Farmers in the agriculture sector are exposed to many of the recognized risk factors for work-related musculoskeletal disorders and experiencing severe workload problems. Heavy workload gives further pressure in having too much to do at peak times. They are expected to work on the farm as well as manage the households and this makes the situation more problematic. In industrially developing countries much of power required for farming activities, especially in the small-scale sector, derives from human energy and animal power and usually little from engine power (Jafry and O’Neill, 2000).

Even in Japan, small-scale strawberry farmers conduct hand harvest, as mechanized harvest is not economically and technically feasible. Farmers are facing some of the highest risks, especially in the field of hand harvest, with stooped postures, long hours of bending and lifting and carrying of heavy materials. Work is also seasonal and working conditions for strawberry farmers vary widely, since work cannot be delayed; working hours are generally uneven and often very long. Researchers have found that there is a possible link between long working hours and risk of health outcomes (Spurgeon et al., 1997). Further, back, neck and shoulder strains are common problems among farm workers (Earle-Richardson et al., 2003).

However, in busy seasons, work schedules may be more demanding, requiring week-end work...
and farmers may work six or seven days per week. Further, the number of farming households in
Japan decreased rapidly and the aging of agricultural workers is increasing (Ministry of Agriculture
Forestry and Fisheries, 2003). Identification of workload, poor postures and long working hours of
farmers are needed for the proper development of workload or modifying postures at work.

Therefore, the main focus of this paper was to investigate problems of workload and awkward
postures among small-scale strawberry farmers and suggest possible recommendations for solving
the identified problems.

METHODS

To carry out the research, well-structured questionnaires were used and thirty-two male and
female strawberry farmers participated. Part one of the questionnaires was covered general informa-
tion about the farmers such as working hours, rest time durations, leisure time durations, working
conditions, etc. The second part was the Cumulative Fatigue Symptoms Index (CFSI) questionnaire.
It comprised 81 items related to chronic, cumulative fatigue. These items were divided into 8 main
categories. The subjects were asked to check those items which they considered to have been com-
plaining lately. The check results gave CFSI scores suggested by Kosugo (1991). In addition, direct
observation and direct interviewing methods were used.

All the farmers were small-scale strawberry farmers in Iizuka City. In Japan, the busy season
starts in November and runs through May and the other period was considered as a slack season. The
questionnaires were distributed in both slack and busy seasons. The strawberry variety called
“Amaou” was grown by all the strawberry farmers in Iizuka City in these seasons. The Agricultural
Corporation, Iizuka helped us in distributing and collecting the questionnaires.

Especially in the busy season, monthly meetings of farmers were held at the regional office and
these provided a great opportunity for us to meet the farmers. They were informed about the purpose
of the study and it took some considerable time to convince them about the aim and the importance
of the study and to provide the correct instructions about how to fill the questionnaires. Further, farm-
ers were not paid and though they were very busy in the harvesting season, volunteer and self-moti-
vated farmers filled the questionnaires and returned.

Mainly, farmers maintained two types of beds, i.e. high and low. So, the impact of two types of
beds regarding picking postures, self-reported comfort, ease of use, speed of workload, feeling after
work and physical and mental stress was also compared. However, incomplete questionnaires were
not considered in the study.

RESULTS AND DISCUSSION

Subjects

Both male and female small-scale strawberry farmers participated in the study and data were
collected in busy and slack seasons. The characteristics of these farmers are depicted in Table 1.

The subjects were of age between 22 and 70 years. The mean age of the subjects was 52 years.
Women farmers’ contribution to the small-scale strawberry farming industry was very low. Fur-
more, all female farmers were above the age of 50 (Table 1). Strawberry farming is one of the
main industries in the area where our study was conducted. Our study results and also other evi-
dences proved (Ministry of Agriculture Forestry and Fisheries, 2003) that young people were rarely
engaged in strawberry farming activities. This farming work included many risk factors associated
with harvesting, storing, soil preparation and packing and was carried out by elderly farmers through-
out the year (Shirono et al., 2004). As the usage of machineries and other types of equipment was
also at low level, the need to counteract the aging agricultural work force has become a major prob-
lem.

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Height of strawberry beds

Only six farmers had strawberry beds which were higher than 100cm (Figure 1). As there was no standard height of the strawberry bed, we considered that the beds, higher than 100 cm were high while others were considered as low. The results revealed that, when the beds were high, 50% of the subjects complained that they had pain in the whole body. When low beds were used, 68% complained. Further, only 16.7% of the farmers who had high beds complained about the stiff shoulders, but the corresponding rate of farmers who had low beds raised to 36%. Therefore, these results provided some clues about the relationship between the height of the strawberry beds and above problems.

The proper work height can increase performance and reduce repetitive motion injury. While standing, if the working height is too high, an individual will lift the shoulders and produce fatigue in the shoulders and neck. Also, if it is too low, the worker needs to bend over, causing back fatigue. The average height of male and female farmers was about 170cm and 155cm, respectively. But unfortunately, 61.3% of the farmers had strawberry beds lower than 30cm. Although some farmers were aware of the advantages of maintaining high beds, high soil preparation costs and other costs acted as the main barrier for introducing such beds.

One farmer, who had a strawberry bed that was 7cm in height, had changed the height of the bed into 120cm (Figure 2 a and b). He was 178cm in height and was wearing a pair of shoes of about 2cm in height when working in the farm. According to the farmer’s picking posture, it was not difficult to understand how it affected the lumber part of the body and how it was stressful for him, especially working long hours in the busy season (Figure 2a).

In addition, the difficulty of hiring part-timers when the beds were low (as working in a low-type bed in long hours is so painful), inability to meet demanding work alone during the busy season, the stressful work, and finally the expectation to earn more profit than earlier motivated the farmer to introduce such a change to the farm. After modifying, he hired two part-time workers in the busy season. Earlier he used trays to carry harvested strawberries and with full of strawberries it was very painful for his arms. Instead of trays, he now uses a trolley which can be rolled over the surface. According to him, it helped to reduce the pain in the hand and shoulders considerably. But earlier, trolleys could not be used inside the farm.

According to our observations and farmers’ responses, modification to the beds seemed acceptable. This need may developments to overcome practical difficulties. Overall, farmers had less dis-

<table>
<thead>
<tr>
<th>Description</th>
<th>No. of farmers</th>
<th>Age distribution of farmers (%)</th>
<th>Type of bed (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male (n=26)</td>
<td>81%</td>
<td>6 0 25 25 25</td>
<td>19 81</td>
</tr>
<tr>
<td>Female (n=6)</td>
<td>19%</td>
<td>0 0 4 9 6</td>
<td>17 83</td>
</tr>
</tbody>
</table>

Fig. 1. Height of strawberry beds
comfort in working in a high strawberry bed than at a low bed. But high modification cost was the main disadvantage for this modification. Balancing profit and high cost has thus become an unsolved problem.

Length of a working day and no. of hired workers

The length of a working day depends on the starting time, finishing time, lunch time duration and the rest time durations of a farmer. There were considerable differences in the amount of time between busy and slack seasons. In the busy season, 83.9% of the farmers finished their daily work around 10 pm. However, 12.9% of the farmers worked until 11 pm or 12 pm. Some farmers noted that sometimes, they slept only for two hours per day in the busy season. The hours of agricultural work for both male and female farmers during the harvesting season were significantly longer than those in the slack season.

There were some farmers who worked 17 hours per day. But, based on the ILO statistics in 1997 weekly working hours were 38.2 for Japan. Sasaki et al. (1999) reported that there were significant relationships between the long working hours and short sleeping hours and the high complaint rates of “drowsiness and dullness”. According to Park et al. (2001), long working hours act as a direct stressor due to cumulative fatigue.

On the other hand, high production cost comprising mainly the labour cost in Japan, and limited the hiring of additional workers even in the busy season. Family members’ support was important and most of the farmers’ spouses or parents supported them during busy seasons. According to the study, even in the harvesting season, maximum numbers of hired workers were limited to 4-6.

Therefore, innovative, economical, alternative methodologies and new equipment should be introduced, e.g. “strawberry picking robot” (Cui et al., 2007). But our study was about “small-scale strawberry farmers”. So according to their capacity, the cost of the machineries and also the area of the farms limited the usage of these facilities. According to this study, farmers complained about the long hours of picking strawberries using their fingers as this was so painful for their fingers. So, simple low-cost, ergonomically designed equipment is needed for satisfying their needs.

Regular rest pauses and daily working plan

According to the study, strawberry farmers do not enjoy sufficient leisure time in their daily life. This may be seriously affecting elderly farmers’ life. The answer to the question of “Do you have enough leisure time in your life”, was “no” among 53.1% of the farmers (Table 2). Therefore, careful attention should be paid on balancing farming and daily life activities. Further, 50% of farmers followed a daily working plan and according to them, it was somewhat easy to perform their activities properly. Farmers’ responses about leisure time and daily working plan also gave an unsatisfied picture of their farming lives. Farmers should be educated about risks associated with the long, continuous working hours, chronic fatigue and long-term effects.

As mentioned in the previous section, the majority of the farmers were above age 50 and this
Table 2. Farmers’ responses regarding leisure time and daily working plan.

<table>
<thead>
<tr>
<th>Description</th>
<th>Farmer’s responses (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Do you have enough leisure time?</td>
<td>12.5</td>
</tr>
<tr>
<td>Do you work according to a daily</td>
<td>50.0</td>
</tr>
<tr>
<td>working plan?</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Physical problems of farmers.

<table>
<thead>
<tr>
<th>Responses (n=32)</th>
<th>Rate of response in each problem (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>low back pain</td>
</tr>
<tr>
<td>Yes</td>
<td>75.0</td>
</tr>
<tr>
<td>Sometimes</td>
<td>6.2</td>
</tr>
<tr>
<td>No</td>
<td>18.8</td>
</tr>
</tbody>
</table>

age distribution provided many interesting relationships with their physical problems (Table 3). Elderly farmers had a significantly higher prevalence of back pain and shoulder pain than that of other health problems (Earle-Richardson et al., 2003).

However, not only the physical comfort but also psychological factors should be considered. Some studies researched indicated that impossibility of social support for the elderly farmers deepened on their sense of dissatisfaction with work and social life. This indirectly suggested the relevance of social support for them (Sasaki et al., 1999). As the strawberry farming industry also has the same situation, i.e. percentages of elderly farmers are increasing, this can also be reasonable for small-scale strawberry farmers.

Comparing average responses of farmers with different occupations

The important part of the farmers’ workload and fatigue was indicated by the Cumulative Fatigue Symptoms Index analysis. Complaints of fatigue and related factors were analyzed according to the CFSI index. This index is based on the rating method and suitable for collecting fatigue data in relation to conditions of work, job characteristics and the workers’ age. The average responses in each of the eight categories of such symptoms were compared between the male and female farmers as well as between different occupations, i.e. office workers, technical workers, sales workers and blue-collar workers (Kosugo and Fujii, 1987).

Both male and female strawberry farmers depicted lower fatigue levels when compared with the

Fig. 3. Responses of farmers vs. different occupations; males (a) and females (b).

NF1, deceased vitality; NF2-1, general fatigue; NF2-2, physical disorders; NF3, irritability; NF4, deceased willingness to work; NF5-1, anxiety; NF5-2, depressive feelings; NF6, chronic tiredness.
other workers (Figure 3a and b). Further, blue-collar workers had a situation very much similar to that of the male strawberry farmers. Female farmers’ decreased willingness to work (NF4), anxiety (NF5-1) and depressive feelings (NF5-2) levels were considerably less pronounced than those of other workers. But in case of male farmers, only NF4 indicated a lower level than the other selected workers (Figure 3a).

Kosugo et al. (1993) stated that complaint rates decreased with increase in age for both males and females except NF2-1. In contrast, rates for NF2-1 such as low back pain, eyestrain, chronic shoulder stiffness and dullness, had a tendency to increase in the age groups of 45-49 or more. This is notable among male subjects (Kosugo and Fujii, 1987).

The important feature is the considerably higher level of general fatigue recorded by the female strawberry farmers (Figure 3b). This may be explained by the fact that female farmers have to play two key roles in their household and in the farm, all the female farmers of our sample were above age of 50 years and their physical capacity was comparatively limited. Further, in busy seasons, highly demanding works irregular and long working hours were not able leading to uncomfortable working conditions, insufficient rest pauses and leisure time, etc. However, for more reasonable comparison, the sample size should be increased.

Although general and CFSI questionnaires were used for the study, there is a need for special questionnaires, which should be very simple, understandable and especially designed for the elderly strawberry frames. As mentioned above, the incomplete questionnaires were not taken into account in the study.

The overall picture of the small-scale strawberry farming industry is depicted in Figure 4. It was found that economic, financial, marketing and ergonomic factors directly as well as indirectly affect ed the farmers’ health, productivity, efficiency, etc. This made their problems more complicated. Further, due to the cyclical nature of the recognized factors, it was difficult to find an easy solution for their complicated and interconnected problems. When presenting solutions, all the factors should be considered well and furthermore this cycle should be broken at somewhere, for instance, by introducing low-cost simple machineries to save time so that farmers can have more leisure time, etc. or beg government interference that should be improved considerably.

Other problems of farmers except the physical ones are summarized in Table 4. Farmers’ responses provide a clear picture about their lives and interest of farming activities. For instance, only 40.6% of the farmers liked to continue farming while 50% of farmers said they had to think again and 9.4% directly mentioned that they wanted to give up farming due to stress, heavy workload and so on. Furthermore, the lack of other farmers’ assistance, poor communication channels and poor social
contacts especially during the harvesting season also de-motivated the farmers to continue their farming activities. According to the results, farmers were not satisfied about existing methods, machineries, government assistance and other circumstances.

CONCLUSION

The main focus of the paper was placed on studying workload and awkward postures among small-scale strawberry farmers. It can be concluded that strawberry farmers were strained under heavy workload, awkward postures, monotones and repetitive works, long working hours and poor working conditions with frequent fatigue symptoms and considerable influence on the health. Effective awareness programs should be launched to educate farmers about their risk factors, work related illnesses and also to convince them by applying simple ergonomic principles for reducing or eliminating these problems. To balance these two extremes, farmers should be convinced that not only profit optimization but also concerns about their health and safety hazards are also of paramount importance.

To get in-depth knowledge of farmers’ situation, combined researches which consider ergonomic problems as well as marketing, financial economic problems is essential. Furthermore, future research should be done especially by paying attention to elderly farmers and young people’s contributions to farming. Further, we should discover the real reason for their unwillingness for farming and motivational programmers should be introduced. Finally, to provide solutions for farmers’ unsolved problems, detailed studies should be needed so as to provide a better foundation for future researches in this field.

REFERENCES


Table 4. Other problems of farmers.

<table>
<thead>
<tr>
<th>Description</th>
<th>Yes</th>
<th>Somewhat/Think again</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuation of business</td>
<td>40.6</td>
<td>50.0</td>
<td>9.4</td>
</tr>
<tr>
<td>Introduction of machineries</td>
<td>62.5</td>
<td>28.1</td>
<td>9.4</td>
</tr>
<tr>
<td>Natural disasters</td>
<td>87.5</td>
<td>12.5</td>
<td>-</td>
</tr>
<tr>
<td>Change the present methods</td>
<td>37.5</td>
<td>43.7</td>
<td>18.8</td>
</tr>
<tr>
<td>Other farmer’s assistance</td>
<td>43.8</td>
<td>-</td>
<td>56.2</td>
</tr>
<tr>
<td>Government assistance</td>
<td>12.5</td>
<td>31.0</td>
<td>56.5</td>
</tr>
<tr>
<td>Communication channel</td>
<td>75.0</td>
<td>15.6</td>
<td>9.4</td>
</tr>
<tr>
<td>Competition</td>
<td>68.8</td>
<td>-</td>
<td>31.2</td>
</tr>
</tbody>
</table>
