Assessing the training needs of agricultural extension workers about organic farming in the North-Western Himalayas

Dinesh Singh Yadav*, Pankaj Sood, Surender Kumar Thakur & Anil Kumar Choudhary

Himachal Pradesh Agricultural University,
Farm Science Centre, Sundernagar District Mandi Himachal Pradesh, India
*Email: dsyadavhpau@yahoo.com

Abstract

Agricultural extension organizations worldwide face challenges of professional competence among their employees. Planning, training and management of human resources within extension organizations are essential to increase the capabilities and overall effectiveness of extension personnel. This paper examines the training needs of agricultural extension workers in the state of Himachal Pradesh, India, regarding organic farming. Random sampling was used to select 65 extension personnel of the Himachal Pradesh State Department of Agriculture (HPSDA) from within ten districts of the state. The data are self reported scores collected with a structured instrument in which ten aspects of organic farming were addressed. The results revealed that the majority of extension workers reported medium to high training needs in seven specific areas: bio-dynamic farming, homa farming, bio-rational pest management techniques, biological methods of pest control, bio-fertilizer technology, record keeping/certification standards, and grading/packing and marketing of organic produce. The majority of extension workers reported low or no training needs in the areas of composting/vermicomposting, green manuring/green leaf manuring, and crop rotations. There was no significant relationship between age, educational qualifications, or service experience with identified training needs. To achieve the potential for the uptake and successful implementation of organic farming amongst Himachal Pradesh farmers, the training of HPSDA agricultural extension workers could concentrate on improving their knowledge in the seven identified areas of organic farming skills.

Keywords: Organic agriculture, training needs, extension officers, Himachal Pradesh, India.

Introduction

Agriculture is the back bone of the Indian economy and plays a vital role in the overall development of the nation (DES, 2012). About 70% of India's population, that is 830 million people, reside in rural villages, and agriculture is their primary source of food, fodder and fuel, as well as income to satisfy other needs (Agoramoorthy, 2008; Baruah & Bora, 2008; Singh *et al*., 2007). However, Indian agriculture is facing serious challenges because of its ever-increasing population, limited land and water availability, and

 ISSN 1177-4258

degradation of natural resources. It is desirable to increase agricultural productivity in a sustainable manner. The excessive use of agro-chemicals over past decades has deteriorated soil health leading to declines of crop yields and produce quality (Yadav, 2011a).

Organic farming is a system involving the use of organic sources for crop nutrition, biological sources for pest and disease management, recycling of farm and animal wastes in order to increase as well as sustain productivity, and could be the most appropriate development path for Indian agriculture. According to Rao (2000) organic farming is an agriculture production system that sustains the demands of production without interrupting the natural eco-system and with little or no dependence on chemical fertilizers and other agricultural chemicals through the increased use of organic matter, bio-fertilizers, reduced tillage, integrated pest management and the adoption of integrated farming systems.

Organic agriculture has grown from 15.8 million hectares to 37.2 milllion hactares worldwide in the course of a decade, and India rates fifth in the world for speed of uptake (Paull, 2011a) and this has occurred with some support from the Indian government. India ranks seventh in the world with 1.2 million hectares of certified organic agriculture, which constitutes about 0.6% of India's total cultivable area (Willer & Kilcher, 2011). India has made substantial progress in organic farming with its national standards of organic production (NSOP) and accreditation widely recognized, including by the European Commission (EC) and the United State Department of Agriculture (USDA) (Wai, 2007; Willer & Kilcher, 2009).

Himachal Pradesh is a hilly northern state of India with the majority of farmers having rain-fed, marginal and small holdings (Singh *et al*., 1998) and with agriculture being their primary source of food and nutritional security. The hill farming systems are organic in nature by default and so they offer vast opportunities for commercialization. The state government has identified organic farming as one of the important areas for agriculture development and have launched a number of programmes for the promotion of organic farming. An organic cluster project of 1200 ha at a cost of 26.7 million rupees (US $490,000) has been launched (Rana, 2011) and the Japan International Cooperation Agency (JICA) has funded a project of 3.21 billion rupees (US$58.7m) described as "crop diversification promotion project" and with organic farming as one of its important elements (www.hpagriculture.com/schemes).

Organic farming has the potential to become an important agri-business among the farmers of the country in general, and marginal farmers of hilly states like Himachal Pradesh in particular, owing to the premium returns from organic produce. However, many organic farmers are not achieving the desired benefits as expected or technically projected by the experts, mainly due to the farmers' lack of technical know-how. This situation has occurred particularly due to the lack of sound technical back-up support, as organic farming is just in its infancy and requires considerable technical knowledge.

A review of the literature indicates variations and deficiencies in knowledge, skills and ability among extension personnel (e.g. Wheeler, 2007, 2008). For the present investigation, the training needs of agricultural extension officers were investigated (a) to identify the training needs of extension personnel and (b) to determine the relationship, if

 ISSN 1177-4258

any, between three independent variables (age, educational qualification, and service experience) and training needs.

Materials and Methods

Research design and study area

An exploratory research design was used in the present investigation. The study on training needs of agricultural extension workers of the Himachal Pradesh State Department of Agriculture (HPSDA) about organic farming technology was conducted during the year 2011 in the state of Himachal Pradesh, India (Figure 1). Himachal Pradesh is situated in North-Western Himalayas between 30^{o} 22' 40" N to 33^{o} 12' 40" north latitude and 75^{o} 45' 55" E to 79^{o} 04' 20" east longitude. Out of the 12 districts of the state, a sample of 65 agricultural extension officers across the state (except for two districts, Kinnaur and Lahaul & Spiti) was drawn randomly for the present investigation; the sample size from each participating district is random (Table 1).

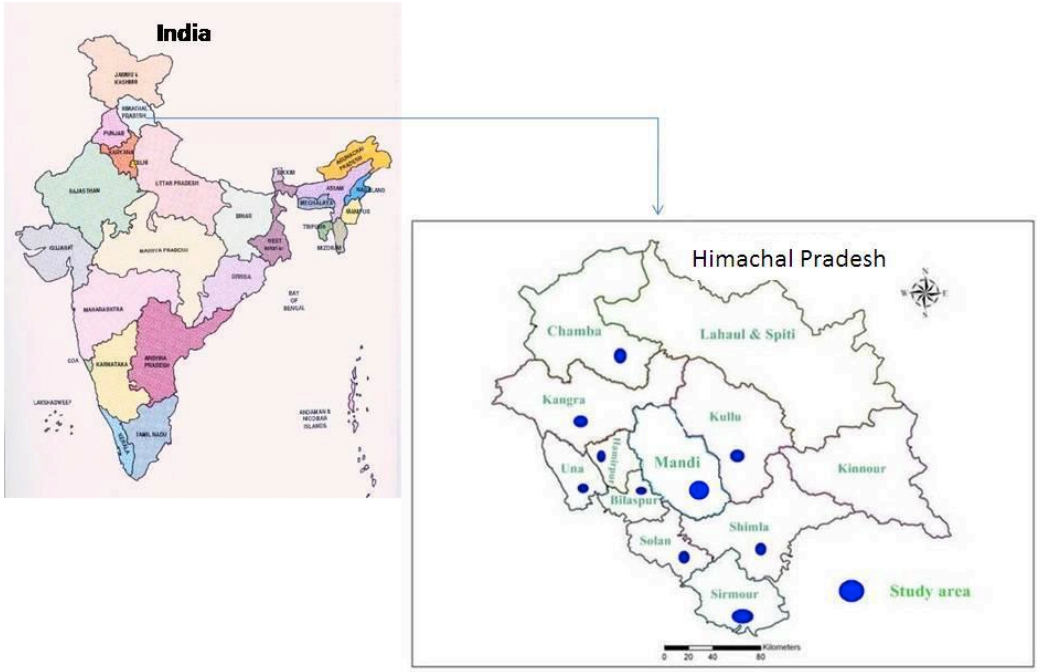

Figure 1. Location of study area.

Table 1. Geographic distribution of sample for assessing the training needs of extension workers of HPSDA.

Districts	Sample size
Kangra	8
Mandi	5
Kullu	7
Hamirpur	7
Chamba	9
Bilaspur	4
Sirmour	8
Una	8
Solan	4
Shimla	5
Total sample	**65**

Tools of the data collection

Training needs were self-assessed and reported, using the perception by self method (Singh 2000). A schedule of ten potential need areas was developed with the aid of literature available on organic farming technologies (Table 3). The schedule was put before the extension workers and were completed based on their self-assessment of their own ability and job need level. The survey instrument included (i) ten questions pertaining to 'Level of ability' which called for a rating by the respondent as 'High', 'Medium' or 'Low' (ii) ten questions on 'Level of need of the job' which also called for a rating 'High', 'Medium' or 'Low' and (iii) three demographic questions. The language of the instrument was the local language of the region as applicable.

The ten identified organic farming need areas for the purposes of the present study were: composting/vermi-composting; green manuring/green leaf manuring; crop rotations; bio-fertilizer technology; bio-dynamic farming; homa farming; biological methods of pest control; bio-rational pest management techniques; record keeping and certification standards; and the grading/packing and marketing of organic produce. The list of ten need areas is not an exhaustive list and there is some overlap between the areas (Table 3).

The so-called green revolution technologies created adverse effects on ecosystems due to the excessive and imbalanced use of synthetic inputs. This situation has led to identifying benign inputs like bio-fertilizers and the use of such natural products to help in safeguarding the soil health as well as quality of products. Bio-fertilizers are an important component in organic farming, they are an alternative to chemical fertilizers, stimulate plant growth, activate soil biologically, restore natural soil fertility, provide protection against drought and some soil borne diseases.

Composting can play an important role in solid waste management programs and can greatly reduce the amount of waste going to landfill and besides it conserves resources, reduces pollution and builds healthy soil. Green manuring is an important component of organic farming as it not only maintains the soil fertility but also conserves soil moisture.

Two specific forms of organic agriculture, bio-dynamic farming and homa farming, were included in the list of ten training topics of the study. Bio-dynamic farming is a form of organic farming that was developed from agricultural lectures of Rudolf Steiner (Paull, 2011b). Homa farming is an Indian practice which derives from the Vedic science of bio-energy denoting the process of removing the toxic conditions of the atmosphere through the agency of fire. This means healing and purifying of the atmosphere with fire as the medium. Homa farming involves the application of agnihotra and homa therapy techniques in organic agriculture. The ash produced by the Hindu ritual agnihotra fire is credited with having fertilizing as well as plant protecting qualities. Agnihotra is reputed to heal the atmosphere, replenish the nutrients necessary for healthy organically grown crops, and to have relevance in pest management (Pathak, 2011; Punam et al., 2011).

Another of the ten knowledge areas identified and included in the study was bio-rational pest management techniques. Bio-rational pesticides are derived from a variety of biological sources, including bacteria, viruses, fungi and protozoa, as well as chemical analogues of naturally occurring biochemicals such as pheromones and insect growth regulators (IGRs). They are considered third-generation pesticides that are

 ISSN 1177-4258

environmentally sound and closely resemble or are identical to chemicals produced by insects and plants. Most bio-rational insecticides are more effective against some insect pests than others. They are typically target-specific and have little to no impact on non-target organisms (Ware, 1989). As a result of such specificity, proper identification of a target insect pest is essential. Bio-rational insecticides have relatively short residual activity compared with synthetic chemical products, and therefore bio-rational products must be applied when the pest is in its most vulnerable life stage, otherwise, applications may be ineffective (Ware, 1989). Bio-rational insecticides are classified into two distinct groups: biochemical and microbial. Biochemical products include hormones, enzymes, pheromones and natural insect and plant growth regulators. Microbial products originate from biological organisms such as bacteria, fungi, nematodes, protozoa and viruses (Ware, 1989).

Determining job need level

For each need area, respondents were asked to indicate one out of three levels of job need, viz. high, medium or low job need level, with corresponding scores of 3, 2, and 1 applied respectively. High, medium and low job need levels refer to high work need frequency (daily/weekly need), moderate work need frequency (15 days to two months), and low work need frequency (once in two to six months), respectively.

Determining ability level

The ability includes knowledge and skill in a particular aspect of a job. For each need area, respondents were asked to indicate one out of three ability levels viz. low, medium, and high ability with corresponding scores of 1, 2 and 3 applied, respectively. Low, medium, high ability corresponds to ‘many mistakes’, ‘few mistakes’, and ‘no or very few mistakes’ made while performing one’s job, respectively.

Determining Training Need

Depending on the ability level and the job need level, the level of the training need of extension workers was determined by adopting the criteria which appear in Table 2 (Singh, 2000).

Table 2. Criteria for determining of training needs of extension personnel.

Level of need of the job	Level of ability	Training need
High	Low	High training need (HTN)
High	Medium	Moderate training need (MTN)
High	High	Low training need (LTN)
Medium	Low	Moderate training need (MTN)
Medium	Medium	Low training need (LTN)
Medium	High	No training need (NTN)
Low	Low	Moderate training need (MTN)
Low	Medium	No training need (NTN)
Low	High	No training need (NTN)

In the present study 'training needs' was considered as the dependent variable while age, educational qualification, and service experience were taken as independent variables. The data collected were quantified, categorized and tabulated by using statistical tools including frequency counts and percentages to draw conclusions. The effect of independent variables on the dependent variable was studied by using the chi square test of significance.

Results

Content of training needs

The data pertaining to training needs were collated and are presented in Table 3. For three of the need areas (composting, green manuring and crop rotations) the majority of the respondents recorded low to no training needs. For composting/ vermi-composting, 71% of respondents scored a low or no training need (Table 3). For green manuring 54% of respondents reported a low or no training. For crop rotations 77% of respondents scored a low or no training need (Table 3).

For the other seven knowledge areas the majority of respondents scored a medium to high training need. For bio-fertilizer technology, 52% of the respondents reported medium training needs followed by high training need of 22% leading to the conclusion that they possessed inadequate knowledge. For both bio-dynamic farming and homa farming the majority of the respondents scored medium to high training needs (Table 3). Plant protection is a challenging aspect of organic farming. Plant diseases and pests are associated with crop damage and sometimes crop failure, and 51% of extension personnel reported medium training needs followed by high training needs of 26% in biological methods of pest control. For bio-rational pest management techniques, the majority of them reported medium or high training needs, 43% and 37% respectively. Record keeping and certification standards are an important component in organic farming without which the produce can not be sold as certified organic, and the majority of respondents reported a medium (40%) or high (24%) training needs indicating that they possessed inadequate knowledge in this area (Table 3). Without proper grading and packing the best price in the market will not be achieved, and extension workers reported training needs of medium (38%) and high (26%) in this area.

Of the 650 ratings of training needs recorded (65 respondents x 10 training areas), 41.7% of all responses were for a specific 'medium' training need, and this was the most common rating of specific needs. There were 20.6% of responses for a specific 'high' need, 28.9% of responses for a specific 'low' training need, and 8.8% of all responses were for a specific 'no' training need (Table 3).

 ISSN 1177-4258

Table 3. Training need of extension workers about organic farming components (N=65).

Sr. No	Subject Matter of Training Need	Training Need							
		HIGH		MEDIUM		LOW		NO NEED	
		No. (Frequency)	Percentage (%)	No. (Frequency)	Percentage (%)	No. (Frequency)	Percentage (%)	No. (Frequency)	Percentage (%)
1.	Composting/ vermi-composting	1	1.54	18	27.69	32	49.23	14	21.54
2.	Green manuring/ green leaf manuring	6	9.23	24	36.92	20	30.77	15	23.08
3.	Crop rotations	0	0.00	15	23.08	37	56.92	13	20.00
4.	Bio-Fertilizer technology	14	21.54	34	52.31	15	23.08	2	3.08
5.	Bio-dynamic farming	19	29.23	35	53.85	9	13.85	2	3.08
6.	Homa farming	20	30.77	33	50.77	10	15.38	2	3.08
7.	Biological method of pest control	17	26.15	33	50.77	14	21.54	1	1.54
8.	Bio-rational pest management techniques	24	36.92	28	43.08	12	18.46	1	1.54
9.	Record keeping & Certification standards	16	24.61	26	40.00	18	27.69	5	7.69
10.	Grading/packing & marketing of organic produce	17	26.15	25	38.46	21	32.31	2	3.08
	TOTALS	134	20.62%	271	41.69%	188	28.92%	57	8.77%

Overall extent of training needs

The results pertaining to the extent of training needs of extension workers are presented in Table 4. The overall extent of training need was determined by following the same procedure as earlier adopted by Yadav et al. (2011d & 2012). In this method, the ability level of the respondents were identified for each area as low, medium and high ability level with corresponding scores of 1, 2 and 3 respectively. For each respondent, the scores for all ten areas were added. This was the individual's overall ability level score. The maximum obtainable score for all ten practices was 30 and the minimum 10. The ability level of all the respondents were further categorized as low (a score of 10), medium (11-20 score) or high (21-30 score). Similarly, the job need level of respondents was established for each area as high, medium and low and assigned scores 3, 2 and 1 respectively. Then for each respondent, the scores for all ten areas were added. This was the individual's overall job need level score. The maximum obtainable score for all ten areas was 30 and the minimum 10. These were then categorized as low (a score of 10), medium (11- 20 score) and high (21-30 score). Based on the overall ability level score and the overall job need level score, the overall extent of training need per respondent was established by reapplying the matrix of Table 2 (Singh, 2000).

Using this method, the majority of the respondents scored an overall medium training requirement. The result was that 69% of the respondents were rated as having an overall medium training need and 31% of respondents were rated as having an overall low training need in organic farming (Table 4).

Table 4. Overall extent of training need about organic farming components (N=65).

Extent of training need	No. (Frequency)	Percentage (%)
MEDIUM	45	69.23
LOW	20	30.77

Relationship between independent variables and training needs

The data pertaining to the relationship of the three independent variables to the overall extent of training need is presented in Table 5. The data revealed that all the independent variables, age, education, and professional experience, showed non-significant relationship with the overall extent of training needs of extension workers with chi square values of 4.19, 4.98 and 4.86 respectively (Table 5).

Table 5. Relationship between selected independent variables and overall extent of training need.

Particular	Training need			Chi square Calculated	Chi square Tabulated	Significance level (5%)
	MEDIUM	LOW	Total			
Age						
Young (24-35 years)	17	3	20	4.19	5.99	Non – significant
Middle (36-46 years)	12	5	17			
Old (47-57 years)	16	12	28			
Total	**45**	**20**	**65**			
Education						
Matric	7	3	10	4.98	9.49	Non – significant
Matric+ Diploma	2	4	6			
10+2	6	3	9			
Graduate	13	6	19			
Post Graduate	17	4	21			
Total	**45**	**20**	**65**			
Professional experience						
Up to 10 years	26	7	33	4.86	5.99	Non – significant
11-20 years	5	1	6			
>20 years	14	12	26			
Total	**45**	**20**	**65**			

Discussion

Knowledge is important component of behaviour and plays a major role in the covert and overt behavior of human beings and training is the commonly used method to achieve a direct impact on the knowledge and skills of clients. Grass root extension workers need to be equipped with knowledge of a variety of technological skills which they can transfer through needs based training. This can effect a diffusion of knowledge and innovations to the target groups for the desired outcome of any technology.

In the present study where the majority of respondents scored medium to high training needs for seven of the knowledge areas we speculate that this was probably due to their poor exposure to sources of information and this has had a negative impact on the knowledge level of extension officers in these areas (Wheeler 2008). With the increasing consumer demand for organic, ‘natural’ and ‘green’ products, the medium to high training

 ISSN 1177-4258

needs of extension workers signifies the importance of inclusion of organic farming components in future training programmes of extension workers.

The respondents reported inadequate knowledge about organic plant protection strategies including biological methods of pest control and bio-rational pest management techniques and the majority of them rated medium to high needs in these areas which could be due to their lack of exposure to appropriate knowledge, skills and awareness. Earlier, Pillegowda *et al.* (1997), Prasad *et al.* (2000) and Yadav *et al.* (2011b) have also reported plant protection as a most important training area in their respective studies.

Record keeping and certification standards are also a very important component of organic farming for registration purposes and for achieving the premium returns for certified organic produce. Similarly, without proper grading and packing the produce will not fetch the best price in the market. In the present study, the majority of respondents rated a medium to high training need in these areas which emphasises their importance.

The majority of the extension workers rated medium to high training needs in most of the nominated areas of organic farming. Precision farming requires specific knowledge and skills (Yadav *et al.* 2011b, 2011c). The overall medium training requirements as rated by the majority of respondents could be due to the lack of exposure to workshops and specific training opportunities. Earlier, Sood (1996), Barman *et al.* (2000) and Yadav *et al.* (2011b, 2011c) also reported overall medium training needs for particular agricultural knowledge areas in their studies.

Organic farming is a new area of agri-business which requires some specific knowledge and skill. However, the selected characteristics of respondents (age, education and service experience) did not show any significant relationship with overall extent of training needs hence the null hypothesis was accepted with the conclusion that these characteristics were not correlated with training need. Earlier, Shrestha (1983), Kaur (1985) and Mahar (1992) also reported non-significant relationships among these variables in their respective studies.

Conclusion

Organic agriculture is emerging as an important income generating oppportunity in the state of Himachal Pradesh. The majority of the extension workers of the HPSDA reported medium to high training needs for seven out of the ten topics of organic farming that were examined. The three exceptions were composting/vermi-composting, green manuring/ green leaf manuring, and crop rotations where the majority of respondents scored a low or no need.

The present study reports a need to upgrade the knowledge and skills of extension workers in seven identified areas of organic farming technology. Therefore, training courses on organic farming coupled with practical demonstrations on important areas including bio-fertilizer technology, bio-dynamic farming, homa farming, biological pest control, bio-rational pest management techniques, record keeping and certification standards, grading/packing and marketing of organic produce should be organized to update the knowledge and skill of the extension workers of HPSDA for the effective transfer of such technology to their clients for harnessing the full potential of organic agriculture.

References

Agoramoorthy, G. (2008). Can India meet the increasing food demand by 2020? Futures, 40(5): 503–506.

Barman, U., Pathak, K., Hazarika, B.N., & Kalita, M.K. (2000). Training needs of village level extension workers in coconut cultivation. Journal of Plantation Crops, 28 (2):154 –155.

Baruah, D.C., & Bora, G.C. (2008). Energy demand forecast for mechanized agriculture in rural India. Energy Policy. 36(7):2628–2636.

DES. (2012). Agricultural Statistics at a Glance 2012. New Delhi: Directorate of Economics and Statistics (DES), Ministry of Agriculture, Government of India.

Kaur, R. (1985). In-service training needs of Mukhya Sevikas of Punjab state. M.Sc. Dissertation, Punjab Agricultural University, Ludhiana, India.

Mahar, S.L. (1992). Extension education training needs of agricultural development officers under training and visit system in Punjab. M.Sc. Dissertation, Punjab Agricultural University, Ludhiana, India.

Pathak, R.K. (2011). Homa jaivik Krishi: A ray of hope for sustainable horticulture MARDI's initiatives. In: National symposium cum brainstorming workshop on organic agriculture, CSKHPKV, Palampur, India held on April 19-20, 2011. Souvenir and Abstracts, p 15-16.

Paull, J. (2011a). The uptake of organic agriculture: A decade of worldwide development. Journal of Social and Development Sciences, 2(3): 111-120.

Paull, J. (2011b). Biodynamic Agriculture: The journey from Koberwitz to the World, 1924-1938. Journal of Organic Systems, 6(1), 27-41.

Pillegowda, S.M., Lakshminarayan, M.T., & Manjunath, B.N. (1997). Training needs of field extension workers on plant protection. Karnataka Journal of Agricultural Sciences, India. 10(4): 1264 –1266.

Prasad, S.V., Reddy, .LB., & Sivanarayana, G. (2000). Training needs of village extension officers of Kurnool district of Andhra Pradesh. Journal of Research, ANGRAU, India. 28(3): 37–40.

Punam., Sharma, S.K., Kumari, R & Paul, Y.S. (2011). Impact of homa farming on the insect pests of tomato (Solanum lycopersicum) Linnaeaus plants in Himachal Pradesh. In: National symposium cum brainstorming workshop on organic agriculture, CSKHPKV, Palampur, India held on April 19-20, 2011. Souvenir and Abstracts, p 151.

Rana, J.C. (2011). Message. In: National symposium cum brainstorming workshop on organic agriculture, CSKHPKV, Palampur, India held on April 19-20, 2011. Souvenir and Abstracts.

Rao Seshagiri, K.Y. (2000). Watershed Comprehensive Development, B.S. Publication, Hyderabad, India.

Shrestha, S.S. (1983). Training need of district agricultural development officers in social forestry. Dissertation Abstract, Haryana Agricultural University, Hissar, India.11(2): 97–98.

Singh, H., Singh, A.K., Singh, H.L., Kushwaha, H.L., & Singh, A. (2007). Energy consumption pattern of wheat production in India. Energy, 32(10):1848–1854.

Singh, R.P. (2000). Management of training programmes. New Delhi: Anmol Publication Pvt. Ltd..

Singh, V., Rana, S.S., & Kharwara, P.C. (1998). A study on the extent of adoption of latest agricultural technology by the farmers of Himachal Pradesh and constraints thereof. In : Sharma, H.R., Kumar, V., Kapoor, A.C. editors. International Symposium on sustainable Agriculture in Hill areas: Economic viability of hill agriculture status and opportunities. CSKHPKV, Palampur, India. p. 217-223.

Sood, A.K. (1996). Role perception, role performance and training needs of subject matter specialists working in department of agriculture, Haryana. Dissertation Abstract. CCS Haryana Agricultural University, Hissar, India. 22(1-2): 88.

Wai, K.O. (2007). Organic Asia 2007. The Organic Standard, 71(March): 3-6.

Ware, G.W. (1989). The pesticide book, 3rd edition. Fresno, California: Thomas Publications.

Wheeler, S. (2007). The views of Australian agricultural professionals towards modern biotechnology and organic agriculture: A comparison. Australian Journal of Experimental Agriculture, 47:120.

Wheeler, S. (2008). What influences agricultural professionals' views towards organic agriculture? Ecological Economics. 65: 145 -154.

Willer, H., & Kilcher, L. (Eds.) (2009). The world of organic agriculture. Statistics and emerging trends 2009. FIBL-IFOAM Report. IFOAM & FiBL, Bonn & Frick.

Willer, H., & Kilcher, L. (Eds.). (2011). The World of Organic Agriculture: Statistics and Emerging Trends 2011: Bonn: International Federation of Organic Agriculture Movements (IFOAM); Frick, Switzerland: Research Institute of Organic Agriculture (FiBL).

Yadav, A.K. (2011a). Restoring soil health, fertility and sustainability in Indian Agricultural soils. In: National symposium cum brainstorming workshop on organic agriculture, CSKHPKV, Palampur, India held on April 19-20, 2011. Souvenir and Abstracts, p 8-11.

Yadav, D.S., Singh, A., Thakur, S.K., Sood, P., & Choudhary, A.K. (2011b). Analysis of training needs of extension workers associated with protected cultivation technology, In: Proceedings of ICSSR National seminar on diversification of agriculture and vulnerability to climate change for sustainable food security and livelihood in north western Himalayas held on 28 Feb, - 1 March CSKHPKV, Palampur, India, ICSSR publication No. 51, p. 20-26.

Yadav, D.S., Singh, Amar, Choudhary, A.K, Rahi, S. & Singh, A. (2011c). Growing coloured capsicum under protected conditions: Training need of Agricultural Extension Officers. Agricultural Extension Review, XXIII (1): 22-26.

Yadav, D.S., Thakur, S.K., Choudhary, A.K. & Sood, P. (2012). Training needs of agricultural extension officers about watershed management. Indian Journal of Soil Conservation, 40(2): 179-182.

Yadav, D.S., Thakur, S.K., Sood, P., & Choudhary, A.K. (2011d). Training needs of field level extension workers about watershed development and management. Paper presented at: International Conference on Innovative Approaches for Agricultural Knowledge Management: Global Extension Experiences on 9-12 Nov., 2011 at NAAS, New Delhi, India, INSEE International Conference Abstracts, p. 610.