.88 (2.83–2.94)
2. All farmers (full- and part-time)	573	4.84 (4.58–5.09)	4.42 (4.15–4.69)	344	4.99 (4.63–5.36)	3.44 (3.12–3.77)
3. (a) Full-time farmers	204	4.80 (4.38–5.22)	4.72 (4.27–5.17)	126	4.86 (4.22–5.51)	3.61 (3.02–4.20)
(b) Part-time farmers	369	4.85 (4.52–5.18)	4.25 (3.91–4.59)	218	5.07 (4.63–5.51)	3.35 (2.96–3.73)
4. Animal producers	82	5.15 (4.49–5.81)	5.17 (4.37–5.97)	33	4.74 (3.46–6.02)	3.34 (2.34–4.34)

^aHospital Anxiety and Depression Scale; HADS-A: anxiety score; HADS-D: depression score.

^bGroup 1 differed significantly ($P < 0.05$) from each of the groups 2, 3(a), 3(b) and 4. The differences between 3(a) and 3(b) were not significant (one-way ANOVA, and Kruskal–Wallis test when Levene's test of equality of variances showed heteroscedasticity).

^cGroup 1 did not differ significantly from any of the groups 2, 3(a), 3(b) and 4. Nor were the differences between 3(a) and 3(b) significant (one-way ANOVA).

^dGroup 1 differed significantly from each of the groups 2, 3(a) and 3(b). The differences between 3(a) and 3(b) were not significant (one-way ANOVA/Kruskal–Wallis test).

To get an indication whether the observed differences in HADS-A and HADS-D scores between farmers and non-farmers were clinically significant, caseness in the groups was examined. There were no significant differences in prevalences of 'possible' anxiety disorder between farmers and non-farmers, or between full- and part-time farmers. However, farmers had significantly higher prevalence of 'possible' depression than non-farmers, except for female part-time farmers and animal producers (Table 2). Compared with non-farmers, the odds ratios (ORs) for depression caseness in male and female full-time farmers were 2.3 and 2.1, respectively. Full- versus part-time farmers did not differ as to the prevalence of depression. Some 24% of male animal producers were 'possible' cases of depression (not significantly higher than for other male full-time farmers), corresponding to an OR of 3.1 compared with male non-farmers.

Work-related factors

Table 3 shows the characteristics of farmers and non-farmers that differed significantly between the two groups. Male farmers experienced higher psychological job demands and slightly less decision latitude than non-farmers. Generally, women had fewer paid work hours per week than men. While 40% of male full-time farmers worked >50 h, the corresponding proportions for part-time and non-farmers were 8 and 4%. Female full-time farmers had significantly fewer paid work hours than female part-time farmers and non-farmers. Being often able to use one's abilities at work was less frequently reported by women than by men, and least by female full-time farmers. The level of physical activity at work was considerably higher among men than women. In both genders it was considerably higher in full-time than

in part-time farmers, and in part-time farmers compared with non-farmers.

Demographics, individual lifestyle and somatic health problems

Level of education and income were considerably lower in full- than in part-time farmers, and considerably lower in part-time farmers than in non-farmers.

Male farmers were more likely to be unmarried than non-farmers. However, since farmers of both genders were less likely to be widowed, separated or divorced, a higher proportion of farmers were married compared with non-farmers (92% of female farmers versus 75% of female non-farmers). Female farmers had children more often, and farmers of both genders had more children, than non-farmers.

Farmers were more likely to be non-smokers and teetotallers, and they had a lower alcohol consumption than non-farmers. Male farmers, particularly those working part-time, were more physically active in leisure time than non-farmers.

Male farmers scored lower than non-farmers on the SF-12 physical composite score, and male part-time farmers had more musculo-skeletal problems than full-time farmers and non-farmers, while female farmers were less likely to have musculo-skeletal problems than non-farmers.

The lowest income male group and work hours

The percentage of full-time farmers having an annual household income of <200 000 NOK (in 1999 equivalent to EUR 24 067) was 31%, while the corresponding figures for part-time and non-farmers were 9 and 5%, respectively. In this lowest income group, 35% (15 of 43) of full-time farmers worked >50 h per week, while the corresponding numbers for part-time

Table 2. HADS-D^a caseness^b in farmers and non-farmers in the Hordaland Health Study: percentages (%) and odds ratios^c (ORs) with 95% confidence intervals (CI)

	Men		Women	
	% ^d	ORs (95% CI)	% ^d	ORs (95% CI)
1. Non-farmers	9.3	1.00 (reference)	7.3	1.00 (reference)
2. All farmers (full- and part-time)	17.3	2.03 (1.61–2.55)	13.2	1.68 (1.19–2.35)
3. (a) Full-time farmers	19.1	2.30 (1.61–3.28)	14.3	2.12 (1.28–3.52)
(b) Part-time farmers	16.3	1.89 (1.42–2.51)	10.1	1.43 (0.91–2.24)
4. Animal producers	24.4	3.13 (1.88–5.22)	9.1	1.27 (0.39–4.18)

^aHospital Anxiety and Depression Scale; HADS-D: depression score.^bPossible cases^c: HADS-D score ≥ 8 .^cFrom logistic regression with non-farmers as reference group.^dThe differences between 3(a) and 3(b) were not significant (Pearson's χ^2 test/Fisher's exact test: $P > 0.05$).**Table 3.** Characteristics of farmers and non-farmers in the Hordaland Health Study (%)

Variables/categories	Men				Women			
	Full-time farmers	Part-time farmers	All farmers	Non-farmers	Full-time farmers	Part-time farmers	All farmers	Non-farmers
Psychological demands, highest level (4th quartile)	25.6	23.9	24.5	17.8 ^a	8.2	17.8	14.2	15.7
Decision latitude (control)								
Highest level (1st quartile)	6.3	15.7	12.6	19.3 ^b	0.0	9.0	5.7	10.1 ^c
Lowest level (4th quartile)	5.1	22.6	16.8	12.7 ^b	15.3	27.0	22.6	23.5 ^c
Number of paid work hours per week								
<20	8.3	2.7	4.5	2.1 ^b	40.0	18.8	25.5	12.2 ^b
>50	40.1	8.3	18.4	4.1 ^b	3.3	0.5	1.4	0.6 ^b
Often opportunity to use one's abilities at work	75.6	75.1	75.3	79.0	56.4	68.6	64.3	71.9 ^b
Heavy manual labour at work	75.3	18.7	40.2	4.9 ^b	37.0	1.6	13.3	0.4 ^b
Level of education								
Less than A-levels/high school	80.9	64.5	70.3	50.4 ^b	65.8	58.3	61.0	52.2 ^b
College/university	6.7	27.9	20.4	40.5 ^b	15.1	29.8	24.4	37.0 ^b
Annual household income in NOK ^d								
<200 000	31.3	8.9	16.8	4.7 ^b	26.1	18.1	21.2	14.3 ^b
>500 000	4.5	10.0	7.5	29.4 ^b	6.3	8.8	7.2	27.0 ^b
Marital status								
Unmarried	18.1	17.1	17.5	13.4 ^b	5.6	3.2	4.1	9.7 ^b
Married, registered partner	78.4	77.5	77.8	75.1 ^b	89.7	93.6	92.2	75.0 ^b
Widow/-er, divorced, separated	3.4	5.4	4.7	11.4 ^b	4.8	3.2	3.8	15.3 ^b
Child(-ren)	86.3	82.9	84.1	86.6	96.0	95.9	95.9	90.2 ^b
Daily smoking	29.9	28.5	29.0	33.6 ^a	23.8	29.4	27.3	34.2 ^b
Alcohol consumption, teetotallers	9.3	9.5	9.4	5.8 ^b	19.8	14.2	16.3	8.1 ^b
Leisure time physical activity, highest level	57.6	68.5	64.6	50.7 ^b	53.7	51.2	52.1	49.3
Musculo-skeletal problems	10.0	16.1	13.9	10.6 ^b	9.7	12.4	11.4	15.7 ^a
Chronic somatic diseases	8.3	10.0	9.4	12.5 ^a	7.9	11.5	10.2	11.8
SF-12 physical composite score, highest level (4th quartile)	23.0	19.4	20.7	26.2 ^b	20.9	24.3	23.0	25.7

^aNon-farmers differed significantly from all farmers (Pearson's χ^2 test or Fisher's exact test: $P < 0.05$).^bNon-farmers differed significantly from (i) all farmers and (ii) full-time and/or part-time farmers (Pearson's χ^2 test or Fisher's exact test).^cNon-farmers differed significantly from full-time and/or part-time farmers (Pearson's χ^2 test).^dIn 1999, NOK 200 000 and 500 000 were equivalent to EUR 24 067 and 60 168, respectively.

farmers and non-farmers were 4 and 3%. Thus, full-time farmers, who constituted 3% of the working population, represented 63% of those with lowest income who worked >50 h a week. Even though more male farmers

than non-farmers were unmarried, this could not explain these findings. In fact, 11 of the 13 married, lowest income workers who worked >50 h per week were full-time farmers.

Could the differences in HADS scores be explained by other factors?

The difference in HADS-A levels between male full-time farmers and non-farmers could be explained by each of the variables work hours, level of physical activity at work, and household income. However, none of the other differences in HADS scores between farmers and non-farmers (Table 1) could be explained by single factors.

The differences in HADS-D levels between full-time farmers and non-farmers could be explained by the combination of work hours and opportunity to use one's abilities at work for women, and the triplet of work hours, level of physical activity at work and income for men. However, the differences in HADS scores between part-time farmers and non-farmers could not be explained by any model.

Discussion

The study showed that male farmers had higher anxiety levels and farmers of both genders higher depression levels as well as higher prevalences of 'possible' depression compared with non-farmers. Among all groups, male animal producers had the highest depression level.

Compared with non-farmers, male farmers reported longer work hours and lower income, while more farmers than non-farmers had heavy manual labour and a low education level.

Differences in anxiety and depression levels between male full-time farmers and non-farmers could be explained by differences in work hours, level of physical activity at work and household income, while the corresponding difference in HADS-D score in women could be explained by work hours and opportunity to use one's abilities at work. However, none of the differences in HADS levels between part-time farmers and non-farmers could be explained by factors measured in the study.

Study strengths and limitations

This study is, to our knowledge, the largest published so far that examined levels of anxiety and depression in farmers, and one of the few that have examined anxiety in this occupation. The assessment of both anxiety and depression levels is important, due to the high correlation between anxiety and depressive symptoms [11].

The large sample size allowed stratification on gender and examination of subgroups of farmers. The gender-specific analyses are important due to the different HADS scores between genders. Also, the knowledge on levels of anxiety and depression in female farmers is minimal, as the few studies that involved female farmers only included a low number. Further, the comparison between full- and part-time farmers has not been previously addressed. Finally, the relatively large number of other work-related

variables included allowed the investigation of possible explanatory factors between farmers and non-farmers, which had not been possible in most prior studies.

The most important limitation of the study is its cross-sectional design. However, the study results confirm the hypothesis that farmers are at risk for depression. The narrow age ranges reduce the generalizability of the findings. On the other hand, because of the large sample size and the age homogeneity, a more thorough investigation of subgroups was possible (gender and subgroups of farmers).

The moderate participation rate warrants some remarks: non-responders to surveys have been found to have higher prevalences of mental disorders [16,17]. The 'Healthy Worker Effect' is well-known [18], and also in our material the unemployed had considerably higher anxiety and depression levels than workers. Thus, in the present study, it is probable that the proportion of working individuals was higher among those participating compared with those not.

The lack of data on farm size represents a limitation. According to the Norwegian Farmers' Union, the average farm in Hordaland county is relatively small compared with farms in other Norwegian counties. Compared with farmers on large farms, those on small farms probably have lower income and higher levels of economic stress, and possibly less social support [19]. When adjusting for possible explanatory factors, the sub-sample used was considerably smaller than the main group of participants. However, the sub-sample did not differ significantly from the main sample with regard to HADS scores, supporting the generalizability of the findings in the sub-sample.

The HADS does not provide definite diagnoses of anxiety and depressive disorders. However, because of the Healthy Worker Effect, it is to be expected that the main part of the variation in HADS scores in our sample was found in the sub-clinical area. This strengthens the argument for comparing levels of symptom load in addition to comparing prevalences of cases.

We showed that the higher depression level in female full-time farmers compared with non-farmers could be explained by less opportunity to use one's abilities at work and fewer work hours. However, the validity of this finding is weakened by two conditions: (i) information acquired through self-administered questionnaires may be biased towards the negative in depressed individuals [20]. Thus, subjective responses, such as self-reports on having the opportunity to use one's abilities at work, could be skewed by a depressed mood; and (ii) the issue of the number of paid work hours per week is problematic as related to farming, since much of the work may not be considered as 'paid'. This may be particularly relevant for farmers' wives who reported to be farmers. Thus, perhaps farmers, particularly women and full-time farmers, have

tended to underreport the number of 'paid work hours per week'.

Finally, because part-time farmers constitute a heterogeneous group regarding education, primary occupation, etc., it may be argued whether they can be truly considered as one sub-group. However, part-time farmers all have farming as a secondary occupation, a characteristic relevant to compare, in relation to both non-farmers and those who depend on farming as their main source of income.

Relation to literature findings

The higher level of depression in men than in women in our study agrees with the findings from the large Norwegian population-based HUNT study, where the odds ratio for HADS depression caseness was significantly higher in men compared with women [21].

Riise *et al.* [22] assessed the HUSK participants' mental health-related quality of life by the mental composite score (MCS) of the SF-12 Health Survey. They concluded that '... the most striking finding was the low score of the agriculture, forestry and fishery workers. Most of these were farmers ...'. Thus, the MCS scores strengthen our own results, which show that farmers are at risk for reduced mental health. The findings of increased depression levels and prevalences in farmers are also congruent with the findings of Roberts and Lee [8]. However, with regard to anxiety in male farmers, ours is the first large study to show increased levels.

Other novel findings are the equally high levels of anxiety and depression in both full- and part-time farmers, and that the differences in HADS scores between full-time farmers and non-farmers could be explained by measured factors, while the corresponding differences between part-time farmers and non-farmers could not.

Selection or 'wear and tear'?

Increased levels of anxiety and depression may be due to one or more of the following:

1. An increased selection into farming of individuals prone to anxiety/depression. A lower level of education and more unmarried men among farmers than non-farmers may strengthen this hypothesis [17].
2. A decreased selection out of farming of individuals prone to anxiety/depression. Although a theoretical possibility, it is equally probable that difficulties related to agricultural work have caused exclusion of anxiety/depression-prone persons [23].
3. A consequence of 'wear and tear': job conditions, as a major source of environmental influence, may influence the development of anxiety and depression [14,24].

Our finding that the considerable difference in depression level between male full-time farmers and non-farmers could be explained by the full-time farmers' longer work hours, physically harder work and lower income strengthens the 'wear and tear' hypothesis. These and other of our findings are congruent with leading stress and burnout theories:

1. The Demand–Control Model states that high psychological job demands (including a heavy work load) and scarce decision latitude increase symptoms of anxiety and depression [14]. Some 40% of male full-time farmers worked >50 h a week (the corresponding figure for British farmers is >70% [19]), which in itself has been shown to have negative health effects [25].
2. A low and declining income among farmers is not particular to Norway. Worries about finance has been identified in several studies as the most important stressor in farmers' lives [19]. Economic stress has consistently emerged as one of the important predictors of psychiatric morbidity and suicide [19,23]. Ortega *et al.* [23] found that an increased depression rate was associated with worsening of the farm economy. According to the Effort–Reward Imbalance Model, the combination of a heavy work load and low reward (financially, job insecurity, etc.) is considered particularly stressful [26]. Male animal producers, having the highest HADS-D level and a heavy work load, is at present the farming group in Norway that experiences the most adverse financial situation, due to the current agricultural policy.
3. Maslach *et al.*'s [27] comprehensive 'Person within Context' Burnout Model states that burnout (which may cause anxiety and depression) is the result of a mismatch between person and job environment in the following areas: excessive workload, lack of control (including overwhelming responsibilities), lack of reward, unfair treatment, conflict of values, and lack of a functioning community (or social support). With regard to the latter, farming has become a lonely occupation [5]. In addition, the long work hours reduce farmers' possibilities of social interaction during leisure time.

High HADS levels in spite of a more conservative and 'healthy' lifestyle among farmers (less divorce, more children, fewer smokers, less alcohol consumption and among men, more physical activity in leisure time) may also point in the direction of the 'wear and tear' hypothesis. Likewise does the farmers' poorer physical health, which may be related to their heavy physical work and an increased risk for occupational accidents (e.g. mechanical equipment, pesticides and other chemicals) and disorders (e.g. pulmonary and skin diseases) [28].

Finally, the 'existential crisis' currently among farmers

probably also represents a considerable strain, namely the prospect of having to give up their way of life and the land itself, handed down for generations [29]. This means that many farmers face much more than a threat of job loss, which in itself is a considerable stress factor [14].

If the 'wear and tear' hypothesis applies to our findings, it might be expected that participating in work life outside of the farm would protect part-time farmers against anxiety and depressive symptoms. On the other hand, the strain of having two (or more) jobs, negative characteristics of the main work and frustrations due to having given up farming as one's main occupation may have the opposite consequences. Alternatively, the lack of significant differences in HADS levels between full- and part-time farmers could indicate that none of these factors are influential. Notwithstanding, the explanatory factors of the high HADS scores in part-time farmers differ from those of full-time, and should be sought outside the variable list of this study.

Conclusion

Our findings show that present-day farming is a strenuous and stressful occupation, associated with increased levels of anxiety and depression. Current agricultural policy suggests that the future of farming is uncertain at best, a situation which may affect farmers' mental health. The high levels and prevalences of depression among farmers, in particular among men, are concerning. Preventative measures, such as mental health educational programs, teaching of coping strategies, self-help groups and specific practical support (with financial problems, retraining for those who wish to leave farming, etc.) [19], as well as screening for cases in need of treatment should be strongly considered.

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