Journal of Agromedicine

ISSN: 1059-924X (Print) 1545-0813 (Online) Journal homepage: http://www.tandfonline.com/loi/wagr20

International Perspectives on Psychosocial Working Conditions, Mental Health, and Stress of Dairy Farm Operators

Christina Lunner Kolstrup PhD , Marja Kallioniemi MSc , Peter Lundqvist PhD , Hanna-Riitta Kymäläinen PhD , Lorann Stallones MPH PhD & Susan Brumby PhD

To cite this article: Christina Lunner Kolstrup PhD , Marja Kallioniemi MSc , Peter Lundqvist PhD , Hanna-Riitta Kymäläinen PhD , Lorann Stallones MPH PhD & Susan Brumby PhD (2013) International Perspectives on Psychosocial Working Conditions, Mental Health, and Stress of Dairy Farm Operators, Journal of Agromedicine, 18:3, 244-255, DOI: 10.1080/1059924X.2013.796903

To link to this article: https://doi.org/10.1080/1059924X.2013.796903

Published online: 11 Jul 2013.

Journal of Agromedicine, 18:244–255, 2013

ISSN: 1059-924X print/1545-0813 online
DOI: 10.1080/1059924X.2013.796903

Taylor & Francis
Taylor & Francis Group

International Perspectives on Psychosocial Working Conditions, Mental Health, and Stress of Dairy Farm Operators

Christina Lunner Kolstrup, PhD
Marja Kallioniemi, MSc
Peter Lundqvist, PhD
Hanna-Riitta Kymäläinen, PhD
Lorann Stallones, MPH, PhD
Susan Brumby, PhD

ABSTRACT. Dairy farm operators—farmers, workers, and family members—are faced with many demands and stressors in their daily work and these appear to be shared across countries and cultures. Dairy operators experience high psychosocial demands with respect to a hard work and production ethos, economic influences, and social and environmental responsibility. Furthermore, both traditional and industrial farms are highly dependent on external conditions, such as weather, fluctuating markets, and regulations from government authorities. Possible external stressors include disease outbreaks, taxes related to dairy production, and recent negative societal attitudes to farming in general. Dairy farm operators may have very few or no opportunities to influence and control these external conditions, demands, and expectations. High work demands and expectations coupled with low control and lack of social support can lead to a poor psychosocial work environment, with increased stress levels, ill mental health, depression, and, in the worst cases, suicide. Internationally, farmers with ill mental health have different health service options depending on their location. Regardless of location, it is initially the responsibility of the individual farmer and farm family to handle mental health and stress, which can be of short- or long-term duration. This paper reviews the literature on the topics of psychosocial

Christina Lunner Kolstrup and Peter Lundqvist are affiliated with the Department of Work Science, Business Economics and Environmental Psychology, Swedish University of Agricultural Sciences, Alnarp, Sweden.

Marja Kallioniemi is affiliated with the Department of Economic Research, MTT Agrifood Research Finland, Vihti, Finland.

Hanna-Riitta Kymäläinen is affiliated with the Department of Agricultural Sciences, University of Helsinki, Helsinki, Finland.

Lorann Stallones is affiliated with the Department of Psychology, Colorado State University, Fort Collins, Colorado, USA; and the Department of Epidemiology, Colorado School of Public Health, Fort Collins, Colorado, USA.

Susan Brumby is affiliated with the National Centre for Farmer Health, School of Medicine, Deakin University, Hamilton, Australia.

Address correspondence to: Christina Lunner Kolstrup, PhD, Department of Work Science, Business Economics and Environmental Psychology, Swedish University of Agricultural Sciences, P.O. Box 88, SE-230 53 Alnarp, Sweden (E-mail: christina.kolstrup@slu.se).

working conditions, mental health, stress, depression, and suicide among dairy farm operators, farm workers, and farm family members in an international perspective.

KEYWORDS. Agriculture, burnout, farmers, mental strain, suicide

INTRODUCTION

Farming, especially livestock farming, differs in many ways from other occupations. Epidemiologists consider the working environment on farms to be especially challenging, because of the diversity and complexity.[1] Globally, dairy farming has undergone extensive structural changes in recent decades. Dairy farms have become fewer, but herd size larger. The expansion from a small family business to a large operation with thousands of dairy cows means increased investments, greater financial responsibility, adaptation to new technologies, and new risks, changed employee-employer responsibilities, different hours and type of work, and a transformation from family farmer to entrepreneur.

Greer[2] describes the current role of farming as multifaceted; in addition to traditional food production, this sector increasingly has other responsibilities such as promoting sustainability related to the environment; development of rural areas; animal welfare; and quality and safety of food products. These changes and transitions may be difficult for most dairy operators and may put a mental strain on members of the farming community.[3,4]

The objective of this paper is to provide a review of the psychosocial working conditions, mental health and level of stress, depression, and suicide among dairy farm operators, farm workers, and farm family members from an international perspective.

METHODOLOGY

This review article was a conjoint project with researchers from Europe, USA, and Australia and the authors have been working in the research field of psychosocial work environment and mental health among farmers, farm workers, and farm families for several years. In developing this review, a snowballing and saturation approach was adopted with the following databases searched: PubMed, Google Scholar, PsycINFO, Scopus, Ebrary, and Web of Science. The key words used in the search procedure were agriculture, farming, livestock farming, dairy farming, dairy farmer, dairy farm operator, dairy farm worker, dairy farm family, migrant workers, rural population, employer, employee, psychosocial work environment, psychosocial working conditions, psychosocial factors, stress factors, stressors, demand, control, social support, internal factors, external factors, health, illness, mental health, mental problems, ill mental health, mental symptoms, mental strain, distress, anxiety, stress, burn out, exhaustion, fatigue, depression, alcohol and drug abuse, suicide, occupational health care, and health services.

Scientific peer-reviewed, English-language research articles, books, e-books, dissertations, and reports were included as literature in this review. The process of selection was (1) reading the title and abstract of the articles or summary of other books, dissertations and reports; (2) reading the full-length articles on the topic and related to dairy farming or livestock farming; and (3) complementing with relevant new references in the found literature.

THE PSYCHOSOCIAL WORK ENVIRONMENT IN DAIRY FARMING

Webster[5] classified the past, current, and future of livestock farming into four categories: (a) traditional; (b) industrial; (c) value-led; and (d) one-planet agriculture. In the present review, we reduced this classification to two types: traditional dairy farming with smaller herd size and manual work; and industrial dairy farming with automated systems, employed workers, and larger herd size.

Traditional Dairy Farming

Dairy farming has unique attributes that impact on farmers' health. Within the traditional dairy farm, the farming family often lives on the farm, including husband, wife, children, grandparents, and perhaps grown-up children and extended family also taking part in the dairy tasks. A special characteristic of the agricultural work force in western countries is the larger proportion of older (over 65 years) and younger (under 16 years) workers compared with other occupational sectors.[1]

Operating a dairy farm involves working early mornings to late evenings, every day, 365 days a year, tending the herd and milking the cows daily. A case study on women's working conditions on 10 dairy farms in Finland found that the working day started on average at 6 AM and ended on average at 6.30 PM.[6] Small dairy farm operators are especially busy, running their farm with no employees and limited opportunities to take a leave or a holiday. Sudden illness or injury may also be a difficult situation to cope with.[6,7] Furthermore, being a small dairy operator means having home and work combined, which leaves little room for full relaxation away from work. Overall, work and home, professional life and private life, and fellow worker and husband/wife may be difficult to separate on farms.[8] Therefore, a personal or family crisis, e.g., serious disabling injury, divorce, or bankruptcy, can cause serious concerns for farmers and their families, resulting in remarkable mental pressure.[3,4]

Despite the global trend of fewer but larger dairy operations, there are still many small family dairy farms, but the decrease in the number of farms also implies an increase in the distance between farms. Many dairy operators work in daily solitude and have limited social contacts. The spouse may have a job outside the farm and not share the same daily work life anymore. Isolation and loneliness have reemerged as a social problem in agriculture today.[9] In a 1997–2001 monitoring study among dairy farmers, the social interaction between family members and neighbors decreased during the study period, indicating a change towards more individualistic values.[10] Farmers under these conditions might be facing and dealing with farm problems on their own, without nearby support.[3,4]

Industrial Dairy Farming

Specialization of livestock production on industrial dairy farms elevates the risk of dairy operators doing fewer work tasks, during longer hours and in adverse working conditions.[1] On the other hand, increased use of automated technology such as milking and forage distribution may relieve the physical demands of work and reduce or alter working times in the dairy. A new responsibility for operators is to monitor these new systems (automatic and robotic milking).

Large dairy operations employ a number of workers. For the farmer, this creates a new kind of professional role as an employer, including extended supervision of staff, wider responsibility for occupational safety, and wider overall management of the farm. The new demands also require new skills and knowledge,[11] such as good leadership, which has been observed to be an important element for work motivation in farm work.[12]

The trend in many Western countries is to use foreign/migrant workers in the dairies. These workers face different psychosocial work environments than farmers or domestic workers, including long work hours in a foreign country away from their family and friends, and social isolation caused by linguistic and cultural barriers. These conditions are often found to be associated with ill mental health, anxiety, depression, alcohol and drug abuse, and even suicide.[13,14]

Multifaceted Psychosocial Demands and Conditions

The International Labour Organization (ILO)[15] defined psychosocial factors at work as including the interplay within and among the work environment. In addition to the content and organization of work, a worker's competence, needs, cultural beliefs and practices, and personal issues may have an effect on work performance and work satisfaction. Most

TABLE 1. ILO[15] Psychosocial Factors at Work and International Characteristics of Dairy Farming

Psychosocial factors at work (ILO, 1986)[15]	Characteristics of dairy farming (source)
1. Physical work environment	Diverse and complex.[1] Traditional vs. industrial farming. Possibly physically demanding and injury risk tasks. New technology in use. High cognitive and sensory requirements.[16]
2. Factors intrinsic to the job; e.g., workload, repetitive work	Intensification of production and long working days. Meaningful work and positive features of work supporting mental health.[16,17]
3. Arrangement of work time	Working periods in cattle houses are outside the ordinary 9–5 working day. Long working days, especially during harvesting/calving.
4. Management and operating practices a. Worker role b. Worker participation c. Relationships at work d. Implementation of changes	a. A new role as an employer requires new skills.[11] Good leadership important for worker motivation.[12] Overlapping roles for farm woman, combination of farm worker and family responsibilities.[6,7] Employed workers with different ethnic and cultural background.[13,14] b. Participation in agricultural decision making may be limited or impossible.[18] c. Private and professional life difficult to separate.[8] Isolation and loneliness.[9] Lack of support and control.[19] d. Structural change; specialization, increased herd size per farm, and increased risks.
5. Technological changes a. Industrialization b. Introduction of new technologies	a. Industrial dairy farming may decrease human-animal contacts and this may be contradictory to, e.g., animal welfare.[20] b. New technologies may improve work conditions but during breakdowns the situation may be difficult to balance. Uses of new technologies often alter the working time and its daily rhythm compared with that on traditional farms.
6. Other factors	Declining economic situation.[2] Symptoms of exhaustion[21] and burnout.[22]

importantly, these factors may have an influence on workers' physical and mental health. The internationally reported characteristics of dairy farming are categorized in Table 1 using the ILO's psychosocial factors at work,[15] highlighting the link to psychosocial influences and possible ill mental health.

Dairy farm operators—farmers, workers, and family members—face many demands, expectations, and stressors in their daily work that are shared across countries and cultures. They may experience high internal demands with respect to hard work and production performance, stable farm income, and social and environmental responsibility. Furthermore, both traditional and industrial farms are highly dependent on external conditions, for which they have little or no control. These external factors include weather conditions, government laws and regulations, disease outbreaks, taxes and expenses related to dairy production, and negative societal attitudes to farming in general. However, farmers have few or no opportunities to influence and control those external conditions. Experiencing a high demand work environment coupled with low control and low social support[19] can lead to stress and strain, ill mental health, and depression, as described by Karasek.[23]

In everyday situations, dairy farmers may face challenges such as high workload, time pressure, machinery breakdown, difficulties understanding new technology, and hazardous working conditions. Economic factors, such as irregular and uncertain income, financial debt, and high interest rates, may elevate the strain. In addition, personal health problems, poor work-life balance, working with multigenerational family members, record keeping, and paper work cause mental strain for farmers.[18,24–27]

In the Nordic countries, studies have shown that young dairy farmers (30–44 years old)

experienced more conflict situations, worked longer hours, and were more worried than older colleagues.[28] They were also more concerned about financial problems and lack of holidays and had difficulties managing the conflicting demands of work and family. Swedish farmers and dairy farmers experienced high demands at work, but also a high degree of control and considered their work meaningful.[29,30] However, they felt more insecure regarding their work situation compared with other occupations. Swedish studies also found that dairy farm employees experienced less influence over decisions made on the farm and a faster work pace than dairy farm owners.[30] Female dairy workers in particular experienced excessive work demands, inadequate control and influence, and few opportunities for development and felt that leadership, feedback, and social support were poor on dairy farms.[18]

Danish farmers ($N = 374$) found the psychosocial work environment favorable in general but experienced high cognitive and sensory demands.[16] Development opportunities within the profession were valued as good and the farmers felt that they performed meaningful work. Although a number of Danish farmers worked alone, they had a large degree of social support from the surroundings.[16] Melberg[17] concluded, based on a wide survey ($N = 3383$) conducted in 1995, that Norwegian farmers also did not experience distress. This lack of distress may be because their way of living provided positive features for mental health, e.g., freedom, independence, fresh air, and work with farm animals.

In general, global dairy farming is associated with small family farms with no employees, long work hours, and limited possibilities for relaxation and holidays, home and work at the same place, spouse often working off farm, and few social contacts, but global dairy farming is also associated with large and technically well-equipped dairy operations with many dairy cows, several employees, and comprehensive employer responsibilities. Dairy farm operators, workers, and family members face a number of internal and external psychosocial demands and societal expectations, which they to some degree are able to control. High demands and few possibilities for influencing and controlling these can, however, be mentally straining and lead to stress and depression, especially if the farmers have poor social contact and are forced to deal with the problems on their own. As shown in Table 1, these psychosocial demands, expectations, mental strain, and stress seem to be shared across countries and cultures.

MENTAL HEALTH PROBLEMS AND STRESS ASSOCIATED WITH PSYCHOSOCIAL DEMANDS AND STRESSORS IN DAIRY FARMING

A review of farming, mental health problems, and mental illness indicated that farmers, farm workers, and their families face an array of stressors related to the physical environment, the structure of farming families, economic difficulties, and uncertainties associated with farming, which may be detrimental to their mental health.[26] In Finland, a study by Saarni et al.[19] found that farmers had the lowest rates in all factors measured concerning work ability, subjective quality of life, and health-related quality of life, when compared with salary earners and other entrepreneurs.

Work-related stress is often defined as a conflict where the demands of work are higher than the worker can manage, control, or cope with.[31,32] There are several factors that may moderate stressful situations, including social support, control of work, personal efficiency,[33] a relaxed, positive attitude, and a balance between work and family life.[34]

The National Institute for Occupational Safety and Health (NIOSH) has listed farming as one of the ten most stressful occupations in the world.[34] Research in the USA and Australia has linked stress and mental strain to a variety of factors, including solitary work, financial worries, weather dependency, and family problems. The mental strain can cause sleeping and concentration problems, psychosomatic disorders, increased injury rates, family problems, substance abuse, and at worst suicide.[26,27,35–37]

A recent review of mental health in the rural sector identified the most common stressors as being commodity prices; financial

pressures; debt; climate change; overwork; seasonal conditions; government regulations; and compliance.[27] Another study added another factor as an increasing new stressor—the lack of skilled labor.[38] A literature review that gathered research results from 15 scientific articles identified the following as the most common stressors among farm entrepreneurs: (a) the farm economy; (b) regulations, including farming bureaucracy, the amount of paperwork, and the political framework related to agriculture; (c) the weather and natural conditions of agriculture; and (d) dangers in farm work, injuries, and deficiencies in the work environment.[39]

A study in England and Wales investigated sources of stress for farmers in general and found that they had problems with record keeping and paperwork (62%), difficulty understanding forms (56%), and problems arising from the effects of new legislation and regulations (49%).[40] Nearly a quarter reported financial problems and most were worried about money. Very few were socially isolated, with over 90% having at least one confidant. Nearly a third had health problems that interfered with their work. The farmers most vulnerable to financial and other problems were those with small farms and mixed farming operations. The survey confirmed findings from several regional studies that many farmers experienced considerable stress from various causes.[40]

An Australian study showed that dairy farmers had extremely high distress levels, which increased significantly over a 12-month study period, exceeding those of a number of other Australian occupations.[22] Specific measures, such as globalization, finances, and demands from society, explained the variance in psychological distress. The analysis indicated that the theoretical job demand-control model was not sufficient to explain the high levels of distress.

In a survey conducted in New Zealand among dairy farmers ($N = 985$), the stress level was reported as moderate.[24] The new technology in use on farms did not increase stress, but the stress level was higher among older farmers and among women respondents. Farm women's double or triple role as farmer, family member responsible for family issues, and/or off-farm worker may increase the prevalence of stress. In the study by Alpass et al.,[24] stress symptoms were associated with time pressures, machine breakage, weather conditions, and governance policies. Berkowitz and Perkins[41] concluded, however, that stress symptoms were not associated with workload or farm complexity among dairy farm wives ($N = 126$) in the USA, and that family relationships served as a buffer to prevent stress symptoms. In that study, psychosocial stress symptoms were nervousness, restlessness, insomnia, shortness of breath, and fainting. Van Haaften et al.[42] observed that the foot and mouth disease crisis was associated with differences in levels of stress, marginalization, and depression among Dutch dairy farmers.

Kallioniemi et al.[21] observed in their study of Finnish full-time farm entrepreneurs that 34% reported symptoms that could be classified as exhaustion. In another study on Swedish dairy farms, female workers reported poorer mental health and lower vitality and felt more stressed than male workers.[18] Lunner Kolstrup and Hultgren[30] found work-related psychosocial symptoms such as irritation, fatigue, and insomnia in 25% of employed dairy workers. In comparison, the dairy farm owners experienced few work-related psychosocial symptoms except for irritation and fatigue.

Deary et al.[25] compared stress symptoms among farmers ($N = 318$) representing different production sectors and found that dairy farmers had higher levels of stress related to time pressure. A telephone survey conducted in 2004 reached a total of 1182 full-time farmers in Finland and found that the prevalence of stress was about the same (33%) among 491 dairy farmers and full-time farm entrepreneurs in general (34%).[43] The prevalence of stress was higher among the working population (44%) than among the full-time farm entrepreneurs and dairy farmers.[44]

A study on possible associations between worker health and animal health showed that employed workers felt more stressed or frustrated when dairy cows had a high incidence of disease and mastitis.[30] The stress or frustration was explained by the increased workload due to the extra physical labor involving in cleaning, separating, and treating mastitic cows, or the increased mental workload due to pressure

or demands from management to improve dairy herd health. An alternative explanation was that workers might have felt empathy and concern for the unwell cows and thus experienced these feelings as mentally unsettling.[30]

Farming has been listed as one of the 10 most stressful occupations in the world.[34] Work-related stress and ill mental health among dairy farmers, workers, and family members have in several international studies been found associated with high workload, time pressure, machinery break down, disease outbreaks, hazardous working conditions and dangers in farm work, difficulties understanding new technology, irregular and uncertain income, financial debt and high interest rates, seasonal conditions, weather dependency, effects of new governmental regulations and compliances, bureaucracy and huge amount of paper work, climate change, employer responsibilities, lack of skilled workers, solitary work and lack of social support, family problems, poor work-life balance, and increased environmental demands and consumer expectations. In addition, studies report increased stress-related symptoms among dairy operators such as sleeping and concentration problems, psychosomatic disorders, irritation, anxiety, nervousness, restlessness, fatigue, exhaustion, increased injury rates, alcohol and drug abuse, depression, and suicide.

SUICIDE AND DEPRESSION IN DAIRY FARMING

People respond to mental strain or stress in many different ways. People may develop physical health problems or they may develop emotional or mental problems, which could lead to depression, alcohol and drug abuse, family violence, or suicide.[27]

Elevated rates of suicide among farmers compared with other occupational groups and the general population have been reported in many Western countries.[45–51] Many factors have been proposed to account for the high rates of suicide among farmers, including access to firearms, the prospect of unemployment, financial difficulties and a sense of personal failure when this involved the loss of a family farm, a functional attitude toward death, increased psychiatric morbidity, personality factors, isolation, lack of social support, lack of personal meaning in life, and high levels of occupational stress. Other studies have addressed the traditional belief that farmers do not like to complain or ask for help, and therefore may be less likely to seek medical care for physical or psychiatric problems.[52]

In a South African case study ($N = 5$) by Holtman et al.,[53] suicide survivors identified contextual factors that included economic problems (poverty), low education, childhood within dysfunctional family environments, alcohol use, interpersonal conflicts and violence, a sense of hopelessness, the absence of coping mechanisms, and easy access to pesticides as a means of self-harm.

Other studies have suggested that exposure to cholinesterase-inhibiting agents may lead to anxiety and depression.[54,55] This mechanism may be a key to the increased risk of suicide observed in some studies, as anxiety and depression are established risk factors for suicidal behavior. Some studies have reported an increased prevalence of depression among farmers compared with other occupational groups,[56–58] and the prevalence of depressive symptoms among farmers who have a history of acute pesticide poisoning is higher than among farmers who have had no history of acute poisoning.[59–62]

Van Wijngaarden[63] reported that suicide was associated with working in occupations exposed to pesticides among men and women. Despite the evidence that selected classes of pesticides may influence mental health, limited work has been done to assess the impact of these compounds on farmers and farm workers. In fact, studies targeting highly exposed workers are rare. Dairy workers are among the farm population that might be exposed to organophosphate chemicals due to the use of these compounds in controlling insects. More work is needed to assess this population of exposed workers.

In the study by Canton and Williams,[64] hearing problems had serious consequences in dairy farm communities in New Zealand ($N = 74$ participants). These hearing problems could lead to communication difficulties and thus, e.g., development of coping strategies, social

isolation, frustration, anxiety, stress, resentment, depression, and fatigue. Peres et al.[65] reported on an AMI (Aging Multidisciplinary Investigation) cohort on France ($N = 1002$), focusing on health and aging in elderly farmers living in rural areas, and found that symptoms of depression were one of several factors cited.

Clingerman and Brown[66] observed that migrant farm workers ($N = 40$) in Texas experienced significant levels of stress during premigration. Arcury et al.,[67] in a study focusing on Latino migrant farm workers ($N = 300$) in the USA, observed that although the work safety climate was considered poor and 27.9% had elevated depressive symptoms, work safety climate itself was not associated with depressive symptoms. However, in the presence of depression, low safety knowledge may increase the probability of injuries.[68]

Mental and physical health is interconnected. Osborne et al.[69] observed in a review that depression was one risk factor for musculoskeletal disorders among farm owners and workers. Depression was the fifth most common health problem (7% mentioned it) in a study by Luque et al.,[70] which examined illnesses and work-related injuries among Latino migrant farm workers ($N = 100$) in Georgia, USA. Depression scores were associated with musculoskeletal problems, which were the major occupational health condition for these farm workers.

Several international studies show elevated rates of depression and suicide among dairy farmers, farm workers, and migrant workers compared with other occupations. Many factors have been proposed to account for these high rates of depression and suicide such as high level of occupational stress, easy access to firearms, pesticides, and medication as a means of self-harm, prospect of unemployment, financial difficulties, sense of personal failure, loss of family farm, lack of social support, lack of personal meaning of life, sense of hopelessness, isolation caused by culture or linguistic, absence of coping strategies, psychiatric morbidity, and personal attitude towards accepting the situation and seeking mental counseling. Exposures to pesticides and acute pesticide poisoning have also been identified as risk factors for depression and suicidal behavior among farmers.

HEALTH SERVICE AVAILABILITY FOR FARMERS, FARM WORKERS, AND FAMILIES WITH MENTAL HEALTH PROBLEMS

Farmers with mental health problems have different possibilities to access health care. To a great extent, it is up to the individual farmer and the farm family to handle the stress, which can be of short- or long-term duration. Besides self-help, the next step is often to get in touch with a local health center or general practitioner, who is often imbued with a high degree of trust by farmers and their families.[71]

Many parts of Australia during 2002–2010 have been in drought, causing associated stress and an increased risk of mental health problems in farming populations. A study by Gunn et al.[72] showed that the most commonly employed coping strategies were planning, acceptance, and active coping, and the least used were alcohol/drug use, denial, behavioral disengagement, and religion. Strong social networks may help farmers cope with stress.[73]

There are a number of different self-help materials available for farmers and farm families, such as resource books for good mental health[74] and guidelines and checklists.[75,76]

A Swedish study carried out among farmers to determine whether psychosocial risk factors were correlated with membership in an occupational health service program. Thelin et al.[77] found that those with occupational health care were less often single and had more education and more social contacts than those without such care. Eating times were more regular and meals were better for those with occupational health care. The Karasek-Theorell indices for psychological demands and decision latitude at work were also higher in those with occupational health care. Better-educated farmers and those with larger farms were more often members of an occupational health care program. In addition, this group had fewer psychosocial risk factors.[77]

Brumby et al.[78] observed that farmers with multiple risk factors for chronic disease (cardiovascular disease, diabetes) benefited from participating in health education and assessment programs with high levels of individual

participation. Further, an association between obesity and higher levels of psychological distress in farm men and women was found in a cohort of 1192 farmers.[79]

Finland is one country with a well-developed voluntary occupational health service for farmers.[39] An occupational health nurse and local agricultural advisor visit farms according to an established schedule to survey working conditions at least every 4 years. Mental well-being is assessed by observing the working conditions and the interaction between farmers and others who work or live on the farm. An overview of the mental well-being of farmers is obtained at least every second year in health examinations, including tests of work ability, burnout, depression, and alcohol consumption. If needed, the farmer will be directed to contact further medical experts.[80] There are also some other systems aiming to encourage good working conditions and well-being on farms, e.g., "Resource barn," a consultancy service provided by a farm advisory organization, and the "Support network for the rural population," which involves volunteers providing a phone helpline for farmers.[39]

Countries around the world have more or less developed systems or measures aiming to ensure good psychosocial working conditions and mental well-being on farms. Often it is up to the individual farmer and farm family to handle and cope with the stress using self-help material. Health service centers with counseling are also provided in several countries and studies show that farmers benefit from participation in occupational health care programs. Farmers or farm family members with serious injuries, health problems, or disabilities, who have severe financial problems or are having a personal crisis, might need extra support in assessing risks and professional help in order to avoid stress and depression.

CONCLUSION

Globally dairy farmers belong to an occupation facing a large number of multifaceted psychosocial demands, expectations, and stressors. Hazardous and mentally straining working conditions, such as high workload and time pressure, machinery breakdowns, unfavorable weather conditions, and possibly disease outbreaks may be difficult to balance. Economic aspects, e.g., irregular and uncertain income, financial debt, and high interest rates, may also elevate daily stress. In addition, there may be social difficulties, e.g., in balancing work and family and working with multigenerational family members or migrant workers. Several studies report increased bureaucracy, record keeping, and paperwork—and all this seems to cut across countries and cultures.

Dairy farm operators, workers, and farm families living and working with and under these demands and stressors on a daily basis are exposed to mental strain. Research shows evidence of existing and increasing levels of stress symptoms, ill mental health, depression, substance abuse, and even suicide among dairy operators and workers. However, some studies report a high degree of control, a perception of meaningful work, and a favorable psychosocial work environment on dairy farms. A crucial question is how to achieve and maintain positive working conditions within this occupational sector.

This paper highlights the commonality of psychosocial and mental issues globally across dairy farmers (traditional and industrial) and highlights the lack of profound systematic studies to address the psychosocial working conditions and mental health of dairy farmers. Several studies have been performed regarding the psychosocial working conditions and mental health of dairy farmers, farm workers, and their family members. However, the structural and technical development in the sector is rapidly changing and there is a need for further research and studies in order to understand the cause and effect of stress, ill mental health, depression, and suicide in dairy farming. Health service centers that offer professional counseling are available in several countries. However, future research should investigate the effectiveness of these programs and if improvements could be made to these health service centers. Some potential research questions include the following: Geographical location—Do farmers have to travel far to seek help because the health

service is located in larger urban areas and not in rural areas? Flexible opening hours—Do farmers work during the day and do the health service centers provide evening appointments? Rural knowledge—Do mental practitioners have profound knowledge regarding rural farm lifestyle?

We recommend that research be undertaken to develop and test self-help measures and further develop, implement, and evaluate mental health programs to assist farmers, workers, and their families to identify and manage stress and ill mental health. Given the findings from this paper and the commonality of these issues globally, this further work should be undertaken at an international and collaborative level to provide economies of scale, robustness of approach, and universal transferability. Extension of this initial work and proposed further work should be communicated through an international conference or other forum.

REFERENCES

1. Merchant J, Reynolds S. Work in agriculture. In: McDonald C, ed. *Epidemiology of Work Related Diseases*. 2nd ed. Hoboken, NJ: BMJ Books; 2008:309–329.

2. Greer A. Agricultural policy. In: Woods M, ed. *New Labour's Countryside: Rural Policy in Britain Since 1997*. Bristol, UK: The Policy Press; 2008:149–166.

3. Schelhaas H. The dairy industry in a changing world. In: Falvey L, Chantalakhana C, eds. S*mallholder Dairying in the Tropics.* Nairobi, Kenya: International Livestock Research Institute; 1999:1–17. Available at: http://www.ilri.cgiar.org/InfoServ/Webpub/fulldocs/SmHDairy/chap1.html. Accessed December 6, 2012.

4. Beldman A, Daatselaar C, Galama P, Prins B. Trends and challenges in world dairy farming: impressions from the 2009 Global Dairy Farms congress in China. Global Dairy Farmers. 2010. Available at: http://www.lei.dlo.nl/publicaties/PDF/2010/2010-015.pdf. Accessed December 6, 2012.

5. Webster J. Husbandry and animal welfare. In: Webster J, ed. *Management and Welfare of Farm Animals. UFAW Farm Handbook*. 5th ed. West Sussex, UK: Wiley-Blackwell; 2011:1–30.

6. Kallioniemi MK, Kymäläinen HR. Women on Finnish dairy farms: hard work in the midst of traditions and changes. *Rural Soc.* 2012;22:1815–1830.

7. Brumby S, Willder S, Martin J. Milking their health for all its worth? Improving the health of farming families through facilitated learning. *Exten Farm Syst J.* 2010;6:1–10.

8. Elger U, Wonneberger E, Lasch V, Fuhr D, Heinzel W. Belastungen und gesundheitliche Risiken von Bäuerinnen. *Soz Praventivmed.* 1995;40:146–156.

9. Uthardt L. *Jordbrukaren mellan tradition och förnyelse* [doctoral thesis] [in Swedish]. Åbo, Finland: Åbo Akademis förlag; 2009. Available at: http://www.doria.fi/bitstream/handle/10024/50690/UthardtLorenz.pdf?sequence=3. Accessed December 6, 2012.

10. Leskinen J. *Saloseudulta EU-isännäksi—lypsykarjayrittäjät muutosmurroksessa. Seurantatutkimus 1997–2001* [*Dairy farmers in a period of transition. A follow-up study 1997–2001*] [doctoral thesis] [in Finnish]. Helsinki, Finland: Finnish Institute of Occupational Health; 2004.

11. González-García E, Gourdine J, Alexandre G, Archimède H, Vaarst M. The complex nature of mixed farming systems requires multidimensional actions supported by integrative research and development efforts. *Animals.* 2011;6:763–777.

12. Lunner Kolstrup C. What factors attract and motivate dairy farm employees in their daily work? *Work J Prev Assess Rehab.* 2012;41(Suppl 1):5311–5216.

13. Bletzer KV, Weatherby NL. Variation in drug and alcohol use among agricultural laborers: watermelon men in the rural South. *Human Org.* 2009;68:115–128.

14. Duke MR, Gómez Carpinteiro FJ. The effects of problem drinking and sexual risk among Mexican migrant workers on their community of origin. *Human Org.* 2009;68:328–339.

15. International Labour Organization. *Psychosocial Factors at Work: Recognition and Control. Report of the Joint ILO/WHO Committee on Occupational Health Ninth Session Geneva, 18–24 September 1984.* Occupational Safety and Health Series No. 56. Geneva: International Labour Organization, International Labour Office; 1986. Available at: http://www.ilo.org/public/english/protection/safework/agriculture/agrivf01.htm. Accessed December 6, 2012.

16. Centre for Alternative Social Analysis. *Under åben himmel* [*Under open sky*] [in Danish]. Copenhagen: CASA, Centre for Alternative Social Analysis; 2005. Available at: http://casa-analyse.dk/files/under_aaben_himmel.pdf. Accessed December 6, 2012.

17. Melberg K. Farming, stress and psychological well-being: the case of Norwegian farm spouses. *Sociol Rural.* 2003;43:56–76.

18. Kolstrup C, Lundqvist P, Pinzke S. Psychosocial work environment among employed Swedish dairy and pig farmworkers. *J Agromedicine.* 2008;13:23–36.

19. Saarni SI, Saarni ES, Saarni H. Quality of life, work ability, and self employment: a population survey of entrepreneurs, farmers, and salary earners. *Occup Environ Med.* 2008;65:98–103.

20. Raussi S. Human–cattle interactions in group housing. *Appl Anim Behav Sci.* 2003;80:245–262.

21. Kallioniemi MK, Simola AJK, Kymäläinen HR, Vesala HT, Louhelainen JK. Mental symptoms among

Finnish farm entrepreneurs. *Ann Agric Environ Med.* 2009;16:159–168.

22. Wallis A, Dollard MF. Local and global factors in work stress: the Australian dairy farming examplar. *Scand J Work Environ Health Suppl.* 2008;34(6):66–74.

23. Karasek R. Job demands, job decision latitude, and mental strain: implications for job redesign. *J Admin Sci Q.* 1979;24:285–308.

24. Alpass F, Flett R, Humphries S, Massey C, Morriss S, Long N. Stress in dairy farming and the adoption of new technology. *Int J Stress Manage.* 2004;11:270–281.

25. Deary IJ, Willock J, McGregor M. Stress in farming. *Stress Med.* 1997;13:131–136.

26. Fraser CE, Smith KB, Judd F, Humphreys JS, Fragar LJ, Henderson A. Farming and mental health problems and mental illness. *Int J Soc Psychiatry.* 2005;51:340–349.

27. Walker JF. *Mental Health in the Rural Sector—A Review.* Report. Feilding: Farm Safe New Zealand; 2012. Available at: http://farmsafe.co.nz/wp-content/uploads/2012/10/Final-Report-Mental-Health-in-the-Rural-Sector.pdf. Accessed December 6, 2012.

28. Lundqvist P. Psychosocial factors in the working environment of young Swedish farmers with milk production. In: *Working Environment in Farm Buildings. Results of Studies in Livestock Buildings and Greenhouses* [doctoral thesis]. Lund, Sweden: Department of Farm Buildings, Swedish University of Agricultural Sciences; 1988:187–222.

29. Holmberg S, Thelin A, Stiernström EL, Svärdsudd K. Psychosocial factors and low back pain, consultations, and sick leave among farmers and rural referents: a population-based study. *J Occup Environ Med.* 2004;46:993–998.

30. Lunner Kolstrup C, Hultgren J. Perceived physical and psychosocial exposure and health symptoms of dairy farm staff and possible associations with dairy cow health. *J Agric Saf Health.* 2011;17:111–125.

31. Cox T, Griffiths A, Rial-González E. *Research on work related stress*. European Agency for Safety and Health at Work. Luxembourg: Office for Official Publications of the European Communities; 2000:55–72.

32. Milczarek M, Scneider E, González ER. *OSH in Figures: Stress at Work—Facts and Figures.* European Risk Observatory. Report 9. Luxembourg, European Communities: European Agency for Safety and Health at Work; 2009. Available at: https://osha.europa.eu/en/publications/reports/TE-81-08-478-EN-C_OSH_in_figures_stress_at_work. Accessed December 6, 2012.

33. Sonnentag, S. & Frese, M. 2003. Stress in organizations. In: Borman WC, Ilgen DR, Klimoski RJ, eds. *Comprehensive Handbook of Psychology. Volume 12: Industrial and Organizational Psychology*. New York: Wiley; 2012:453–491.

34. National Institute for Occupational Safety and Health. Stress at work. Cincinnati: Publications Dissemination, EID, National Institute for Occupational Safety and Health; 1999. Report No. 96–115. Available at: http://www.cdc.gov/niosh/docs/99-101/pdfs/99-101.pdf. Accessed December 6, 2012.

35. Elliott M, Heaney CA, Wilkins JR, Mitchell GL, Bean T. Depression and perceived stress among cash grain farmers in Ohio. *J Agric Saf Health.* 1995;1:177–184.

36. Gunderson P, Donner D, Nashold R, Salkowicz L, Sperry S, Wittman B. The epidemiology of suicide among farm residents or workers in five north-central states, 1980–1988. *Am J Prev Med.* 1993;9(Suppl 1):26–32.

37. Walker LS, Walker JL. Stressors and symptoms predictive of distress in farmers. *Fam Relat.* 1987;36:374–378.

38. Ang HBA, Lamm F, Tipples R. The impact of stressors on the psychological wellbeing of New Zealand farmers and the development of an explanatory conceptual model. *Policy Pract Health Saf.* 2008;6:79–96.

39. Kallioniemi MK, Simola A, Kinnunen B, Kymäläinen H-R. Stress in farm entrepreneurs. In: Langan-Fox J, Cooper CL, eds. *Handbook of Stress in the Occupations*. Cheltenham, UK, and Northampton, MA: Edward Elgar; 2011:385–406.

40. Simkin S, Hawton K, Fagg J, Malmberg A. Stress in farmers: a survey of farmers in England and Wales. *Occup Environ Med.* 1998;55:729–734.

41. Berkowitz AD, Perkins HW. Correlates of psychosomatic stress symptoms among farm women: a research note on farm and family functioning. *J Human Stress.* 1985;11:76–81.

42. Van Haaften EH, Olff M, Kersten PH. The psychological impact of the foot and mouth disease crisis on Dutch dairy farmers. *NJAS Wageningen J Life Sci.* 2004;51:339–349.

43. Simola, A. Henkinen hyvinvointi [Mental well-being]. In: Rissanen P, ed. *Työterveys ja maatalous Suomessa vuonna 2004* [*Occupational Health and Agriculture in Finland in Year 2004*] [in Finnish]. Kuopio, Finland: Finnish Institute of Occupational Health; 2006:58–72.

44. Kallioniemi MK, Simola AJK, Kymäläinen HR, Vesala H, Louhelainen J. Stress among Finnish farm entrepreneurs. *Ann Agric Environ Med.* 2008;15:243–249.

45. Charlton J. Trends and patterns in suicide in England and Wales. *Int J Epidemiol.* 1995;24(Suppl 1):S45–S52.

46. Gallagher LM, Kliem C, Beautrais AL, Stallones L. Suicide and occupation in New Zealand, 2001–2005. *Int J Occup Environ Health.* 2008;14:45–50.

47. Kposowa AJ. Suicide mortality in the United States: differentials by industrial and occupational groups. *Am J Ind Med.* 1999;36:645–652.

48. Pickett W, King WD, Lees REM, Bienefeld M, Morrison HI, Brison RJ. Suicide mortality and pesticide use among Canadian farmers. *Am J Ind Med.* 1998;34:364–372.

49. Stallones L. Suicide mortality among Kentucky farmers, 1979–1985. *Suicide Life Threat Behav.* 1990;20:156–163.

50. Stallones L, Beseler C. Safety practices and depression among farm residents. *Ann Epidemiol.* 2004;14: 571–578.

51. Miller K, Burns C. Suicides on farms in South Australia 1997–2001. *Aust J Rural Health.* 2008;16 327–331.

52. DeArmond S, Stallones L, Chen P, Sintek E. Depression and somatic symptoms within the farming community. *J Agric Saf Health.* 2006;12:5–15.

53. Holtman Z, Shelmerdine S, London L, Flisher A. Suicide in a poor rural community in the Western Cape, South Africa: experiences of five suicide attempters and their families. *South Afr J Psychol.* 2011;41:300–309.

54. London L, Beseler C, Bouchard MF, et al. Neurobehavioral and neurodevelopmental effects of pesticide exposures. *Neurotoxicology.* 2012;33:887–896.

55. MacFarlane E, Simpson P, Benke G, Sim M. Suicide in Australian pesticide-exposed workers. *Occup Med.* 2011;61:259–264.

56. Gregoire A. The mental health of farmers. *Occup Med.* 2002;52:471–476.

57. Scarth RD, Stallones L, Zwerling C, Burmeister LF. The prevalence of depressive symptoms and risk factors among Iowa and Colorado farmers. *Am J Ind Med.* 2000;37:382–389.

58. Stallones L, Leff M, Garrett C, Criswell L, Gillan T. Depressive symptoms among Colorado farmers. *J Agric Saf Health.* 1995;1:37–43.

59. Beseler C, Stallones L, Hoppin JA, et al. Depression and pesticide exposures in female spouses of licensed pesticide applicators in the agricultural health study cohort. *J Occup Environ Med.* 2006;48:1005–1013.

60. Beseler CL, Stallones L. A cohort study of pesticide poisoning and depression in Colorado farm residents. *Ann Epidemiol.* 2008;18:768–774.

61. Beseler CL, Stallones L, Hoppin JA, et al. Depression and pesticide exposures among private pesticide applicators enrolled in the Agricultural Health Study. *Environ Health Perspect.* 2008;116:1713–1719.

62. Stallones L, Beseler C. Pesticide poisoning and depressive symptoms among farm residents. *Ann Epidemiol.* 2002;12:389–394.

63. Van Wijngaarden E. An exploratory investigation of suicide and occupational exposure. *J Occup Environ Med.* 2003;45:96–101.

64. Canton K, Williams W. The consequences of noise-induced hearing loss on dairy farm communities in New Zealand. *J Agromedicine.* 2012;17:354–363.

65. Pérès K, Matharan F, Allard M, et al. Health and aging in elderly farmers: the AMI cohort. *BMC Public Health.* 2012;12:558.

66. Clingerman EM, Brown A. Stress in migrant farmworkers during premigration. *Biol Res Nurs.* 2012;14:27–37.

67. Arcury TA, O'Hara H, Grzywacz JG, Isom S, Chen H, Quandt SA. Work safety climate, musculoskeletal discomfort, working while injured, and depression among migrant farmworkers in North Carolina. *J Inform.* 2012;102:S272–S278.

68. Beseler CL, Stallones L. Safety knowledge, safety behaviors, depression, and injuries in Colorado farm residents. *Am J Ind Med.* 2010;53:47–54.

69. Osborne A, Blake C, Fullen BM, et al. Risk factors for musculoskeletal disorders among farm owners and farm workers: a systematic review. *Am J Ind Med.* 2012;55:376–389.

70. Luque JS, Reyes-Ortiz C, Marella P, et al. Mobile farm clinic outreach to address health conditions among Latino migrant farmworkers in Georgia. *J Agromedicine.* 2012;17:386–397.

71. Sartore GM, Kelly B, Stain HJ. Drought and its effect on mental health—how GPs can help. *Aust Fam Physician.* 2007;36:990–993.

72. Gunn KM, Kettler LJ, Skaczkowski GLA, Turnbull DA. Farmers' stress and coping in a time of drought. *Rural Remote Health.* 2012;12:2071.

73. Fuller J, Kelly B, Sartore G, et al. Use of social network analysis to describe service links for farmers' mental health. *Aust J Rural Health.* 2007;15:99–106.

74. Ashfield J. *Taking Care of Yourself and Your Family*. A resource book for good mental health. Adelaide: Government of South Australia and Beyondblue: The National Depression Initiative, Peacock Publications; 2007.

75. Australian Centre for Agricultural Health and Safety. *Managing the Pressure of Farming. Farm Family Business Handbook.* Moree: Australian Centre for Agricultural Health and Safety; 2008. Available at: http://www.aghealth.org.au/pressures/. Accessed December 6, 2012.

76. California Dairy Research Foundation. Stress, depression and suicide prevention resources for dairy farmers. 2012. Available at: http://cdrf.org/2012/09/25/stress-depression-suicide-prevention-resources-for-dairy-farmers/. Accessed December 6, 2012.

77. Thelin A, Stiernstrom EL, Holmberg S. Psychosocial conditions and access to an occupational health service among farmers. *Int J Occup Environ Health.* 2000;6:208–214.

78. Brumby S, Willder S, Martin J. The sustainable farm families project: changing attitudes to health. *Rural Remote Health.* 2009;9:1012.

79. Brumby S, Chandrasekara A, McCoombe S, Kremer P, Lewandowski P. Farming fit? Dispelling the Australian agrarian myth. *BMC Res Notes.* 2011;4,89.

80. Kinnunen B, Mäittälä J, Pulkkinen-Närhi P, Siitonen T, Taattola K, Weman M. *Hyvä työterveyshuoltokäytäntö maatalousyrittäjien työterveyshuollossa* [*Good occupational Health Practice in Farmer's Occupational Health Services*]. Helsinki, Finland: Finnish Institute of Occupational Health and the Ministry of Social Affairs and Health; 2007.