

Investigating Agriculture Farmers Working on Hand Tools in Rajasthan

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Abstract: Farmer's life is an important aspect in terms of performance for individual as well as farm environment. This study focused on investigating the working and problems faced by farmers in using hand tools. The facts related to work life of farmers collected through questionnaire survey from 60 farmers in two districts of Rajasthan (India). Results showed that satisfaction in hand tool working influences working and performance of the farmers. Also farmers have significantly higher odds of suffering from neck pain (OR: 2.429, $P < 0.05$) and wrist pain (OR: 2.347, $P < 0.05$). The collected data have raised the major investigation should be done for finding risk factors that influence more and make a strategy. Improvement in existing hand tools with using ergonomic principles after considering comfort and discomfort factors can improve the quality of work life of farmers.

1 Introduction

Agriculture working is defined simply as the production of crops, vegetables and fruits, etc. by the skill of the powered and non-powered tools mostly. Agriculture is the pillar of the Indian frugality that plays the crucial role in the economic and social development of the country [1]. Most industrial sectors have ergonomics in their agendas which also gives them success. In India, most people belong to the rural sector that make it different than other countries. So it expects greater attention to ergonomics [7, 12], particularly to agricultural production for both commercial and smallholder farming [2].

The accidents and injuries are natural hazards [11] in the farm environment. These happen due to multiple factors, e.g., man, machine, crop, toxic chemicals or environmental factors. The All India Coordinated Research Projects (AICRP) [6] on human engineering and safety in agriculture reported accident and injury data (1996–2002) from forty-four sample villages of various regions provided summary statistics of the accidents and injuries data of northern region (mean of accidents) given in Table 1. This table shows that in India, total fatal and non-fatal accidents percentage were 5.5 % and 94.5 % (AICRP [6]).



Table 1 Accidents per unit village in Northern regions (Source: AICRP [6])

| Type of accidents | Northern India (Mean) |
|--|-----------------------|
| Machinery related accident rate/1,000 machines/yr. | 1.33 |
| Tractor accident rate/1,000 tractors/yr. | 1.31 |
| Chaff cutter accident/1,000 chaff cutter/yr. | 0.94 |
| Thresher accident/1,000 thresher/yr. | 1.80 |
| Sugar cane crusher accident/1,000 sugar cane crusher/yr. | 1.31 |
| Sprayer accident/1,000 sprayer/yr. | 1.73 |
| Hand tools related accident rate/1,000 hand tools/yr. | 0.02 |
| Other accidents (snakebite, agro-chemicals, etc.)/1,000 workers /yr. | 0.70 |

2 Literature Review

Working conditions in agriculture is hazardous. Farmers, family members and children are facing the risk of accidents higher than other occupations [9].

In most industrialized countries [12], the costs of compensation for Musculoskeletal disorders (MSDs) account for at least half of all farmers' compensation costs. Upper limb and low back pain problems are primary contributing factors for compensation cost due to MSDs. Few researchers in agriculture area has identified poor working conditions [3-4], awkward postures that compel frequent bending, twisting [2-3] and inadequate rest breaks [4] are among the risk factors for MSDs among the farmers. Agriculture farmers who comprise a part of the unorganized work sector in rural India were not in a favorable condition. There is large number of investigation of farmers working is present, still literature regarding their comfort and discomfort for using hand tools is unavailable. To fill this gap an exploration regarding satisfaction in existing working of farmers is done with following objectives:

- To study the existing quality of work life.
- To find out how work, life leads to high satisfaction and performance.

3 Research Methodology

In this research, questionnaire survey methodology was used to explore various issues of farmer's work life and pain. The previous study in handicraft industries [10] gives a great motivation and measures for doing the same for agriculture farmers. This cross-sectional study conducted among farmers in the villages of eastern Rajasthan. Figure 1a-1b shows the working of the farmers on the different type of hand tools like sickles, hoe in the awkward postures.

Data from total 60 farmers were collected for this investigation study. The survey administered at the field site. First, the survey included featured questions about worker's personal characteristics, i.e., name, age, gender, etc. Secondly, it included questions about quality of working life. Thirdly, it also included questions about MSDs were adopted from the Nordic musculoskeletal Questionnaire (NMQ) for identifying problems related to MSDs of farmers [8]. After collecting the data from the investigating sample these techniques used

for investigation:

- a. Chi-square test to examine the nature of the relationship between various parameters,
- b. MSDs in farmers.



Fig. 1 Farmers working on different hand tools in field
a –Rajasthani Sickle, b – long handled hoe

4 Data Analysis and Results

In this section, the representation of raw data as a percentage ratio for better understanding of collected data was done. Personal data showed that majority (90%) of the workers belong to the age below 50 years whereas only 10% workers belong to the age above 50 years. The decrement in workers interest above 50 years maybe due to increased degree of the MSDs in body with age. Distribution of male and female was same to 50% of the workers, and 78.3% of the workers were married. Quality of work data show that increasing disorders in the body was due to repetitive working in awkward postures with the existing hand tools.

4.1 Chi-square analysis

4.1.1 Relationship between work experience and salary

H0: There is no relationship between work experience and salary.

H1: There is relationship between work experience and salary.

Table 2 Significant relationship between work experience and salary

| SS \ FE | SD – No. (%) | D – No. (%) | NSND – No. (%) | S – No. (%) | SS – No. (%) | Total - No. (%) |
|----------------------------|-----------------|----------------|-------------------|----------------|-----------------|--------------------|
| <10 years | 5(71.4) | 7(38.9) | 4(40) | 9(42.9) | 1(25) | 26(43.3) |
| 10 - 20 years | 0(0) | 1(5.6) | 3(30) | 4(19) | 1(25) | 9(15) |
| >20 years | 2(28.6) | 10(55.6) | 3(30) | 8(38.1) | 2(50) | 25(41.7) |
| Chi-Square Value (p-value) | | | | | | 7.39 (0.495) |

SS: Salary Satisfaction, FE: Farmer Experience, SD: Strongly Dissatisfied, D: Dissatisfied, NSND: Neither Satisfied nor Dissatisfied, S: Satisfied, SS: Strongly Satisfied



Table 2 indicates that the calculated chi-square value is 7.39, and tabulated value at 8 degrees of freedom and 5% of significance is 15.507. Chi-square analysis shows that work experience not create any effect on the salary. It is also clear form Table 2 that majority of farmers are working under low-income range.

4.1.2 Relationship between gender and satisfaction in hand tool using

H0: There is no relationship between gender and satisfaction in hand tool using.

H1: There is relationship between gender and satisfaction in hand tool using.

Table 3 Significant relationship between gender and satisfaction in hand tool using

| HTS \ Gender | SD – No. (%) | D – No. (%) | NSND – No. (%) | S – No. (%) | SS – No. (%) | Total - No. (%) |
|----------------------------|--------------|-------------|----------------|-------------|--------------|-----------------|
| Male | 5(41.7) | 11(45.8) | 3(42.9) | 5(50) | 6(85.7) | 30(50.0) |
| Female | 7(58.3) | 13(54.2) | 4(57.1) | 5(50) | 1(14.3) | 30(50.0) |
| Chi-Square Value (p-value) | | | | | | 4.214 (0.378) |

HTS: Hand Tool Satisfaction, SD: Strongly Dissatisfied, D: Dissatisfied, NSND: Neither Satisfied nor Dissatisfied, S: Satisfied, SS: Strongly Satisfied

Table 3 indicates that the calculated chi-square value is 4.214, and tabulated value at 4 degrees of freedom and 5% of significance is 9.488. Gender also not create any influence on the satisfaction in hand tool using and performance of the farmers working with the same hand tool.

4.1.3 Relationship between average working hours and Satisfac-tion in Hand tool using

H0: There is no relationship between working and satisfaction in tool using.

H1: There is relationship between working and satisfaction in tool using.

Table 4 Significant relationship between average working hours and Satisfaction in Hand tool using

| HTS \ AWH | SD – No. (%) | D – No. (%) | NSND – No. (%) | S – No. (%) | SS – No. (%) | Total - No. (%) |
|----------------------------|--------------|-------------|----------------|-------------|--------------|-----------------|
| < 42 hours | 14(51.85) | 8(44.4) | 9(100) | 3(100) | 0(0) | 34(56.7) |
| > 42 hours | 13(48.15) | 10(55.6) | 0(0) | 0(0) | 3(100) | 26(43.3) |
| Chi-Square Value (p-value) | | | | | | 14.45 (0.005) |

AWH: Average working hours, HTS: Hand Tool Satisfaction, SD: Strongly Dissatisfied, D: Dissatisfied, NSND: Neither Satisfied nor Dissatisfied, S: Satisfied, SS: Strongly Satisfied

Table 4 indicates that the calculated chi-square value is 14.45 and, tabulated value at 4 degrees of freedom and 5% of significance is 9.488. Therefore, satisfaction in hand tool working influences working and performance of the farmers.

4.2 MSDs Reporting in Farmers

Odds ratio (OR) helps to provide a measure of association between exposure and an outcome during particular time interval in our study [13]. For investigating the MSDs reporting from the NMQ results was checked for the odds that an outcome will occur given a particular exposure, compared to the odds of the outcome occurring in the absence of that exposure.

Table 5 Days at work in a week and years of service and presence of MSDs

| Region | Category | Yes (%) | No (%) | Odd Ratio | p-value |
|-----------------|-----------|-----------|-----------|-----------|---------|
| Neck | In a week | 26 (43.3) | 34 (56.7) | 2.429 | 0.018* |
| | In year | 39 (65) | 21 (35) | | |
| Shoulder | In a week | 39 (65) | 21 (35) | 1.077 | 0.847 |
| | In year | 40 (66.7) | 20 (33.3) | | |
| Elbows | In a week | 31 (51.7) | 29 (48.3) | 2.019 | 0.064 |
| | In year | 41(68.3) | 19 (31.7) | | |
| Wrist/ Hands | In a week | 35 (58.3) | 25(41.7) | 2.347 | 0.034* |
| | In year | 46 (76.7) | 14 (23.3) | | |
| Upper back | In a week | 27 (45) | 33 (55) | 1.966 | 0.069 |
| | In year | 37 (61.7) | 23 (38.3) | | |

Table 5 represents the presence of MSDs related to hand for working of farmers during week and year. These farmers had significantly higher odds of suffering from neck pain (OR: 2.429, P < 0.05) and wrist pain (OR: 2.347, P < 0.05).

5 Concluding Remarks

In this study, farmers work life was investigated using questionnaire survey methodology. Average working hours and performance have found as a crucial risk factor for hand tool satisfaction in agriculture farmers of Rajasthan.

Several limitations exist in the present study regarding measurements of environment determinates factor like heat, workload, moisture and noise level at farming sites due to lack of measuring instruments. Small sample size for the analysis was also the limitation of this study, but currently authors are carrying out further research in this direction. Less number of factors are considered for investigating the working of farmers. Future research could extend this work with larger samples from various other districts present in Rajasthan with some more physical and psychological aspects of working. Evaluation of postures of famers using various ergonomic assessment tools like rapid upper limb assessment, rapid entire body assessment, agriculture lower limb assessment, agriculture upper body assessment and agriculture whole body assessment should be done for identifying the different dimensions of hand tool to be improved.



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