ABSTRACT

India witnessed the green revolution in late sixties and the country which was once called "The Begging Bowl" become the "Bread Basket", Credit for this change goes to our farmers and workers who toil in the field day and night, their efforts helped the country to have a good grain production over 210 million tones.

Organic agriculture is that form of farming which produces sufficient food to meet the needs of the present generation without eroding the ecological assets and the productivity of the life supporting system of future generation. The concept of organic farming has been getting very popular of late with many advocating a return to traditional methods of agriculture. In order to avoid the deleterious effects of synthetic chemical, fertilizers and pesticides, organic farming is needed as an alternative to provide ecologically safe methods of farming.

Although the concept of organic farming has received much elaboration at different levels, the description offered by has been found to be most comprehensive covering all essential factors. Organic agriculture is production system, which avoids or largely excludes the use of inorganic fertilizers, pesticides, growth regulators and livestock feed – additives. To the maximum extent feasible, organic farming system rely on crop rotations, crop residues, animal manures, legumes, green manures, off farm organic wastes and aspects of biological pests control to maintain soil productivity and filth, to supply plant nutrients and to control insects, weeds and other pests.

Women were perhaps the first to domesticate the crop plants, and have played a pivotal role in the development of agriculture. In Indian mythology, women are rightly worshipped as annapurna – the provider of food. Even today, the rural women continue to play an important role in farm related

operations, besides fulfilling other responsibilities of home making and child rearing. The female population in country according to Census 1991, is 406.38 million (48.16 percent of total population) of which 75 percent are rural. The percentage of women cultivators is 34.22, women agricultural labourers is 44.93 in livestock, forestry, fisheries and other allied activities 1.60 percent of women are involved (Gongadhara, 1995).

To boost up the agricultural production, the need for enhancing the technical knowledge of women has been felt since long but not much attention was paid in this direction. Inspite of the pivotal role played by women in farming, women specific modern technologies are either not available in the country or information are not available about these technologies. Technologies developed in India has been carried out to identify the appropriate technologies related to production, processing and preservation of agricultural produce which are gender neutral and suit equally to both men and women alike. Their adoption will reduce drudgery, increase productivity and generate additional income and employment.

In today's world, comfort occupational health and safety issues have become very important and the same is true for agriculture also. With the adoption of more and more power operated equipment, it has become imperative to give due attention to design of safe, comfortable and efficient machines to carry out various agricultural operation. Most of the agricultural workers are in unorganized sector and have to work with the machines of ergonomical and safety aspects in design and operation leads to fatigue and discomfort.

The present research study proposed to be located in the villages of Nainital district of Uttranchal would provide opportunities to rural women farmers to accept improved implements for farmers to accept improved implements for various organic agricultural and allied task and improve the

work performance. This would also help them to safe time and also energy. If women farmers had to participate in activities in farm, which improves the family's economic conditions. The present study had great practical utility for the women farmers who spend the whole day in their fields, perform all household chores at home, look after the livestock and carryout income generating activities. The study would provide useful information to hem about modification of equipments and use of improved technologies. The application of improved / modified technology can help in increasing efficiency and their by productivity of the workers without jeopardizing their health and safety.

Descriptive – cum – experimental research design was used for present investigation. The resent study has been carried out in Nainital district. Two block Haldwani and Bhimtal were selected for the present study purposively. The purposive – cum – convenience sampling design was sued to select the study area and women farmers. The total sample consisted of 120 women farmers. All the respondents were involved in organic farming for the selection of experimental data 5 percent i.e., 6 women farmers purposively selected on the basis of a physical fitness test.

For descriptive data interview schedule was developed keeping in view the objectives of the study. Information about the background characteristics of women farmers the household like age, education, type of family etc. Extent of women's involvement in various types of activities. Type of technologies used for various activities, type of technologies used for various activities, health problems and body discomfort experienced by women farmers, time spent, distance traveled and posture involved in various activities. Attitude of women farmers towards acceptance of modified technologies.

For experimental work, anthropometrics dimensions, checklist to assess modified and traditional technologies. It also included various type of observation and record sheet for recording to physiological cost of activities in terms of heart rate, energy expenditure TCCW, postural stress and muscular

stress. Body map and to point scale was also included for measuring body discomfort by women farmers during activities.

Descriptive and relational statistics were used for the present study.

The mean age of women farmers was 36.06 ± 1.94 years. Out of the total sample 34.16 percent of women farmers were illiterate and very few of them i.e. 5.83 percent were graduate. Rest of them varied in their educational level. On the whole majority of farmers i.e. 95.0 percent were full time farmers and very few of them i.e. 5.00 percent were part time farmers. Majority of women farmers i.e. 98.33 percent were male headed household. More than half i.e. 59.16 percent of women farmers belonged to nuclear family. The mean family size of the women farmers was approximately 7 members. On the whole 18.0 percent of women farmers had large size of land holding (greater than 10 hectare). Mean monthly income of family was Rs. 4051.06 ± 331.52 monthly income of family ranged from Rs. 1700 to Rs. 11500. On the whole less that half of the respondents 45.0 percent of women farmers had medium income ranging from Rs. 1701 to Rs. 4200 while 29.16 percent of them had low income i.e. upto Rs. 1700. Remaining 25.83 percent of them had high income range of Rs. 4201 to 11500. From the total sample 73.33 percent of women farmers had less than 5 animals and only 2.5 percent of women farmers had more than 10 animals.

For digging of land 85.0 percent used 'Kudal' and remaining used small handle 'hoe'. It was observed that majority of women farmers i.e. 73.33 percent women did leveling of land manually. For application of sowing majority of them used hand it by hands. For sowing majority of them used hand and remaining i.e. 25.0 percent did sowing behind plough. All women farmer were used for interculture, hoeing and weeding. For harvesting all the women farmers used only traditional sickle. For threshing and winnowing majority of them performed this activity by hands.

It was found that maximum time spent by women farmers was on weeding (475 minutes/day) and minimum on digging of land (198 minutes/day). It was further analyzed that highest distance traveled by women farmers was (19.5 meters for weeding and lowest distance traveled by them was 3.15 meters for winnowing.

Posture mainly adopted by women farmers during various activities like digging of land, leveling of land, sowing, interculture, hoeing, weeding, harvesting, threshing and winnowing was squatting and bending. For application of manure they adopted standing and squatting body posture.

The average normal standing height of women farmers was found to be 145.2 ± 4.97 Cm. The percentile values were calculated as 5^{th} percentile i.e. 154.2 Cm and 95^{th} 162.0 Cm. Little difference was observed in the average eye height (91.50 Cm), sitting eye height (72.30 Cm) popliteal height (42.30 Cm), knee-height (sitting) (45.3 Cm). Functional leg length (94.3 Cm), forearm hand length (42.3 Cm). Elbow grip length (42.3 Cm). Elbow grip length (32.7 Cm). Buttock knee length (50.7 Cm).

A high difference was found in their average. Thumb tip reach, forearm hand length, foot-length, foot breath, shoulder grip length, hand length, hand circumference, wrist wall length and wrist center of grip.

Findings showed that near about half i.e. 66.66 percent of women farmers possessed favorable attitude towards acceptance of modified technologies. Remaining 16.66 percent had neutral attitude towards acceptance of modified technologies.

Positive correlation was found between size of land holding, numbers of animals and livestock, income of the family, time spent and distance traveled in

various activities and attitude of women farmers towards acceptance of modified technologies. Negative correlation was found between age and attitude of women farmers towards acceptance of modified technologies.

On the basis of score range, very few of them i.e. 8.33 percent had mild discomfort, about 47.5 percent had moderate and 43.33 percent had severe body discomfort. On the basis of percentage of respondents experiencing discomfort in different body parts, it was found that knee pain (94.16 percent), back pain (97.50 percent), lumber pain (99.16 percent) hip and thigh (91.66 percent) were more common among them while headache (50.0 percent) Neck pain (60.0 percent) and chest pain were least common among them.

A positive correlation was observed between size of land holding, numbers of animals and livestock, time spent and distance traveled in various activities and body discomfort experienced by women farmers. Negative correlation co-relation was found between age, income of the family and body discomfort experienced by women farmers.

It was found that mean physical fitness index score of women farmer was 117.53 ± 6.73 which indicated that their physical fitness was of good average category. Mean body type score of women farmers was 24.21 ± 0.89 which showed that they were mesomorphic category.

A positive correlation ($P \leq 0.01$) was observed between age and physical fitness index. Thus, it could be inferred that as age increased physical fitness index decreased. Heart rate (beats/min) of women farmers during activities with traditional and modified technologies.

Heart rate highest during digging of land with traditional technologies. (138.66 beats/min). It was lowest during threshing with modified technologies (110.17 beats/min). These activities were classified as heavy to sever activities

with traditional technologies and except threshing and winnowing with modified technologies which were a positive correlation was observed between heart rate while digging of land, leveling of land, application of manure, interculture, hoeing weeding, winnowing and age of the respondent

Energy expenditure during digging of land with traditional technologies was highest i.e. 13.248 kJ/min and percentage increase in energy expenditure was 263.380 percent. While it was lowest during threshing with modified technology i.e. 8.787 kJ/min. and percentage increase in energy expenditure during threshing with modified technology was 134.203 percent. A positive correlation was observed between energy expenditure and heart rate of women farmers before and while performing various activities.

It was observed during sowing with modified technologies heart rate was more i.e. 125.05 beats/min and output also more i.e. 6.84 m^2 and heart rate was less (117 beats/min) with traditional technologies and output was also less (4.20 m^2). It was observed that significant difference in physiological cost (heart-rate) before and after acceptance of modified technologies, while performing farm activities.

Total cardiac cost of work (TCCW) of women farmers was significant high ($P \leq 0.01$) during digging of land with traditional technologies i.e. 988.33 beats while it was lowest during winnowing with modified technology (593.99 beats).

It was found that muscular stress (grip strength) was highest i.e. 5.30 kg of right hand and 4.22 kg of left hand with traditional technologies and mean difference in muscular stress was lowest during threshing with modified technologies i.e. 3.87 kg of right hand and 3.19 kg of left hand.

A positive correlation was observed between, muscular stress while digging of land, leveling of land, application of manure, interculture, hoeing, weeding, harvesting, threshing and age of women farmers.

It was found that postural stress was more while performing various activities such as digging of land, leveling of land, application of manure, sowing, weeding, hoeing, interculture, with traditional technologies as compared to modified technologies, it was observed that during sowing, with traditional activities postural stress (angle of deviation) was more i.e. 7.55 degree in upper portion and 3.12 degree in lower portion as compared to modified technologies i.e. (1.40 degree in upper back and 1.32 degree in lower back).

Physiological cost in terms of heart rate, energy expenditure, TCCW, postural stress and postural stress were less with modified technologies in all activities as compared to traditional technologies and out put was also more.

There was need of minor modification in some of the modified technologies, for example modification in handle of hoe, Kutla, land leveler and hand scraper. But there was need for major changes in maize seeder on the basis of ergonomic parameters and some suggestions for better gripping in maize Sheller and modified sickle.

It was very important that there were some major changes in traditional technologies like, Kudal, traditional, hoe on the basis of ergonomic parameter because they are not suitable to the women farmers.