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Research Article

Evaluation of a Training Program on Soil Fertility and Crop Yield Improvement Techniques

Muhammad Nisar Khan[1*], Ghulam Sadiq Afridi[1], Hamida Bibi[2], Hassnain Shah[1], and Sajida Taj[1]

[1]Social Sciences Research Institute, National Agricultural Research Centre, Islamabad
[2]Department of Soil and Environmental Sciences, KPK Agricultural University Peshawar

Abstract: This research paper aimed to examine the training immediate effect on professional knowledge and to provide suggestions that how can further improve the training programs in future. Soil and Water Conservation Research Institute (SAWCRI) organized a professional training on "Soil Fertility and Crop Yield Improvement Techniques" under USDA/ICARDA funded project "Improving Soil Fertility & Soil Health through Demonstration of Best Management Practices for Farmers in Pakistan". The training was held at district Chakwal of Punjab, Pakistan in April, 2015. The purpose of the training was to disseminate latest knowledge about green manuring and on-farm composting techniques and to raise the awareness in professionals. The results were based on the data collected from forty-one professionals participated in the training program from different government and non-government organizations. The professionals were asked to rate a various statement about presenters and overall training activities using a five-point likert scale ranging from 1 (strongly agree) to 5 (strongly disagree). The findings showed that as a result of training, the knowledge of technologies and confidence level of training professionals were increased. This enormous improvement in professionals' knowledge and awareness about the technologies revealed that the training was very useful and practical. Similarly, majority of professionals were satisfied and appreciated resource persons as they were experts, and well-informed about these techniques. Training professionals intimated that the training was interesting and the field activities were also well organized. They were assured that this training had put down a significant impact on professionals' knowledge both theoretically and practically.

Keywords: Professional training, Knowledge, Green manuring, Composting, Dissemination, Pakistan.

1. INTRODUCTION

Agricultural training to the right people at the right time and in a right way will remain essential for the development of the agricultural sector. Training programs helps in constructing a more conducive learning environment for professionals and train them for future challenges [1]. Training is an important mechanism for technology transfer and human skills improvement regarding developmental process. To ensure agriculture development, present institutes needs to be strengthened with well-planned system of training [2]. Effective training programs help employees to get acquaintance with the desired new technological advancement. It also helps in gaining full command on the competencies and skills required to perform at particular job and to void on the job errors and mistakes [3].

Fertile soils are a challenge to the world because soils are one of the most important components of food systems. Therefore, we must encourage conservation practices and the adoption of technologies to restore degraded land and protect those that are still functional [4]. Green manure or cover crop is a great technique to add nutrients to the soil and increase its fertility. Green manure crops are divided into legumes and non-legumes. Legumes are plants whose roots work with bacteria in the soil to grab nitrogen in the atmosphere, while non-legumes are all other green manures like ryegrass, cowpea, sorghum, buckwheat, alfalfa

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* Corresponding Author: Muhammad Nisar Khan <mrwt01@gmail.com>

and oats. Decrease in crop productivity is strongly linked with decline in the level of soil organic matter. While organic matter determines the improvement of physical aspects, water retention and biological activity in poor soils. Therefore, for sustaining soil productivity on small farms, biomass is revealed to be a fundamental element. It allows nutrient recycling and controls the microbial inhabitants that retain beneficial soil properties [5]. While high fertilizer usage badly affects the soil nutrient contents and crop yield. The rapid decrease in soil fertility with increase in cost of fertilizer made the legumes a popular alternate like organic fertilizers. The legumes are significant for improving soil fertility and have a more encouraging effect on grain yield [6]. Legumes restrict durable increases of soil organic matter and enhance nutrient retention and nitrogen -uptake efficacy of soil. The suitable green manure or cover crops help in erosion control and decreased nutrient loss. It also helps to control weeds and pests of specific crops [7]. The availability of manures is mostly insufficient in organic arable farming. In Northern Europe, using other sources of nitrogen is necessary for fertilizing high yielding cereals under organic farming [8]. Similarly, in the tropics, green manures are perfect and best technique for sustaining soil fertility [9, 10]. Green manures can recover soil structure in a numerous way. Some species produce deep tap roots that help out in breaking compacted soil. A series of pot experiments identified Lucerne roots as being particularly effective at penetrating hard layers, with lupin, red clover as having intermediate capability and barley the poorest [11]. Some plants, especially lupin and buckwheat have the ability to increase phosphate mobility in the soil. Lupin grown in phosphorus deficient soil was found to extrude protons and organic acids such as citric acid, increasing the mobility and uptake of phosphorus [12]. Some scientists think that green manures are not wealthy in potash and phosphorus. However, they get better the physical characteristics and stimulate microbial activities of soil [13].

Composting is a controlled biological decomposition of organic matter by microorganisms. The microorganisms amend the raw organic materials (sludge, manure, leaves, paper, food garbage etc.) into a soil-like material which can be used to improve the fertility and quality of soils. Compost is a wealthy source of soil organic matter and plays a significant job in sustaining fertility of soil, which leads to sustainable production. Additionally, it recovers the physical, chemical and biological properties of soil [14]. Unlike other synthetic fertilizers, renewable soil fertility modified technologies symbolize sources for on-farm, biologically fixed nitrogen and affix huge quantity of organic matter to cropping systems [15]. Biological nitrogen-fixation can add as much as 300kg N/ha in a season through grain legumes and outstandingly 600 kg N/ha in a year through tree legumes [16]. The slow discharge of nitrogen from decomposing green manure residues better synchronize with plant uptake than sources of inorganic, probably increasing nitrogen uptake efficiency and crop yield and reducing its leaching losses [17]. It is important for the compost mass to reach about 60^{o}C to kill any unwanted pathogens and weed seeds and break down all the material properly and must not get hotter than 70^{o}C as this will reduce the nutrient and carbon value of your compost and kill beneficial decomposer organisms. A good quality compost should take about 8 weeks, and it is very important not to use compost unless it becomes ready as beneficial organisms will not have established, and nitrogen will have been temporarily taken by the decay organisms and be unavailable to plants. The purpose of current study was to evaluate the training activities as well pre and post-knowledge status of professionals through feedback after attending the training sessions and practical visits of demonstration sites.

2. MATERIALS AND METHODS

This research study was carried out based on primary data from the participants of a training program organized by Soil and Water Conservation Research Institute (SAWCRI), Chakwal from 21 to 22 April, 2015. SAWCRI, Chakwal demonstrated the technologies of green manuring and on-farm composting under the project of "Improving Soil Fertility & Soil Health through Demonstration of Best Management Practices for Farmers in Pakistan" funded by USDA-ICARDA. At day 1st, four presentations about the technologies (green manuring & on-farm composting) were delivered by resource persons (SAWCRI scientist) inside the training hall. While on 2nd and 3rd day of training, participants practically visited demonstration sites conducted at the field of farmers in two villages;

Thoha Bahadur Khan and Batti Gujar of district Chakwal. During field visits, two more lectures were delivered by SAWCRI scientists regarding the specific technologies. Effectiveness of the training program was determined, by using pre and post-training evaluation questionnaires that were distributed among participants at the beginning and end of the training. The exercise was conducted to evaluate training course from participants own perspective and by requesting them to comment honestly regarding the program. The evaluation strategy to assess pre and post-training knowledge of the participants was consisted of their views regarding instructors, lecture materials and training activities. The evaluation framework used in this study based on the 5-point Likert Scale ranging from "Strongly Agree" on one end to "Strongly Disagree" on the other through various statements from level A to level E and these ranks were assigned scores in the following way:

- ✓ A. Strongly Agree =1
- ✓ B. Agree =2
- ✓ C. Neutral =3
- ✓ D. Disagree =4,
- ✓ E. Strongly Disagree =5

3. RESULTS AND DISCUSSION

The first section describes the socioeconomic characteristics of the participants including their age, education, farming experience and gender participation. While, second section describes the feedback of training respondents about instructor's presentations, overall training activities, and pre and post-training knowledge status of respondents about the specific technologies.

3.1. Age of training participants

Age of a person has significant substantial contribution towards personal learning because higher age of respondents leads to higher experience in farming. One-third (32%) of the training participants were in age group of 20-30 years followed by in age group of 41-50 years (29%), in age group of 31-40 years (22%) and in age group of above 50 years (17%) (Table-1). Thus, majority of the participants were young and middle aged persons that generally have more interest in dissemination and adoption of promising crop production technologies.

Table 1. Age group of training respondents

Age group (years)	Frequency	Percentage
20-30	13	32
31-40	09	22
41-50	12	29
Above 50	07	17
Total	41	100

Source: Training data, 2015

3.2. Educational level of training respondents

Education plays a key role in learning new knowledge and sharing it with others. The educated people are more enriched in knowledge and have the ability to accept new ideas and take adoption risks. Table-2 indicates that the proportion of university graduates were considerably high (46%). Similarly, more than one-third of the participants (37%) were college graduates followed by high school graduates (17%). The high school represents low level, college represents medium level and university represents high level of education.

Table 2. Education level of training respondents

Education	Frequency	Percentage
High School	07	17
College	15	37
University	19	46
Total	41	100
Total	41	100

Source: Training data, 2015

3.3. Professional experience of training participants

Farming experience of a farmer decided his exposure to risks and other challenges and use of risk management strategy. Table 3 indicates that 39% of training participants had (less than 5 years) of experience), followed by those who were involved in crop farming for more than 20 years (27%), 5-10 years (17%), 11-15 years (12%) and 16-20 years (5%). These results indicate that the training participants were mostly in young and middle aged persons having reasonably good professional experience.

Table 3. Professional experience of training respondents

Experience	Frequency	Percentage
Below 5	16	39
5-10	07	17
11-15	05	12
16-20	02	05
Above 20	11	27
Total	**41**	**100**

Source: Training data, 2015

3.4. Gender participation in training program

It is important for women to participate in trainings because it will help them to improve their economic status as well as empowers them in decision making about farm, family and budget related matters [18]. Table 4 indicates that out of forty-one (41) training participants, 34 were male respondents representing (83%) while 7 were female representing (17%) of total respondents.

Table 4. Gender participation in training program

Gender	Frequency	Percentage
Male	34	83
Female	7	17
Total	41	100

Source: Training data, 2015

3.5. Respondents' observations regarding presenters

Observations of the training professional regarding the training presenters are presented in Fig. 1. More than one-third (34%) of training respondents were strongly agreed and majority (63%) were simply agreed about the presenter's communication skills of the subjects. Similarly, 41% of respondents were strongly agreed and 49% were simply agreed about the presenters convincing power of their subjects; 29% of training respondents were strongly agreed and 68% were simply agreed about the presenters' ability to answer the questions of respondents; and 20% of training respondents were strongly agreed and 61% were simply agreed about the presenters keeping attention aptitude during the training. However only few of training respondents were disagreed and some were showed neutral responses about presenters' communication and their presenting skills, keeping attention ability, knowledge of the subjects and to answer the questions of training respondents.

3.6. Respondents' observations about different aspects of training program

Training plays a vital role in improving human performance as well as enhances their knowledge, skills, competencies, ability, and behavior [19, 20]. Fig. 2 provides the description of respondents about various aspects of training program. The training effectiveness was measured through six different aspects. As the data indicate that majority (68%) of respondents were strongly agreed and 27% were simply agreed about the training relevancy; while more than one-third (37%) of respondents were strongly agreed and 61% were simply agreed that training met their purpose of attending. Similarly, 44% of respondents were strongly agreed and 49% were simply agreed that training motivated them to take action; and nearly half (49%) of respondents were strongly agreed and 46% were simply agreed that they will share the training experiences with others. Moreover, 34% of respondents were strongly agreed and 63% were simply agreed that training supporting material were helpful; while 29% of respondents were strongly agreed and 68% were simply agreed that they will personally use this training knowledge in future. However, some of respondents showing disagreement or no reaction about the training relevancy, purpose of attending, supporting material, training motivation etc.

3.7. Pre and post-knowledge status of training respondents about technologies

Pre and post-knowledge status of training respondents about technologies is presented in Fig. 3. The knowledge levels were divided into three categories; low, medium and high. As the training results illustrated that majority of training respondents already had awareness about the technologies but after training they had further improved their knowledge status. Increase in knowledge levels of respondents was found to be the most important benefit of training. The findings noted in fig. 3, indicated that maximum level of change occurred in respondent's knowledge after training. As pre-training; the knowledge levels (low, medium and high) of respondents about green

manuring were (34%, 56% and 10%) while post-training knowledge levels were (2%, 24% and 73%). Similarly, pre-training, the knowledge levels of respondents about on-farm composting were (63%, 32% and 5%) while post-training knowledge levels were (5%, 27% and 68%). Similar results are evaluated by Masood and Usmani in medical teacher training program through Kirkpatrick's model and participants in their training perceived that their learning considerably improved after training [21].

- ✓ Low= Know very little about this technology
- ✓ Medium = Know about this technology but there are more things to learn
- ✓ High= Have a good knowledge but there are things to learn

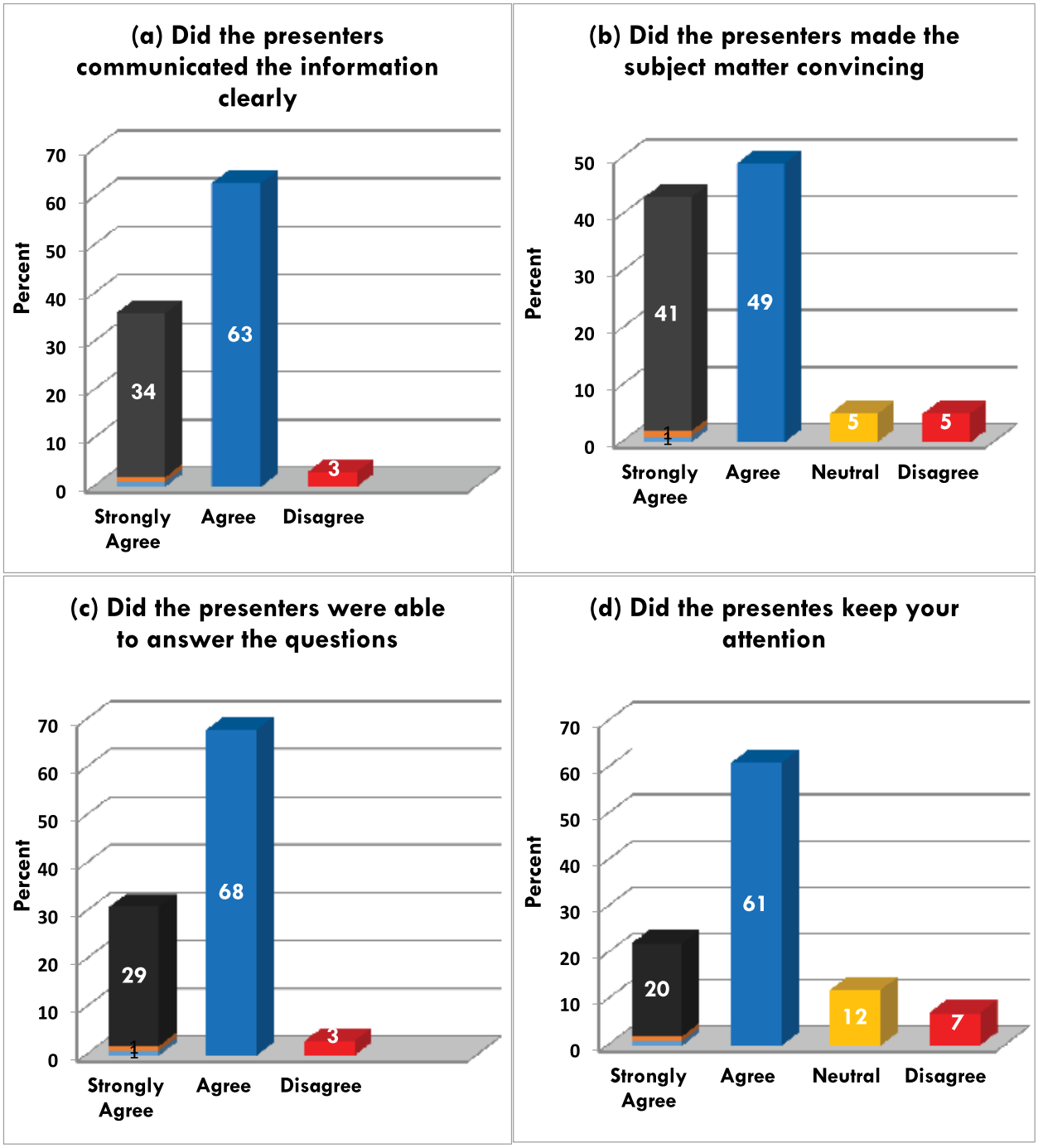

Fig. 1. (a-d) Respondents' observations regarding presenters.

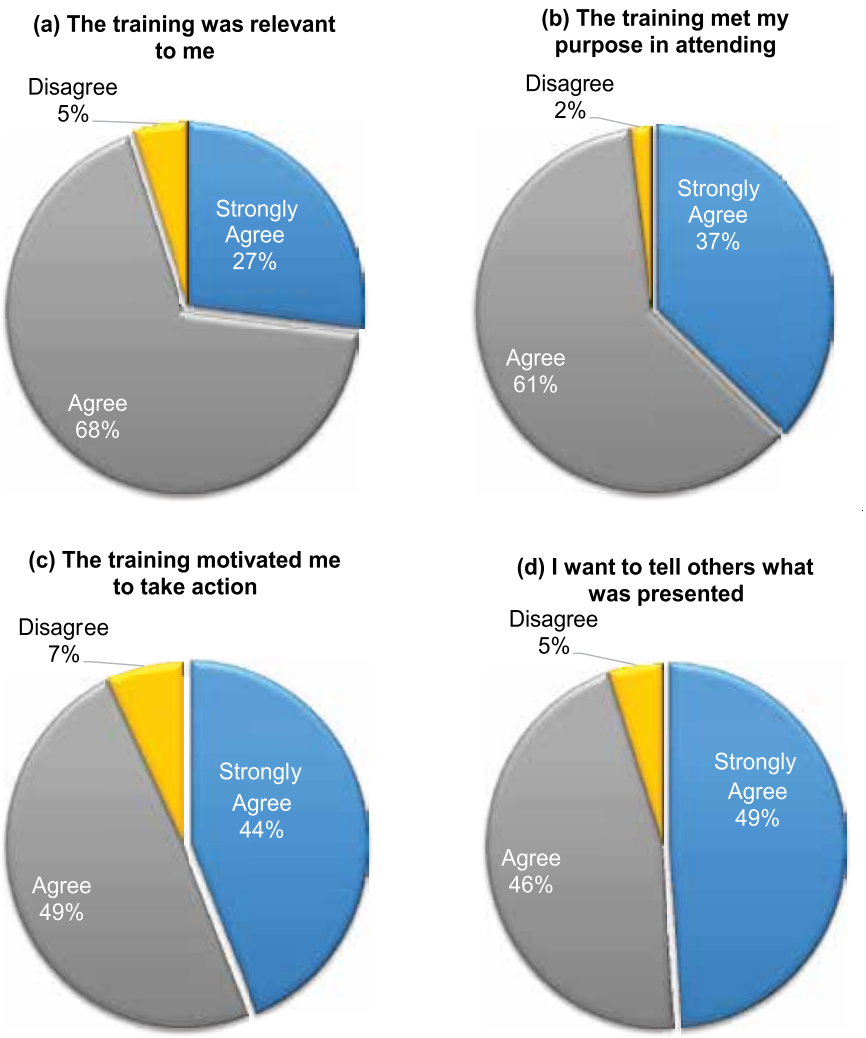

Fig. 2. (a-d) Respondents' observations about different aspects of training program.

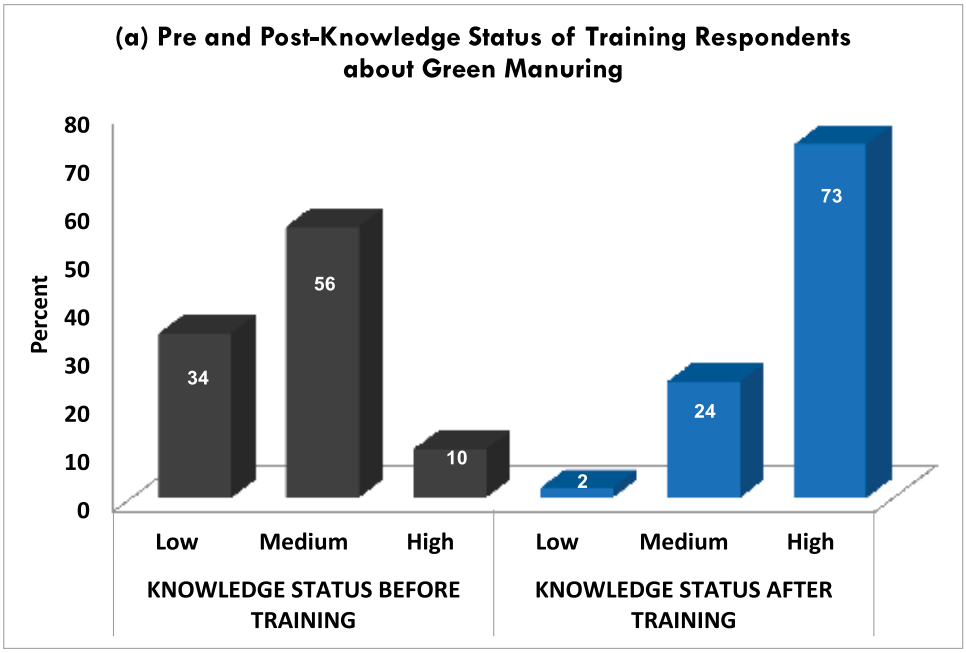

Fig. 3(a). Pre and post-knowledge levels of respondents about technologies

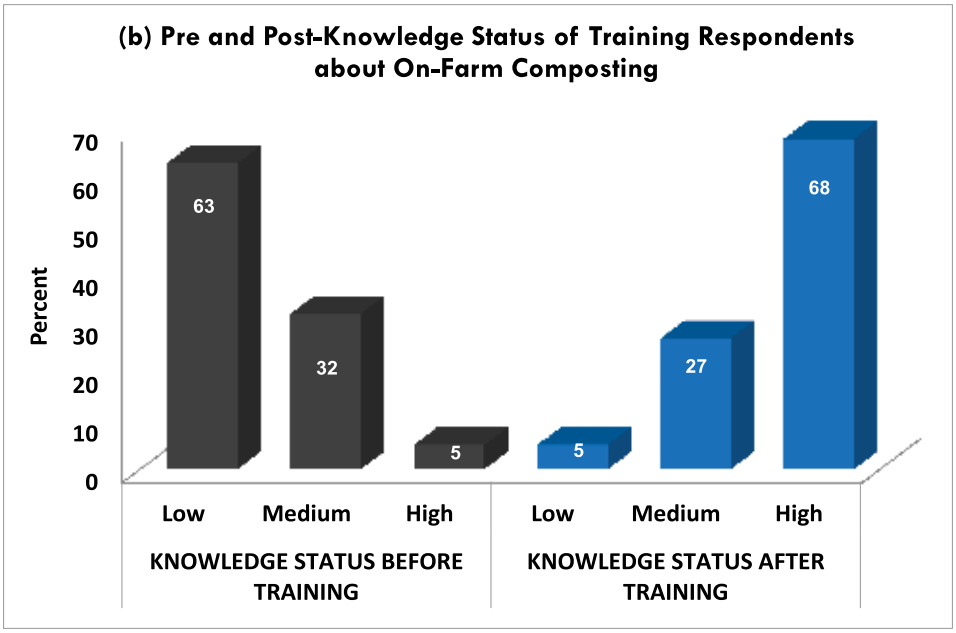

Fig. 3(b). Pre and post-knowledge levels of respondents about technologies

3.8. Training glimpses of field activities

Fig. 4. Demonstration site of green manuring

Fig. 5. Demonstration site of on-farm composting

Fig. 6. Observe the impact of green manuring on wheat

Fig. 7. Observe the impact of compost on vegetables

Fig. 8. Field lectures about green manuring and on-farm composting

Fig. 9. Social scientists getting training feedback from professionals by pre and post-questonaires

4. CONCLUSION

Evaluation is the systematic and objective assessment of an on-going or complete program. Training is effective only if it produces desired results. Training programs are most likely to be effective when they incorporate the respondents' motivation, recognizes the individual differences and makes proper schedule of the learning process. It is concluded from the present training evaluation that majority of respondents were well qualified and already had good knowledge of the specific technologies. Results indicated that through training, the respondents had more improved their skills and knowledge about the technologies. Majority of the respondents were satisfied from the resource person's capabilities and from overall usefulness of training activities. Most probable reason for dissatisfaction of these few respondents was irrelevancy of their jobs with the training. The respondents also acknowledged that they had learned the exact procedure of composting which will be very effective and beneficial for them. They appreciated the practical field visits of the demonstration sites as well as affirmed that field lectures were very good and helpful.

Furthermore, respondents' knowledge about these technologies improved much with the training. Lastly, a few suggestions are being made to ensure the success of such training programs in future; the training duration should be increased and training management be improved in both delivery of lectures as well as in field work; the brochures and CDs of the presentations should be provided to the respondents; and there should be a proper sound system arrangement in the training room, as during the question-answer session some respondents were inaudible.

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