ANNUAL REPORT

KRISHI VIGYAN KENDRAS

ZONE – I

(2012-13)

भाकृअनुप
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Preface

Krishi Vigyan Kendras (KVKs) are the district level Farm Science Centres, established by the Indian Council of Agricultural Research for speedy technology transfer to the farmer's fields. Krishi Vigyan Kendras (KVKs) stand as a bridge between the research laboratories and application of modern agricultural sciences in rural India. To meet the ever growing needs of knowledge intensive agriculture, appropriate means and mechanism have been devised so that there is a continuous flow of knowledge, techniques and technologies from the research institutes and universities to KVKs to minimize the time lag between generation of technology and its awareness.

There are 67 KVKs in Zone-I, comprises the states of Punjab, Haryana, Himachal Pradesh, Jammu & Kashmir and Delhi. The first KVK in the Zone was established in 1976 at NDRI, Karnal. Since then, there has been a phenomenal growth of KVKs.

The progress report for the year 2012-13 has been compiled and contains staff position, infrastructure facilities, budget and revolving funds of the KVKs of Zone-I. The training achievements i.e. farmer's training, rural youth training and in-service training have been provided along with impact of training programmes. The results of various On Farm Trials and Front Line Demonstrations have also been compiled. Various extension activities, seed and seedling produced, soil and water testing undertaken by KVKs of Zone-I have also been compiled. The details of Scientific Advisory Committee Meetings, Collaborative programmes with other agencies, feedback and some case studies have also been listed.

Authors

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Authors

Executive Summary

Zonal Project Directorate, Zone-I monitors the mandated activities of 67 KVKs located in five states namely Punjab, Haryana, Delhi, Himachal Pradesh and Jammu & Kashmir. Assessment of available technology for location-specificity was done by KVK under Zone-I and conducted total On Farm Trails on the given thematic areas and assessed technologies by On–farm testing. Total Number of 636 technologies were tested by KVKs out of which 601 were related to crops while remaining 35 were tested on livestock.

For disseminating the technology amongst the users at wider scale, a total of 8083 FLDs were conducted by KVKs of Zone-I on oilseeds, pulses, cereals, vegetables, cash crops, agro-forestry and other important crops covering the area of 2531.03 ha. For regular knowledge-updating and imparting new skills, total 6048 trainings courses were organized benefiting 0.95 lakh participants including farmers and farm women, 15424 rural youth and 7703 extension personnel. KVK personnel of Zone-I were nominated in 24 different training programmes organized by State Agricultural Management Extension & Training Institute, Shimla; Sher-e-Kashmir University of Agricultural Sciences & Technology, Srinagar; National Academy of Agricultural Research Management, Hyderabad; Dr. Y. S. Parmar University of Horticulture & Forestry, Nauni, Solan; National Institute of Agricultural Extension Management, Hyderabad; Indian Agricultural Research Institute, New Delhi; Punjab Agricultural University, Ludhiana; Sher-e-Kashmir University of Agricultural Sciences and Technology, Jammu; Directorate of Research on Women in Agriculture, Bhubaneswar and National Research Centre for Orchids, Pakyong, Sikkim for enhancing their capacity and working efficiency.

For popularizing the technologies in the region, total 39721 extension activities in the form of field days (322), farmers fairs (98), exhibitions (322), film shows (581), farmers visit to KVK (67431) etc. were organized.

For enhancing the production through quality seeds and planting materials total 34753.43 q seeds and 10.1 Lakh units planting materials were produced by the KVKs of the Zone I. A total of 88 SAC meetings were conducted. Regarding soil & water sample testing, 11200 soil samples, 3509 water samples and 2043 plant samples were tested by the KVKs.

1. INTRODUCTION

The Krishi Vigyan Kendras (KVKs) are Farm Science Centres established by the Indian Council of Agricultural Research (ICAR) for speedy transfer of technology from the Research Laboratories to the farmers' fields. With overall mandate of Assessment, Refinement and Demonstration of technologies / products of agriculture and allied sectors, the KVKs are entrusted with following specific objectives:

- On-farm testing to identify the location specificity of agricultural and allied technologies under various farming systems;
- Front-line demonstrations to establish production potentials of technologies on the farmers' fields;
- Training of farmers, farm women and rural youth to update their knowledge and skills in modern agricultural and allied technologies;
- Training of extension personnel to orient them in the frontier areas of technology development; and
- Work as resource and knowledge centre of agricultural and allied technologies for supporting initiatives of public, private and voluntary sector for improving the agricultural economy of the district.

1.1 KVKs of Zone-1

The state wise detail of KVKs is as follows:-

Table-1.1 KVKs across the five states in the Zone- 1

Name of State	No. of KVK	Details of KVK			
		SAU	NGO	ICAR	Total
Punjab	20	20	0	0	20
Haryana	18	14	2	2	18
Delhi	1	0	1	0	1
Himachal Pradesh	12	12	0	0	12
Jammu & Kashmir	16	16	0	0	16
Total					**67**

The state- wise and host institution wise distribution of KVKs is given in Table: 1.2.

Table-1.2: Institutional set-up for operational KVKs under ZPD Zone-1

S No.	Host Institution	No. of KVKs
1.	**Punjab**	20
	PAU, Ludhiana	17
	GADVASU, Ludhiana	3
2.	**Haryana**	18

S No.	Host Institution	No. of KVKs
	CCSHAU, Hisar	14
	SCHE, New Delhi	1
	SBBA, Rewari	1
	IARI, New Delhi	1
	NDRI, Karnal	1
3.	**Delhi**	1
	NHRDF, Nasik (KVK Delhi)	1
4.	**Himachal Pradesh**	12
	Dr. YSPUH&F, Solan	4
	CSKHPKV, Palampur	8
5.	**Jammu & Kashmir**	16
	SKUAST (J), Jammu	6
	SKUAST (S), Srinagar	10

The KVKs have uniform staff strength of 16. The current staff position in KVKs of Zone -1 is given in Table 1.3. An analysis of staff position under different categories shows that about 80.00 percent position is filled up.

Table- 1.3: Staff Position in KVKs under Zone-I

S. No.	Sate	Sanctioned Posts	PC (1)		SMS (6)		PA (3)		Admn. (6)		Total	
			S	F	S	F	S	F	S	F	S	F
1	Punjab	320	20	18	120	95	60	46	120	81	320	240
2	Haryana	288	18	17	108	84	54	37	108	85	288	223
3	Delhi	16	1	1	6	6	3	2	6	6	16	15
4	Himachal Pradesh	192	12	11	72	66	36	35	72	72	192	184
5	Jammu & Kashmir	256	16	16	96	64	48	40	96	71	256	191
Total		**1072**	**67**	**63**	**402**	**315**	**201**	**160**	**402**	**315**	**1072**	**853**

The details of status of infrastructure facilities in KVKs under Zone-1 are given in Table 1.4

Table-1.4: Status of Infrastructure Facilities in KVKs under Zone-I

S. No	Sate	No. of KVKs	Admn. Building			Trainees Hostel			Staff Quarters		
			Completed	In progress	NA	Completed	In progress	NA	Completed	In progress	NA
1	Punjab	20	15	5	0	10	5	5	9	7	4

2	Haryana	18	17	1	0	12	2	4	12	1	5
3	Delhi	1	1	0	0	0	0	1	0	0	1
4	Himachal Pradesh	12	9	1	2	12	0	0	7	2	3
5	Jammu & Kashmir	16	10	2	4	8	2	6	7	2	7
Total		**67**	**52**	**9**	**6**	**42**	**9**	**16**	**35**	**12**	**20**

NA= Not available

The details of budgetary information of KVKs in ZPD, Zone-1 is given in Table 1.5

Table-1.5: Budgetary Information of KVKs and Zonal Project Directorate, Zone-I

S. No.	Name of State	Budget Estimate	Revised Estimate	Total Released	Actual Expenditure
1	Punjab	1840.78	1502.46	1502.46	1502.46
2	Haryana	1547.28	1489.87	1489.87	1485.63
3	Delhi	90.25	85.05	85.05	85.05
4	Himachal Pradesh	1152.15	1266.80	1266.80	1266.80
5	Jammu & Kashmir	1095.08	1059.84	1059.84	1059.84
6	ZPD, Zone-I	408.89	276.58	276.58	276.58
Total		**6134.43**	**5680.60**	**5680.60**	**5676.36**

1.2 Agro-ecological characteristics of Zone-1

Of the three plain states of Zone-1 namely, Punjab, Haryana and Delhi, first two are agriculturally most important states in the country and are considered as the homeland of green revolution while the last one houses the premier Agricultural Institute of the country, IARI. The large scale availability of irrigation water in these states has helped in promoting extensive use of high yielding varieties, agricultural chemicals and farm machineries. However, at present, these states are facing the problems of deterioration of natural resources (soil and water), predominance of paddy-wheat rotation, imbalanced use of nitrogenous fertilizer, heavy use of agro-chemicals, etc.

The hill states of Himachal Pradesh and Jammu & Kashmir are relatively less important from crop production point of view but they have made considerable progress in the field of horticulture. Himachal Pradesh has become the Apple state of the country and lately increasing attention is being paid towards production of off-season vegetables in both the hill states. However, emphasis has to be given on rain water harvesting, post harvest management of fruits and vegetables, rejuvenation of old orchards, promotion of medicinal and aromatic plants, proper management of

grasslands and pastures and improvement of local breeds of cows for harnessing their full potential. The agro-climatic zones in Zone-I are given in the following table:

Agro-climatic Zones under Zone-1

Agro-climatic Zones	Districts under the Zone	Major crops
Haryana (2)		
Eastern Zone	Ambala, Kurukshetra, Karnal, Faridabad, Kaithal, Yamunanagar, Panipat, Sonepat; and parts of Jind, Rohtak and Gurgaon	Wheat, Paddy, Maize, Bajra, Jowar, Barley, Rapeseed, Gram, Moong, Sunflower, Mustard, Raya, Toria, Sugarcane, Groundnut, Cotton
Western Zone	Mahendergarh, Sirsa, Hisar, Fatehabad, Bhiwani, Rewari, Jhajjar; and parts of Gurgaon, Rohtak and Jind	Wheat, Bajra, Guar, Barley, Gram, Arhar, Moong, Mustard, Raya, Cotton, Chilli, Cauliflower, Cabbage, Tomato, Brinjal
Punjab (5)		
Sub- Mountaine Undulating Zone	Parts of Gurdaspur, Hoshiarpur and Ropar	Wheat, Paddy, Maize, Raya, Gobhi sarson, Sunflower, Toria, Groundnut, Mash, Sugarcane, Gram, Moong, Kinnow, Guava
Undulating Plain Zone	Parts of Gurdaspur, Hoshiarpur, Ropar, Ludhiana and Patiala	Wheat, Paddy, Maize, Gobhi sarson, Groundnut, Raya, Sunflower, Gram, Lentil, Moong, Arhar, Mash, Peas, Sugarcane, Okra
Central Plain Zone	Jalandhar, Nawanshahar and Fatehgarh Sahib; and parts of Amritsar, Patiala, Gurdaspur, Kapurthala, Ludhiana, Ferozepur and Sangrur	Wheat, Paddy, Maize, Gobhi sarson, Sunflower, Gram, Lentil, Arhar, Moong, Mash, Sugarcane, Radish, Onion, Okra, Chilli, Tomato
Western Plain Zone	Moga, Mansa and Muktsar; and parts of Amritsar, Faridkot, Ferozepur and Sangrur	Wheat, Paddy, Maize, Barley, Bajra, Cotton, Raya, Gobhi sarson, Toria, Groundnut, Sunflower, Gram, Arhar, Moong, Lentil, Mash, Sugarcane, Radish, Okra, Potato, Chilli, Tomato
Western Zone	Bathinda and parts of Faridkot and Ferozepur	Wheat, Paddy, Bajra, Cotton, Gram, Moong, Raya, Sunflower, Lemon
Himachal Pradesh (4)		
Sub- Mountaine and Low Hills Sub-tropical Zone	Hamirpur, Una, Bilaspur; and parts of Sirmaur, Kangra, Solan and Chamba	Maize, Wheat, Paddy, Barley, Gobhi sarson, Toria, Til, Linseed, Gram, Mash, Rajmash, Soybean, Sugarcane, Citrus, Mango, Litchi, Guava, Pomegranate, Pea, Radish, Tomato, Potato
Mid Hills Sub-humid Zone	Parts of Kangra, Shimla, Mandi, Solan, Kullu, Chamba, and Sirmaur	Maize, Wheat, Paddy, Barley, Gobhi sarson, Toria, Linseed, Soybean, Til, Moong, Arhar, Gram, Pea, Mash, Rajmash, Radish, Chilli, Okra, Brinjal, Broccoli, Tomato, Potato,

Agro-climatic Zones	Districts under the Zone	Major crops
		Cauliflower, Cabbage, Pea, Apple, Peach, Plum, Walnut, Almond, Apricot, Citrus
High Hills Temperate Wet Zone	Parts of Chamba, Kullu, Shimla, Solan, Mandi, Kangra and Sirmaur	Maize, Wheat, Paddy, Barley, Raya, Gobhi sarson, Soybean, Pea, Mash, Rajmash, Radish, Okra, Tomato, Cabbage, Potato, Cauliflower, Broccoli, French bean, Onion, Garlic, Apple, Plum, Apricot, Pear
High Hills Temperate Dry Zone	Kinnaur, Lahaul & Spiti and parts of Chamba	Potato, Wheat, Minor millets, Barley, Mash, Saffron, Cabbage, Peas, Sugar beet, Apple, Cumin, Kathu (Duck wheat)
Jammu & Kashmir (4)		
Low Altitude Sub-tropical Zone	Jammu, Kathua and Riasi	Wheat, Paddy, Maize, Millets, Berseem, Mustard, Gobhi sarson
Mid to High Altitude Intermediate Zone	Doda, Rajouri and Poonch	Paddy, Maize, Wheat, Millets, Pulses, Summer vegetables
Mid to High Altitude Temperate Zone	Anantnag, Baramulla, Kupwara, Pulwama, Budgam and Srinagar	Wheat, Paddy, Maize, Millets, Mustard, Lentil, Moong, Beans, Field Pea, Oat, Chilli, Tomato, Onion, Potato, Cabbage, Brinjal, Apple, Cherry, Plum, Peach, Walnut, Almond, Hops, Saffron, Apricot
Cold Arid Zone	Leh and Kargil	Millets, Wheat, Barley, Mustard, Onion, Rasin, Grapes, Apple, Apricot

1.3 Thrust area for the KVKs under Zonal Project Directorate Zone-1

Punjab, Haryana and Delhi

- Soil & water conservation and improvement of soil health
- Crop Diversification
- Hybrid Seed Production
- Integrated Nutrient/Pest/weed Management in different crops
- Popularization of resource conservation technologies
- Improvement in the productivity of livestock
- Management of Repeat Breeding in dairy animals
- Clean milk production and processing of dairy products

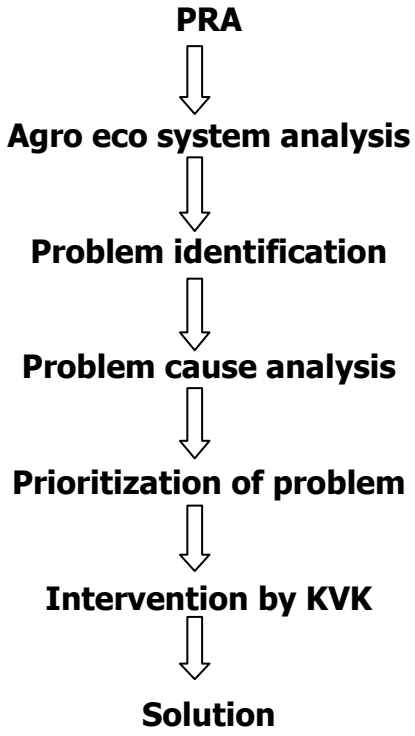
- Drudgery Reduction of Farmwomen
- Value addition in agricultural products
- Supplementary Source of Income for farmwomen
- Self employment for rural youth
- Use of Information and Communication Technologies

Himachal Pradesh and Jammu & Kashmir

- Water Conservation and Management
- Promotion of exotic and off-season temperate vegetable cultivation
- Protected cultivation of low volume and high value crops
- Rejuvenation of old Orchards
- Integrated Nutrient/ Pest/ Weed Management
- Promoting vermin-compost and organic farming
- Promoting cultivation of medicinal and aromatic plants
- Improvement in the productivity of livestock
- Drudgery Reduction of Farmwomen

2. Technology Assessment through On Farm Testing

Appropriate technologies are roots of agrarian development. However, any agricultural technology cannot perform equally in every micro agro-climatic situation. On farm testing (OFT) of technologies are based on the farmer participatory research and are mainly focused to test already developed technologies in terms of location specific sustainable land use systems and helpful to solve the most important and widely spread problems of farmers in a defined area within their farming system perspective with their active participation and management. The objective of On Farm Testing is to test and evaluate the findings of Research Stations at the farmer's field and to refine and modify the technologies as per particular farming situation. Participatory Rural Appraisal (PRA) is conducted to identify the problems faced by the farmers and based on the priority of the problems, OFT is formulated. Economically viable, operationally feasible technologies matching with farmers' needs are identified to solve the problems faced by them. Process of identification of technology for on-farm trials in farming system perspective is given in the following diagram.



The KVKs under the ZPD Zone-I assessed and refined the technologies of crop and animal husbandry under OFT. The details of OFTs are given below:

Table 2.1 : Summary of On Farm Testing

Particulars	No. of OFTs	No. of Trials
Technology Assessed		
Crop	497	2016
Livestock	30	209
Total	527	2225
Technology Refined		
Crop	108	465
Livestock	5	32
Total	113	497
Grand Total		
Crop	605	2481
Livestock	35	241
	640	**2722**

The above mentioned table 2.1 shows that total number of 640 technologies were tested by KVKs at 2722 different locations out of which 605 were related to crop while remaining 35 were conducted on livestock. The total number of trials were recorded 2722. OFTs were conducted on the thematic areas like varietal evaluation, integrated nutrient management, Integrated pest management, Integrated crop management, Integrated disease management, weed management, drudgery reduction, value addition, Integrated disease management, resource conservation technologies, Agro- forestry etc.

Fig 2.1 shows the percentage thematic Area wise On Farm Testing which were tested by KVKs. The highest numbers of OFTs were conducted on Integrated Nutrient Management (23.3%) followed by Varietal Evaluation (16.9%), Integrated Pest Management (15%), Integrated Disease Management (12.8%), integrated Crop Management (9.9%), Integrated Weed Management (8.1%), Resource Conservation Technologies (5.4%), Value Addition (4%), Feed Management (1.6%), Small Scale Income Generation Enterprises (0.8%), Drudgery Reduction (0.8%), Diversification (0.8%), Poultry (0.3%), Dairy (0.2%) respectively. Fig. 2.2 shows the thematic area wise number of OFTs and number of trials conducted by KVKs. The highest number of OFTs were conducted on Integrated Nutrient Management(146) followed by Varietal Evaluation (106), Integrated Pest Management (94), Integrated Disease Management (80), integrated Crop Management (62), Integrated Weed Management (51), Resource Conservation Technologies (34), Value Addition (25), Feed Management (10), Small

Scale Income Generation Enterprises (5), Drudgery Reduction (5), Diversification (5), Poultry (2), Dairy (1) respectively.

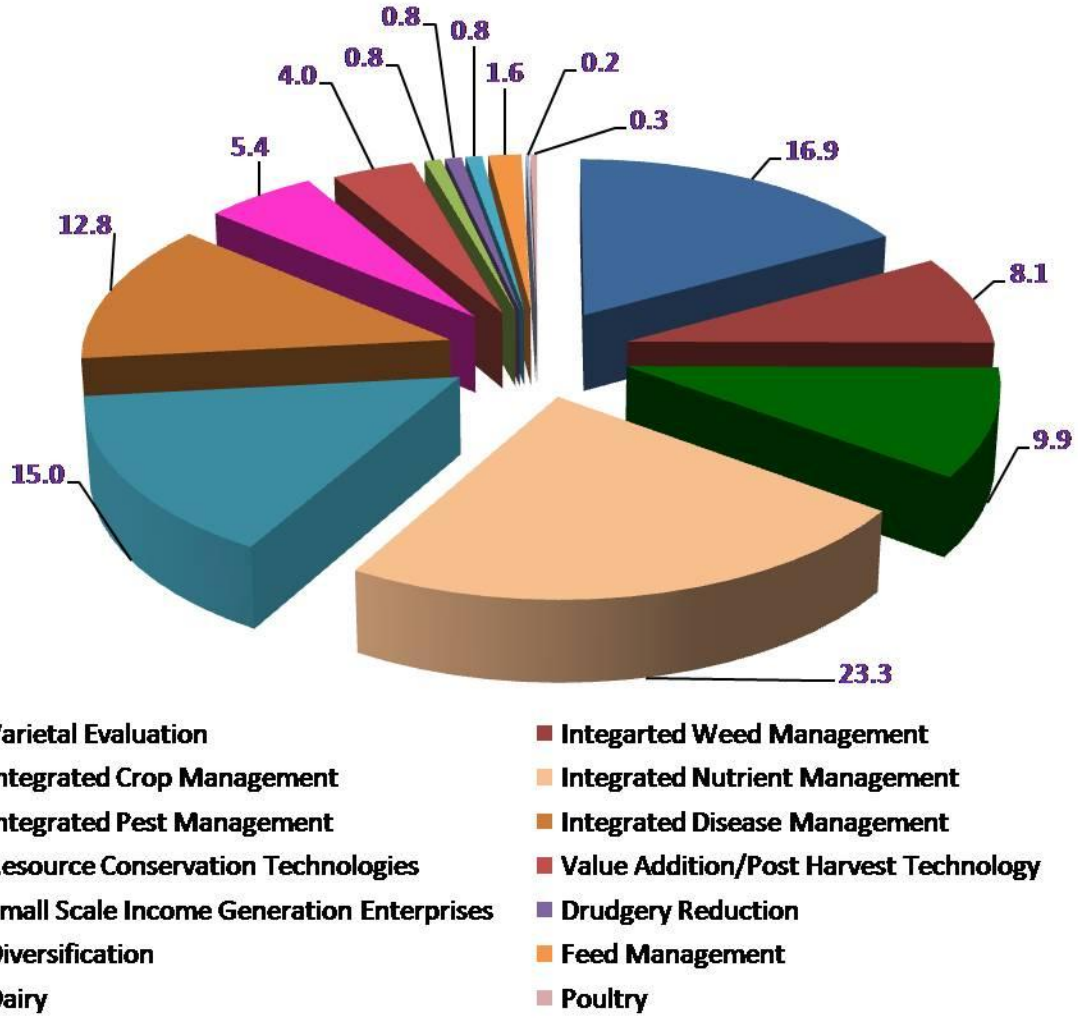


Fig. 2.1: Percentage thematic Area wise On Farm Testing which were tested by KVKs.

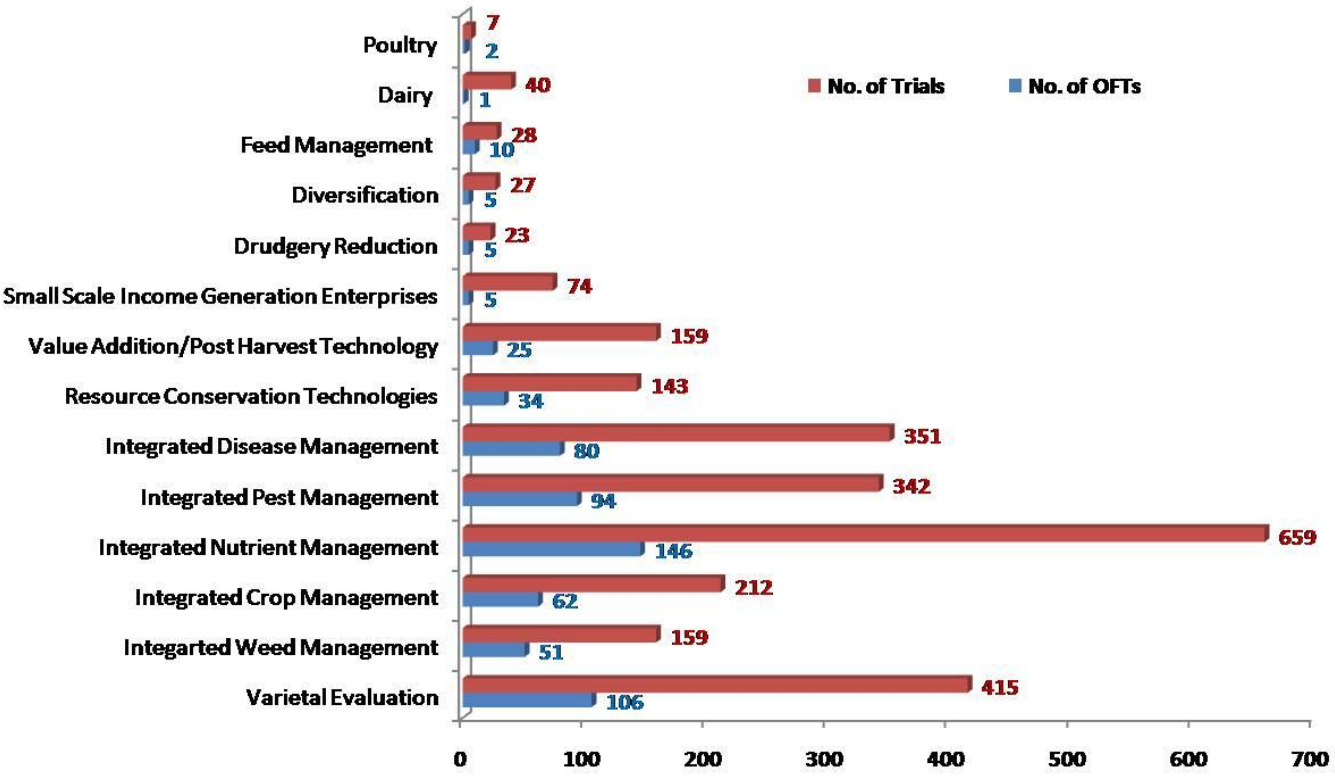


Fig. 2.2: Thematic area wise number of OFTs and number of trials conducted

The state- wise numbers of OFTs are given in below mentioned table 2.2 which shows that highest numbers of OFTs were conducted in Haryana followed by Punjab, Himachal Pradesh, Jammu & Kashmir and Delhi.

Table 2.2: state-wise On Farm Testing during 2012-13

State	No. of OFTs	No. of trials
Punjab	160	475
Haryana	210	1214
Delhi	13	46
Himachal Pradesh	130	576
Jammu & Kashmir	127	411
Total	**640**	**2722**

Some of the important technologies assessed by KVKs after diagnosis the problem of the area in different sub-heads with major results are given below:

1. Integrated Pest Management

Problem definition*:* Yield losses due to heavy infestation of pod borer (*Helicoverpa armigera*) in tomato

Technology refined: Pheromone traps and safer insecticides

Tomato is an important cash crop grown in Mandi district of Himachal Pradesh in an area of 1058 hectare. Pod borer is the major pest that causes yield loss of upto 20-40%. The management of this pest has become very difficult since this pest has developed resistance due to repeated sprays of same group of insecticides by the farmers. Further, indiscriminate use of pesticides is aggravating the ill effects. KVK Mandi conducted on farm trial to address this problem. It is evident from the **Table 2.3,** that installation of pheromone traps @ 25 traps/ ha followed by foliar application of flubendamide @ 0.12 % or acephate @ 0.01 % were found effective in checking the incidence of *Helicoverpa armigera* in tomato and improving the fruit yield.

Table 2.3: Effect of integrated pest management measures in controlling *Helicoverpa armigera* pest in tomato

Technology Option	No. of trials	Fruit damage (%)	Fruit yield (q/ha)	BC Ratio
Repeated sprays of cypermethrin+ chlorpyriphos (Farmers' practice)	5	18.27	191.50	4.52
Pheromone traps @ 25 traps/ ha		15.62	210.80	5.03
Pheromone traps @ 25 traps/ ha + Acephate spray @ 0.01 % at flowering		9.40	245.30	5.54
Pheromone traps @ 25 traps/ ha + Spray of flubendamide @ 0.12 % at flowering		6.49	276.10	6.20

Problem definition*:* Heav**y** incidence of stem borer in paddy resulting in considerable yield losses

Technology assessed: New insecticide molecules

Paddy is one of the important *kharif* crops of the district Ambala; however the incidence of paddy stem borer takes a heavy toll of the crop resulting in poor yields and low returns. Further, farmers are using the insecticides which are easily available and are not aware of new molecules which are highly effective and comparatively safer. KVK Ambala, therefore, conducted on farm trials to evaluate insecticides against stem borer in paddy (*Oryza sativa*) var.HKR-127. As indicated in **Table 2.4** that the application of fipronil 5SC (Regent) @ 1.5 L/ha resulted in minimum incidence of stem borer (15 %) followed by chlorpyriphos @ 2.0 L/ha (20 %) and monocrotophos @ 1.4 L/ha (25 %). With regard to grain yield, fipronil treatment resulted in highest grain yield of 68.75 q/ha and BC raio of 3.74 followed closely by monocrotophos. The yield and BC ratio was lowest in case of farmers practice i.e. chlorpyriphos. The findings heceforth indicate that use of fironil is more effective for stem borer management and more economical.

Table 2.4: Effect of foliar application of insecticides on stem bore incidence and paddy yields

Technology Option	No. of trials	Grain yield (q/ha)	Stem borer incidence (%)	BC Ratio
Chloropyriphos @ 2.0 L/ha (Farmers' practice)	3	65.0	20	3.54
Monocrotophos (Nuvacron 36 SL) – @ 1.4 L/ha		66.25	25	3.6
Fipronil 5SC(Regent) – 1.5 L/ha		68.75	15	3.74

Problem definition*:* Heavy infestation of maize shoot borer

Technology assessed: Application of tricho cards and safer insecticides

Maize is an important crop grown in Ropar district of Punjab however, heavy infestation due to maize shoot borer affects its yield to a greater extent. KVK Ropar conducted on farm trial on the bio intensive management of this pest. Results revealed that timely use of tricho-card as well as spray of decis @ 200 ml/ha resulted in to reduced population and provided higher yields than the farmers' practice (**Table 2.5**).

Table 2.5: Effect of application of Chemical and bio-pesticides on management of maize shoot borer

Technology Option	No. of trials	No. of dead hearts/m^2	Yield (qtl/ha)	BC ratio
Lara 505 @ 500 ml/ha as and when required (Farmers' practice)	4	2.99	46.10	1.95
Tricho-card sticking @ 10,000 parasitized eggs on 10-15 days old crop		1.27	49.95	2.30
Spray of decis @ 200 ml/ha on 20 days old crop		0.90	50.08	2.35

Problem definition*:* Low Productivity of wheat due to termite attack

Technology assessed: Seed treatment with chlorpyriphos and spray in standing crop

Termite is major pest that causes reduction in yield of wheat in Kathua district. KVK Kathua conducted on farm trial on management of termite in the district. Data presented in **Table 2.6** revealed that seed treatment with chlorpyriphos @ 4ml/kg of seed and application of chlorpyriphos in standing crop resulted in to significant reduction in termite incidence as compared to farmers' practice. This treatment also gave the highest yield 28.20 q/ha with B:C ratio of 1.75.

Table 2.6: Effect of seed treatment and spray of chlorpyriphos on termite incidence and productivity of wheat

Technology Option	No. of trials	Termite incidence (%)	Yield (q/ha)	BC ratio
No Seed treatment (Farmers' practice)	4	30.95	22.45	1.30
Seed treatment with Chlorpyriphos 4ml/kg seed		7.45	27.00	1.50

Seed treatment with Chlorpyriphos 4ml/kg seed + application in standing crop		6.50	28.20	1.75

Problem definition*:* Attack of leaf folder in paddy

Technology assessed: Effect of application of safer insecticides

Due to less rainfall and delayed monsoon, the infestation of leaf folder in paddy is very high. The use of Cartap hydrochloride (farmers' practice) is not so effective to control this pest. This pest has however developed resistance due to repeated sprays under farmers' practice. Therefore, KVK Delhi conducted on farm trial to assess the effect of newly safer insecticides for the management of this pest. The results given in **Table 2.7** revealed that spray of Acephate 75WP @ 2.0g/liter water resulted in lowest (10%) leaf folder infestation and highest yield (31.26qt/ha) followed by spray of Acephate 75WP @ 1.5g/liter water. The insect infestation was recorded highest (15.6%) in farmers' practice of application of Cartap hydrochlode 4G @ 15 kg/ha.

Table 2.7: Effect of application of safer insecticides on pest incidence and productivity of Paddy

Technology Option	No. of trials	Pest infestation (%)	Yield (q/ha)	BC ratio
Cartap hydrochloride 4G @ 15 kg/ha (Farmers' practice)	3	15.6	29.86	1.69
Spray of Acephate 75WP @ 1.5g/liter water		11.2	31.10	1.76
Spray of Acephate 75WP @ 2.0g/liter water		10.0	31.26	1.77

2. Integrated Disease Management

Problem definition*:* Collar rot in apple

Technology assessed: Effect of biological control agents and agro chemicals

Apple is an important cash crop of Kinnour district of Himacahal Pradesh. Collar rot is the major disease causing huge economic loss to the apple growers. KVK Kinnour conducted on farm trial on evaluation of combined effect of biological control agents and agro chemicals against collar rot. Biological method and chemical fungicide were tested against the disease. From the **Table 2.8,** it is evident that *Trichoderma viride* + Ridomil MZ (0.4%) treatment was found best in managing the disease and provided highest yield (9.40MT/ha) as compared to other treatments.

Table 2.8: Effect of biological control agents and fungicides against collar rot disease management in apple

Technology Option	No. of trials	(% healing)	Production per unit (MT/ha)	BC Ratio
Drenching with Bavistin (Farmers' Practice)	5	0.00	3.50	1.1
Ridomil MZ @ 0.3-04 %		50.23	6.90	2.7

Trichoderma viride + Dithane M-45 @ 0.4%		58.88	8.50	3.0
Trichoderma viride + Ridomil MZ @ 0.4%		65.22	9.40	3.1

Problem definition*:* Incidence of foot rot disease in basmati rice

Technology assessed: Chemical and bio-pesticides

Pusa 1121, a basmati variety of paddy is grown in Patiala district by the farmers however, this variety is infested by foot rot disease causing significant loss in yield. KVK Patiala conducted on farm trial to assess the effect of chemical and bio pesticides on the incidence of foot rot disease in basmati rice. The results revealed that root dip in bavistin solution (0.2%) and broadcasting of bavistin in nursery 7 days before transplanting (2 gm/ sq. meter of nursery) resulted in a decrease in disease incidence and increase in yield than the farmers' practice (**Table 2.9**)

Table 2.9: Effect of application of chemical and bio-pesticides on management of foot rot disease in basmati rice

Technology Option	No. of trials	Disease incidence (%)	Yield (q/ha)	BC ratio
Broadcasting of *Sanjeevni* ™ (*Trichoderma viride*) in basmati field 4 weeks after transplanting @1250 gm/ha (Farmers' practice)	3	2.5-4.2	35.25	2.68
Root dip in Bavistin solution (0.2%)		0.5	40.95	3.09
Broadcasting of Bavistin in nursery 7 days before transpanting. (2 gm/ sq. metre of nursery)		0.5–1.2	40.38	3.03

Problem definition*:* Canker on stem and twigs of the apple tree

Technology assessed: Scarification + Chaubatia Paste

Apple growers of Kashmir are facing the problem of canker in apple that causes huge loss to them. Farmers generally make use of mud plastering to control this disease however; this practice is not able to manage this problem. KVK Bondipora conducted on farm trial for the management of canker in the area. The data presented in **Table 2.10** revealed that callus formation was better by using scarification + chaubatia paste and canker size reduced to 141.67 sq cm as compared with farmers' practice .

Table 2.10: Effect of Bordeaux Paste/ Chaubatia Paste on management of canker in apple

Technology Option	No. of trials	Initial canker size (sq/cm)	Callus formation after 5 months (sq/cm)
Mud plastering (Farmers' practice)	3	221.55	251.95
Scarification + Bordeaux Paste		201.11	183.94

Scarification + Chaubatia Paste		147.70	141.67

Problem definition*:* Low yield due to stem rot in mustard

Technology Assessed: Effect of application of chemical and bio fungicides

KVK Delhi conducted on farm trial on management of stem rot (*Sclerotinia sclerotiorum*) disease in mustard (*Brassica Juncea*). This disease causes huge loss in the region. A perusal of data presented in the **Table 2.11** revealed that application of Carbendazim resulted in to lowest (2.80%) disease incidence and gave highest yield (21.83 qt/ha) followed by other treatment and farmers' practice.

Table 2.11: Effect of application of fungicides on stem rot disease incidence and mustard productivity

Technology Option	No. of trials	Stem rot disease incidence (%)	Yield (q/ha)	BC ratio
No seed treatment (Farmers' practice)	3	11.46	20.50	4.2
Soil treatment @ 9.75kg/ha and seed treatment @ 5 gm/kg seed with *Trichoderme harzinium*		3.06	21.26	4.3
Seed treatment with carbendazim @ 2.0 gm/kg seed		2.80	21.83	4.4

Problem definition*:* High incidence of BLB in cluster been resulting in poor yields

Technology Assessed: Fungicides

Cluster been is an important cash crop in Mahendergarh district. The incidence of BLB in the crop, however, is posing serious threat to its successful cultivation. There is an urgent need for effective control measures of disease. In view of this, KVK Mahendergarh, conducted on farm trials to assess the effectiveness of some recommended chemicals for the management of this disease. The results presented in **Table 2.12** revealed that seed treatment with streptocycline (6g/acre seed) and bavistein (2g/kg seed) along with foliar application of streptocycline (30g/acre) and copper oxychloride (400 g/acre) provided maximum control of the disease and highest yield as compared to other The BC ratio was also highest (4.72) in this case followed by seed treatment with streptocycline (6g/acre seed) and bavistein (2g/kg seed). The findings indicate that farmers should practice seed treatment with streptocycline (6g/acre seed) and bavistein (2g/kg seed) along with foliar application of streptocycline (30g/acre) and copper oxychloride (400 g/acre) to protect their crop from BLB and to obtain higher yields and profitability.

Table 2.12: Effect of different treatments on BLB incidence and cluster been yields

Technology Option	No. of trials	% disease (BLB) incidence	Grain yield (q/ha)	BC Ratio
No spray (Farmers' practice)	5	64.0	6.5	2.57
Seed treatment with streptocycline@6g/acre seed and bavistein@2g/kg seed		16.0	10.25	4.04
T2 + two sprays of		7.0	12.5	4.72

streptocycline (@30 g./acre) and Copperoxychlocride (@400g/acre) after 55-60 DAS and second at 15 days interval.				

3. Integrated Nutrient Management

Problem definition*:* Poor quality and productivity of onion seed due to imbalanced use of fertilizers

Technology assessed: Foliar application of macro and micro-nutrients

In Ambala district, *Rabi* onion seed crop is grown in two cropping sequences i.e. Fodder/Maize-seed onion -paddy and early potato-seed onion-maize. However, unawareness as well as negligence at farmer's level, the seed production efficiency of this local genotype is still unexploited to its potential level mainly because the majority of the onion growers are considering it as a non-commercial activity and, in most cases, seed is produced only to fulfill their own requirement. So there is a need to work on quality seed production of this local genotype at breeder's level by balanced use of fertilizers especially foliar application of macro& micro nutrients. KVK Ambala, therefore, conducted on farm trials to evaluate the effect of foliar application of macro and micro-nutrients on growth and productivity of *Rabi*-onion *(Allium cepa)* seed crop (var. local selection) at three locations. The results presented in **Table 2.13** revealed that the soil application of recommend dose of chemical fertilizer (N 70 kg, P_20_5 50 kg & K_20 60 kg/ha)) followed by foliar application of macro and micro nutrients (Polyfeed (19:19:19) @ 0.07% & Agromin Gold 0.1%) at 60 & 90 DAS resulted in maximum number of umbels per plant (5.30) and highest seed yield of 9.12 q/h. The BC ratio was also highest in this treatment; hence the findings indicate that apart from use of soil application of recommend dose of chemical fertilizer farmers should also rsort to foliar application of macro and micro nutrients in order to obtain higher yields and profitability.

Table 2.13: Effect of foliar application of insecticides on stem bore incidence and paddy yields

Technology Option	No. of trials	Seed yield (q/ha)	No. of umbels/ plants	BC Ratio
T_1:Soil application of recommend dose of chemical fertilizer (N 70 kg, P_20_5 50 kg & K_20 60 kg/ha) [Farmers' practice]	3	7.93	5.27	4.29
T_1+ Foliar application of macro nutrients (Polyfeed (19:19:19) @ 0.07% at 60 & 90 DAS		8.50	5.20	4.47
T_1+ Foliar application of macro and micro nutrients (Polyfeed (19:19:19) @ 0.07% & Agromin Gold 0.1% at 60 & 90 DAS)		9.12	5.30	4.75

Problem definition*:* Low nutrient use efficiency due to imbalanced application of synthetic fertilizers in green pea

Technology assessed: Effect of bio-fertilizers on green pod yield of pea cv. PB-89

Indiscriminate use of synthetic fertilizers imparts reduced nutritive value and sensory parameters; whereas integration of organic amendments and bio-fertilizers reduces the NPK doses and improves the soil health and plant nutrient availability resulting in higher pod yield besides being environmentally safe. Application of bio-fertilizers in vegetable crops has been of much significance because they not only fix atmospheric nitrogen but also produce growth promoting and antifungal substances. KVK Kullu therefore, conducted on farm trials to determine the effect of Bio-fertilizers on the green pod yield of new variety of pea (PB-89). As indicated in **Table 2.14** that the refined practice of seed treatment of pea (*Pisum sativum*) cv. Punjab -89 with PSB + Rhizobium+ recommended dose (RD) registered highest germination (79%) and produced the highest green pod yield (113.24 q/ha) compared to farmers' practice (96.10 q/ha) over locations. The maximum B:C ratio (3.07) was obtained with PSB + Rhizobium+RD which was closely followed by the application of PSB (3.03) over farmers' practice (2.88).

Table 2.14: Effect of application of Bio-fertilizers on the green pod yield of new variety of pea (PB-89)

Technology Option	No. of trials	Average green pod yield (q/ha)	Germination (%)	BC Ratio
No seed treatment + FYM@10 /ha + 50% NPK (25:30:30) [Farmers' practice]	3	96.10	69	2.88
Seed treatment with Rhizobium + Recommended dose (NPK:50:60:60 kg/ha)		110.40	77	2.99
Seed treatment with PSB + Recommended dose (NPK:50:60:60 kg/ha)		111.68	77	3.03
Seed treatment with Rhizobium + PSB + Recommended dose		113.24	79	3.07

Problem definition*:* Soil application of MOP is unable to ameliorate potassium deficiency

Technology assessed: Effect of potassium application methods on productivity of cotton

Cotton is an important crop in Faridkot area however; its productivity is low due to potassium deficiency. As per farmers' practice, the soil application of MOP is unable to ameliorate potassium deficiency. Therefore, KVK Faridkout conducted on farm trial to assess the effect of different methods of MOP application on its productivity. The results given in **Table 2.15.** revealed that the spray of potassium nitrate (13:0:45) 4 times @ 2 percent starting from flowering at weekly interval recorded the highest seed cotton yield of 23.50 q/ha followed by band placement of muriate of potash @ 50 kg/ha (21.80 q/ha), blanket application of muriate of potash @ 50kg/ha (20.00q/ha).

Table 2.15: Effect of Potassium application methods on productivity of cotton

Technology Option	No. of trials	Productivity q/ha	BC ratio
Blanket application of Muriate of potash @ 50 kg/ha (Farmers' practice)	3	20.00	2.01

Band placement of Muriate of potash @ 50 kg/ha		21.80	2.20
Foliar application of Potassium nitrate (13:0:45) @ 2 %		23.50	2.37

Problem definition*:* Fruit drop, black depressions, corky core and bitter pit on the apple fruit

Technology assessed: Effect of Calcium and Boron application

Since, apple is an important crop of Kashmir valley and farmers are facing problem of fruit drop and black depressions on the fruit. KVK Bondipora conducted on farm trial to assess the effect of Calcium and Boron application on quality and yield of apple (Cv. Red Delicious) in the area. The data presented in **Table 2.16** revealed that maximum (70%) A grade apple was recorded with two pre harvest sprays of boric acid @0.2% and $CaNo_3$ @0.5% with recommended application of NPK. The percent internal corking was also minimum in this treatment as compared to others.

Table2.16: Effect of Calcium and Boron application on quality parameter and yield of apple (Cv. Red Delicious)

Technology Option	No. of trials	Internal corking (%)	A grade Apple (%)	Yield (q/ha)
No application of Ca, B, application of NPK (Farmers' practice)	3	15	37	240
Two Pre harvest sprays of boric acid @0.1% and $CaNo_3$ @0.5% , recommended application of NPK		5	61	270
Two Pre harvest sprays of boric acid @0.2% and $CaNo_3$ @0.5%, recommended application of NPK		2	70	270

Problem definition*:* Low yield of wheat (*Triticum aestivum*) due to poor soil fertility

Technology assessed: Effect of application of Azotobactor and Phosphorus Solublising Bacteria (PSB)

Low yield of wheat due to imbalance use of fertilizers is the major problem in Delhi area. KVK Ujwa New Delhi conducted on farm trial to assess the effect of azotobactor and PSB (Phosphorus Solublising Bacteria) on productivity of wheat. The data presented in **Table 2.17** revealed that the maximum tillers ($425/m^2$), plant height (105.75 cm) and highest yield (52.60q/ha) was recorded with the application of Azotobactor + PSB @ 500g each/ha (seed inoculation) followed by application of Azotobactor alone and farmers' practice.

Table 2.17: Effect of application of biofertilizers on different parameters and productivity of wheat

Technology Option	No. of trials	No. of tillers/m^2	Plant height (cm)	Yield (q/ha)	BC ratio
No use of Bio-fertilizer (Farmers' practice)	3	388	97.00	50.0	2.10
Azotobactor @ 500g/ha (seed inoculation)		401	102.50	51.6	2.17
Azotobactor + PSB @ 500g each/ha (seed inoculation)		425	105.75	52.6	2.21

4. Integrated Crop Management

Problem definition*:* Paddy nursery failure due to low temperatures

Technology assessed: Nursery raising of paddy under protected and modified protected conditions

The protected nursery and modified protected paddy nursery enhanced the days taken to emergence of the seedlings compared to farmers practice by KVK Srinagar. There was a difference of 10 and 13 days in protected nursery and modified protected paddy nursery raising respectively as compared to farmers practice. The vigour and health of the seedlings was best in modified protected paddy nursery, followed by protected paddy nursery while the seedlings from unprotected paddy nursery i.e. farmers' practice were weak. The low temperature during the nursery period caused yellowing of the leaves in farmers practice. The data presented in **Table 2.18** revealed that the yield was also influenced by these treatments. Modified protected nursery out yielded (60q/ha) than other two practices. It was followed by the protected paddy nursery 54 q/ha while the yield of the seedlings raised in farmers practice was only 45 q/ha.

Table 2.18: Effect of nursery raising under protected and modified protected conditions on productivity of paddy

Technology Option	No. of trials	Yield (q/ha)	Net returns (Rs/ha)
Unprotected paddy nursery raising (Farmers' practice)	1	45.00	81000
Protected paddy nursery raising		54.00	97200
Modified Protected paddy nursery raising		60.00	100000

5. Weed Management

Problem definition*:* Incidence of broad leaf weeds and *Poa annua* in wheat

Technology assessed: Application of 2,4 D Amine

Farmers of Kapurthala district are facing the problem of broad leaf weeds and *Poa annua* weeds in wheat resulting in to low yield. KVK Kapurthala conducted on farm trial to evaluate the effect of weedicides on weeds population and yield parameter. Results showed that the 2,4-D Amine (625 ml/ha) as post emergence spray application gave good control of broad leaf weeds and *Poa annua* in wheat and recorded highest grain yield. It was closely followed by 2,4 D Sodium salt (625g/ha) + Sencor (125g/ha) for good control of weed flora (**Table 2.19**).

Table 2.19: Effect of weedicides on weeds population and yield of wheat

Technology Option	No. of trials	Broad leaf weed count/m^2		Grassy weeds count/m^2		Yield q/ha	BC ratio
		Before spray	After spray	Before spray	After spray		
Hand weeding (Farmers' practice)	2	18	2	27	12	40.30	2.09

Algrip (20 g/ha)		18	1	27	27	41.00	2.21
Isoprotrun (1.25kg/ha)		18	2	27	8	40.25	2.17
2,4 D Amine (625ml/ha)		18	0	27	3	41.25	2.22
2,4 D Sodium salt (625g/ha) + Sencor (125g/ha)		18	0	27	8	40.80	2.20

Problem definition*:* Poor yield of black gram due to weeds infestation

Technology assessed: Application of weedicides

Black gram is important crop grown in Hamirpur district. Farmers of the district are facing problem of weed infestation in black gram as weeds cause huge losses as they compete for nutrition. KVK Hamirpur conducted on farm trails to assess the effect of different weedicide on weeds infestation and crop yield. The results indicated that application of Pendimethalin @1.5 L /ha reduced weed population and also gave higher yield (10.5q/ha) over control **(Table 2.20).**

Table 2.20: Effect of weedicide application on weed population and yield of black gram

Technology Option	No. of trials	Weed count/sq m	Yield (q/ha)	BC Ratio
Hand weeding (Farmers practice)	**5**	286	6.7	1.75
Application of Pendimethalin @1.5L ai /ha		72	10.5	2.31
Application of Imazathapyre @ 40 g/ha		103	7.9	2.19

Problem definition*:* Reduction in maize yield due to weed infestation

Technology assessed: Performance of chemical weedicide application and wheel hand hoe

Weeds cause huge losses in Maize crop in Rajauri district. KVK Rajauri conducted on farm trial to assess the performance of chemical weedicide application and wheel hand hoe on productivity of maize. The results indicated that weeding with wheel hand hoe recorded highest yield 26.30 q/ha followed by chemical control and farmers' practice (**Table 2.21**). In case of weeding by wheel hand hoe there was an increase of 26.53% in yield as compared to the farmers practice.

Table 2.21: Effect of chemical and weeding with wheel hand hoe on productivity of maize in Rajauri district

Technology Option	No. of trials	Productivity q/ha)	BC ratio
No weeding (Farmers practice)	3	18.90	-
Chemical control (Atrazine).		22.12	1.05
Weeding with wheel hand hoe		26.30	1.44

Problem definition*:* Weed infestation in paddy

Technology assessed: Effect of application of weedicides

Farmers of the Delhi area are facing the problem of weeds in paddy even after application of pre–emergence herbicides. After application of pre-emergence herbicides the continuous flooding of fields may not be possible due to less availability of water. Weeds start to germinate after disappearance of water. KVK Delhi conducted on farm trial to assess the effect of weedicide application on weeds population and productivity of paddy. The results given in **Table 2.22** revealed that the application of Pritlachlor 50% @ 2.0 lit/ha (1-3 DAT) and Bispyribac sodium 10% @ 250ml/ha (20 DAT) controlled 98.27 % weeds and recorded highest yield (34.30q/ha) followed by Bispyribac sodium 10% @ 250ml/ha and farmers' practice.

Table 2.22: Effect of application of weedicides on weed control efficiency and productivity of paddy

Technology Option	No. of trials	Weed population (No./m^2)	Weed control efficiency (%)	Yield (q/ha)	BC ratio
Use of Pritlachlore/ butaclore @ 2.0 lit/ha 1-3 DAT (Farmers' practice)	3	10.53	91.83	31.00	1.81
Bispyribac sodium 10% @ 250ml/ha 20 DAT		3.70	97.13	33.70	1.96
Pritlachlor 50% @ 2.0 lit/ha 1-3 DAT and Bispyribac sodium 10% @ 250ml/ha 20 DAT		2.23	98.27	34.30	2.01

6. Resource Conservation

Problem definition*:* Farmers are using very high seed rate in peas

Technology refined: Appropriate seed rate for pea cultivated in Lahaul Valley

Farmers of Lahaul & Spiti district of Himachal Pradesh are using very high seed rate in peas as compared to the recommended seed rate. KVK Lahaul & Spiti conducted on farm trial to find out appropriate seed rate for pea cultivated in Lahaul Valley. Best results in terms of green pod yield were obtained with the seed rate of 350 kg/ ha though highest B:C ratio was recorded with 250 kg/ ha seed rate (**Table 2.23**).

Table 2.23: Effect of different seed rate on green pod yield of peas

Technology Option	No. of trials	Green pod yield (q/ha)	BC Ratio
Seed rate 350 Kg / ha (Farmers' practice)	3	91.2	4.56
Seed rate 125 Kg / ha		64.3	4.84
Seed rate 187.5 Kg / ha		79.6	5.37
Seed rate 250 Kg / ha		89.4	5.38

Problem definition*:* Clogging in sowing in wheat with Happy seeder in heavy textured soils

Technology Assessed: Wheat sowing evaluation in heavy textured soil with the use of rain gun

Happy seeder is an appropriate machine to avoid burning of paddy residue. In heavy textured soils, Happy seeder is not used due to clogging problems and farmers generally burn their crop residue

which causes environmental pollution. KVK Fatehgarh Sahib conducted on farm trial to see the effect of irrigation on efficiency of Happy seeder in these soils. As depicted in **Table 2.24**, In heavy textured soils, Happy seeder performed best along with rain gun irrigation method as it yielded 55 q/ha wheat yield with B:C ratio of 2.39.

Table2.24: Effect of irrigation on efficiency of Happy seeder in heavy textured soils

Technology Option	No. of trials	Yield (q/ha)	BC ratio
Wheat sowing with seed drill after burning of crop residue (Farmers' practice)	1	53.75	2.17
Wheat sowing with happy seeder irrigated with rain gun		55.00	2.39
Wheat sowing with Happy Seeder with flood irrigation (Recommended practice)		54.20	2.33

Problem definition*:* Decreasing water availability due to falling water table

Technology refined: Zero tillage and bed planting in wheat

Rice wheat cropping system is most common in the region, but persistent practicing of this cropping system has posed a number of problems especially declining water table and decreasing water availability. To assess the effectiveness of zero tillage and bed planting to solve this problem, KVK Kurukshetra conducted on farm trials on assessment of resource conservation technologies in wheat. The results presented in **Table 2.25** revealed that bed planting resulted in highest grain yield of 52.5 q/ha apart from saving of water to the tune of 30 percent, followed by zero tillage and convention tillage (both yielding 50.0 q/ha). The benefit cost ratio was however, highest in case of zero tillage i.e. 3.00 followed by conventional tillage and bed planting. Though bed planting and zero tillage are useful interventions in the area but are labour intensive, hence need motivation of the farmers for their adoption.

Table 2.25: Effect of resource conservation technologies on wheat crop yields

Technology Option	No. of trials	Grain yield (q/ha)	BC Ratio
Conventional tillage (Farmers' practice)	2	50.0	2.56
Zero tillage		50.0	3.00
Bed planting		52.5	2.46

7. Varietal Evaluation

Problem definition*:* Low productivity, Poor quality and long juvenile period of standard cultivars of apple.

Technology assessed: Evaluation of coloured strain of apple planted on clonal root stock (MM-111)

Apple is an important horticultural crop of Shimla district of Himachal Pradesh. Since 80 % of apple orchards in Shimla district are on Starking Delicious cultivar, using 90% seedling rootstocks, which is a very old variety and needs replacement. These standard cultivars are having long juvenile period. With the change in the marketing trend, there is need to develop the apple cultivar of international standard. Keeping this in view, KVK Shimla conducted location specific varietal evaluation trial for best colour strains of apple. The data was recorded on seven year old plant planted on clonal root stock MM-111 (**Table 2.26**). The initial results showed that all the three cultivars viz. Scarlet Spur, Super Chief and Royal Gala can be of commercial importance in mid hill area of the state to replace the existing cultivar Starking Delicious.

Table 2.26: Performance of different apple cultivars planted on clonal root stock MM-111 for growth, yield and quality parameters

Technology Option	No. of trials	Fruit yield/ plant (Kg)	Annual Extension growth (cm)	Trunk Girth (cm)	Plant Height (m)	Fruit colour	Fruit shape	Production (t/ha)	BC Ratio
Starking Delicious (Farmers' practice)	4	19.2	45.4	15.4	5.3	70 % Red	Round to flat	9.6	1.08
Scarlet Spur		19.2	45.4	15.4	5.3	70 % Red	Round to flat	17.4	3.18
Super Chief		19.2	45.4	15.4	5.3	70 % Red	Round to flat	14.7	2.53
Royal Gala		19.2	45.4	15.4	5.3	70 % Red	Round to flat	10.7	1.56

Problem definition*:* Low yield of wheat in local varieties

Technology assessed: Performance of new wheat varieties

In Leh area of Jammu & Kashmir, the productivity of wheat crop is low as the soil and climatic conditions does not favour for the full potential of this crop and the testing of different varieties suitable to the particular area is imperative. KVK Leh conducted on farm trial to assess the performance of newly wheat varieties in the farmers' fields. The data presented in the **Table 2.27** revealed that Mansarover yielded higher than both of the varieties i.e., local and Sonam variety of the wheat. It is suggested that wherever the wheat is grown in this district the Mansarover variety may be used against the local variety which has proven superior in terms of its yield over others.

Table 2.27: Performance of wheat varieties on productivity of wheat in Leh area of Jammu & Kashmir

Technology Option	No. of trials	Yield (q/ha)	BC ratio
Local variety (Farmers' practice)	2	17.25	1.2
Sonam		26.50	1.45
Mansa rover		27.50	1.65

Problem definition*:* Low productivity of existing mustard varieties

Technology assessed: New mustard varieties

Mustard is an important crop in Bhiwani district of Haryana, however continuous cultivation of old varieties has resulted in yield stagnation and low productivity apart from disease susceptibility. New varieties of mustard have been developed and recommended for cultivation in the state but the farmers are not aware of the same. To assess the performance of some new and high yielding mustard varieties in the district, KVK Bhiwani conducted on farm trials using some new mustard varieties viz. RH -749, RH- 119 and RH -406. The results presented in **Table 2.28** revealed that RH - 749 is most suitable variety in the district as it outperformed the other varieties evaluated. The yield obtained in case of RH-749 was 25.00 q/ha compared to 20.0 q/ha in case of farmers practice and 23.75 q/ha in case of RH-119. This variety henceforth could be popularized in the region through front line demonstrations to increase the mustard yield.

Table 2.28: Performance of different mustard varieties in district Bhiwani of Haryana

Technology Option	No. of trials	Yield (q/ha)	BC Ratio
RH-30 (Farmers' practice)	3	20.00	2.13
RH-406		21.25	2.48
RH-119		23.75	2.76
RH-749		25.00	2.90

8. Water Management

Problem definition*:* Water scarcity & delayed germination under late sown conditions

Technology assessed: Seed priming with hydrogel in wheat

Wheat is an important Rabi season crop in the region, but water scarcity and delayed germination under late sown conditions is adversely affecting the crop resulting in poor yields. Seed priming with water for 12 hrs has been recommended for getting better and timely germination. Apart, seed priming with hydrogel is new technology advocated in rainfed areas for better germination and good crop stand. To assess the effectiveness of these technologies, KVK Bhiwani conducted on farm trials on effect of seed priming on wheat productivity under late sown water scarce conditions. The results presented in **Table 2.29** revealed that seed priming with water for 12 hrs resulted in early germination & gave 2.0% and 6% higher yield than seed priming with hydrogel and no seed priming, respectively. The application of hydrogel also increased the grain yield over farmers practice but was inferior to seed priming with water for 12 hrs before sowing. The findings indicated that seed priming with water for 12 hrs before sowing should be practiced by the farmers in water scare areas under late sown conditions.

Table 2.29: Effect of seed priming with hydrogel on wheat grain yield

Technology Option	No. of trials	Grain yield (q/ha)	BC Ratio
No seed priming [Farmers practice]	3	37.5	1.88
Seed priming with water for 12 hrs before sowing		40.0	1.99
Seed priming with hydrogel @ 2.5 kg/ha at the time of sowing		39.0	1.80

9. Drudgery Reduction

Problem definition*:* Drudgery & accidents of farm women in Chaff cutting

Technology assessed: Effect of efficacy of safety devices in chaff cutting

Due to the lack of technical capability of the local artisans, adhering to safety and design standards is impractical to the implements fabricated in the rural areas. Therefore work drudgery, the traumatic accidents and injuries are the major concerns to examine options for ergonomics intervention and betterment of work in chaff cutting activities. Hence, an OFT was planned by KVK Delhi with the objective to assess the efficacy of safety device in chaff cutter. The results presented in **Table 2.30** revealed that the safety device put on chaff cutter eliminated the chance of accident which resulted in less anxiety (heart beat 73/minute) and better posture discomfort score (48.4) as compared to working with chaff cutter without safety device (heart beat 78/per minute and posture discomfort score 50.0).

Table 2.30: Effect of safety devices in Chaff Cutting on heart beat and postural discomfort of farm women

Technology Option	No. of trials	Heart rate/minute	Postural discomfort score (No.)
Chaff cutter without safety device (Farmers' practice)	3	78	50.0
Chaff cutter with safety device		73	48.4
Chaff cutter with simplified safety device		75	51.0

Problem definition*:* Drudgery in use of old traditional sickle

Technology Assessed: Improved Falcon sickle

The farmers and farm women are using the same old traditional sickle since ages so there is need to give an ergonomically well designed sickle which could be time & energy saving. In view of this, KVK Rohtak conducted on farm trials to assess the comparative performance of two types of sickle for harvesting. Simple sickle is dominantly used for harvesting so it was compared with improved sickle i.e Falcon sickle The results presented in **Table 2.31** on ergonomic evaluation on the basis of a pre -tested questionnaire revealed that the size and shape of grip was comfortable, the farm women did not experience any pain or cramps in the body, frequent sharpening of blade was not required and time taken to cut was also less. Ergonomically improved Falcon sickle was found to be better than the traditional sickle and is time and energy saving, however its cost is more so government should give subsidy or its cost should be reduced.

Table 2.31: Comparative performance of two types of sickle for harvesting

Technology Option	No. of trials	Size & shape of grip	Pain & cramps in body	Frequent sharpening of blade required	Time taken to cut 1/4acre
Simple sickle [Farmer Practice]	5	Not comfortable	Yes	Yes	7hrs.
Improved Falcon sickle (Recommended Technology		comfortable	No	No	6hrs.

10. Crop Diversification

Problem definition*:* Mono cropping of rice during *kharif*

Technology refined: *Kharif* maize for crop diversification

Rice wheat cropping system is most common in the region, but persistent practicing of this cropping system has posed a number of problems especially declining water table and decreasing water availability. Paddy in kharif in particular is water consuming crop hence new cropping systems involving other crops like maize in kharif are required to be popularized for crop diversification. KVK Kurukshetra conducted on farm trials on assessment of kharif maize to diversify rice crop in rice –wheat cropping areas. The results presented in **Table 2.32** revealed that grain yield in rice and kharif maize was 70.0 and 62.5 q/ha, respectively. While in case of green cob purpose kharif maize the green cob yields were 168.0 q/ha in addition to 400 q/ha green fodder. The economics of different crops however, revealed the superiority of green cob purpose kharif maize as the BC ratio was highest for this treatment compared to dwarf rice and grain purpose kharif maize.

Table 2.32: Evaluation of kharif maize as an alternate crop to paddy

Technology Option	No. of trials	Grain yield (q/ha)	Green cob yield (q/ha)	Fodder yield (q/ha)	BC Ratio
Dwarf Rice [Farmers' practice]	1	70.0	-	-	1.73
Kharif Maize (green cob purpose)		-	168.0	400	2.25
Kharif Maize (grain purpose)		62.5	-	-	1.53

11. Farm Machinery

Problem definition*:* Depleting water table

Technology assessed: Comparison of different methods of Puddling in paddy

KVK Gurdaspur conducted on farm trial to assess the performance of different methods of puddling in paddy. The results revealed that the puddling done with the pulverizing roller was comparable with rotavator and better than the conventional method **(Table 2.33)**. Moreover, there is saving of one operation if the puddling is done by pulverizing roller or rotavator.

Table 2.33: Effect of different methods of puddlin on infiltration rate and paddy productivity

Technology Option	No. of trials	Infiltration rate (mm/h)	Yield (q/ha)	BC ratio
Conventional (Farmers practice)	2	0.85	68.0	2.7
Pulverizing Roller		0.75	68.2	3.1
Rotavator		0.70	67.9	2.5

12. Agro Forestry

Problem definition: Poor growth of existing *Eucalyptus* varieties

Technology assessed: Superior Eucalyptus clones

Eucalyptus is an important agro forestry crop in the region but the existing *Eucalyptus* varieties are yielding poor returns. In view of this, KVK Sonipat conducted on farm trials to assess the performance of superior *Eucalyptus* clones. The results presented in **Table 2.34** on various growth parameters of *Eucalyptus* clones revealed that clone 413 is performing better after 4th year of plantation under Sonipat condition. The average height, girth and survival percent after fourth year in case of clone 413 was 20-22 m, 56.0 cm and 95%, respectively. It was followed by clone 411 where average height, girth and survival percent recorded was 17-19 m, 51.5 cm and 94 percent.

Table 2.34: Comparative performance of *Eucalyptus* clones under Sonipat conditions

Technology Option	No. of trials	Average height (m)	Average girth (cm)	Survival (%)
Eucalyptus clone 072	1	18-20	49.0	72
Eucalyptus clone 413		20 -22	56.0	95
Eucalyptus clone 411		17-19	51.5	94

13. Beekeeping

Problem definition*:* Incidence of *Varroa* mite in honeybee colonies

Technology refined: Application of Apistan -miticide strips

Incidence of *Varroa* mite is a major problem in beekeeping. KVK Hoshiarpur conducted on farm trial for its management in the district. The results in **Table 2.35** revealed that Apistan use in the honeybee colony during brooding period i.e. October, can lead to reduction in *Varroa* mite incidence and subsequent good colony strength and high honey production. Use of Formic acid and Oxalic acid were also effective in managing *Varroa* mite, however their periodic use for two weeks was less favourable to the farmers as compared to apistan treatment.

Table 2.35: Effect of application of Apistan -miticide strips, formic and oxalic acid on control of mites in bee colonies

Technology Option	No. of trials	Mite incidence on adult bees (No. /200 bees)	Honey Yield (kg/colony)	BC ratio
Application of Bayticol (Flumethrin 1%)- 85 µl/colony (Farmer's practice)	3	3.1	4.1	2.2
Application of Apistan -miticide strips –attached to single bee frame/colony		2.5	4.6	7.6
Application of Formic acid (85%) @ 5 ml/day for two weeks on bottom board/colony (Recommended Practice)		2.5	4.4	1.0
Application of Oxalic acid solution (4.2%) in sugar water mixture (60%) @ 5 ml at weekly interval three times in between the bee frames/colony (Recommended Practice)		2.6	4.1	3.8

14. Mushroom Cultivation

Problem definition: Low mushroom yield per unit area

Technology assessed: Mixing of phosphotica & azotobactor in compost

Mushroom cultivation is an important and remunerative entrepreneur for rural farm youths. Low mushroom yield per unit area however, is causing threat to the sustainability and profitability of this venture. In view of this, KVK Yamunanagar conducted on farm trials to assess the effectiveness of supplementation of phosphotica & azotobactor in compost in increasing the mushroom yields. The results presented in **Table 2.36** revealed that use of phosphotica @ 10ml/ 10kg compost resulted in higher mushroom yields of 18.400 kg fresh mushroom per 100kg compost, followed closely use of Phosphotica & Azotobactor @ 10ml /10kg compost (18.3 kg fresh mushroom) compared to 15.8 kg in untreated check (farmers practice) and 16.0 kg in case of azotobacter treatment. The same trend was also observed with regard to BC ratio as use of phosphotica @ 10ml/ 10kg compost scored highest BC ratio of 1.9-85, followed by 1.83 in case Phosphotica & Azotobactor @ 10ml /10kg compost and 1.78 in case of use of azotobacter alone.

Table 2.36: Effect of phosphotica and azotobacter supplementation on mushroom yield

Technology Option	No. of trials	Production of fresh mushroom kg/100 kg compost	BC ratio
No use of Phosphotica & Azotobactor (Farmers practice)	2	15.8	1.60
Use of Phosphotica @ 10ml /10kg compost		18.4	1.85
Use of Azotobactor @ 10ml /10kg compost		16.0	1.78
Use of Phosphotica & Azotobactor @ 10ml /10kg compost		18.3	1.83

15. Fisheries

Problem definition*:* No proper stocking of fish seed

Technology assessed: Impact of fish seed ratio/numbers on fish production

Fish farming is emerging as an enterprise in Jammu district. However, farmers are not getting the expected returns due to the improper ratio of stocking of fish seed. KVK Jammu conducted on farm trial to evaluate the impact of fish seed ratio on production of fish in the area. A perusal of data given in **Table 2.37** revealed that recommended ratio of seed with 5% extra seed was found more suitable to complete the seed loss due to predatory birds, snakes etc. and gave highest fish yield (44 q/ha) than the farmers and recommended practice.

Table 2.37: Evaluation of fish seed ratio on fish productivity

Technology Option	No. of trials	Fish Yield (q/ha)	BC ratio
Stocking of, Katla, Rohu, Mrigal without any ratio	2	28.00	3.5

(Farmers' practice)			
Recommended- 3:3:4		39.00	3.75
5 % extra of recommended practice		44.00	4.18

16. Foods & Nutrition

Problem definition*:* Traditional colocasia rolls prepared with maize are poor in quality and quality protein

Technology refined: Supplementation of colocasia leaf rolls with different protein sources

Colocasia leaf rolls are prepared and consumed in almost every household of Hamirpur district of Himachal Pradesh. As per the local practice, maize flour is used for making the rolls which is poor in quality protein. KVK Hamirpur conducted on farm trial on evaluation of colocasia leaf roll supplemented with different protein sources. For that leaf rolls were smeared with the paste of different protein sources like legumes and cereals. The data was analyzed on different parameters like taste/flavor, texture, acridity and colour. As indicated from the data that leaf rolls prepared with Bengal gram were most acceptable followed by soybean smeared colocasia leaf rolls (**Table 2.38**). The farmers were satisfied with the results as both the accepted legumes are locally available and are good source of protein.

Table 2.38: Evaluation of colocasia leaf rolls supplemented with different protein sources

Technology Option	No. of trials	Sensory Acceptability score (Scale 1-9)				
		Taste	Texture	Acridity	Colour	Overall acceptability
Maize (ground paste) @100gms/75 gms of leaves (Farmer's practice)	4	7.0	5.2	8.2	5.5	6.75
Soyabean (ground paste) @100gms/75 gms of leaves		6.8	7.4	7.8	7.8	7.45
Bengal gram (ground paste) @100gms/75 gms of leaves		8.2	7.9	8.6	8.4	8.28
Rice (ground paste) @100gms/75 gms of leaves		5.4	5.3	8.2	5.5	6.10

Problem definition*:* Anemia among adolescent girls

Technology assessed: Effect of bi-weekly IFA supplementation with and without vitamin 'C'

Adolescence is a great transition and vulnerable phase that one has to pass through while reaching adulthood. Hence, this period demands prompt care and attention to avoid any kind of serious consequences. Therefore, the present trial was designed by KVK Delhi to improve the Hb level of adolescents thereby reducing the iron deficiency anemia through bi-weekly iron supplementation (with and without vitamin 'C'), to improve the efficacy of iron absorption and subsequently. The data presented in **Table 2.39** revealed that all the two intervention groups (T_1 & T_2) had shown an improvement in the hemoglobin level of the subjects due to the impact of IFA supplementation. Supplementation of IFA and Vitamin C biweekly was found to be the best intervention. Therefore, the finding strongly recommends,

that adolescent girls may be supplemented with iron folic acid along with Vitamin 'C' bi-weekly for a period of three months with parallel support of intensive nutrition and health education/counseling to adolescent girls and their families for better compliance and improvement in personal hygienic & dietary practices.

Table 2.39: Effect of bi-weekly IFA supplementation with and without vitamin 'C' on hemoglobin level of adolescent girls

Technology Option	No. of trials	Hemoglobin status (gm)	
		Before	After
Hb test without supplementation (Control group)	10	9.2	9.6
Hb test with IFA supplementation (T_1)		9.5	10.3
Hb test with IFA + vitamin C supplementation (T_2)		8.9	10.4

17. Nutritional Management (Livestock)

Problem definition*:* High rate of mortality in summer due to heat stress in broiler chicks

Technology assessed: Supplementation of broiler feed with turmeric powder

Poultry is an important enterprise in the district, however higher incidence of mortality due to heat stress in broiler chicks for the past few years has been observed as a major problem. In order to address this problem, KVK Ambala conducted on farm trials to study the effect of turmeric powder supplementation on growth performance of broiler chicks reared under heat stress conditions. The results presented in **Table 2.40** revealed that supplementation of readymade poultry feed with vitamin C (0.06 g/liter)and turmeric powder (5 g/kg feed) resulted in higher body weight (1680 g), low feed intake (2842 g), low feed conversion ratio (1.69) and low mortality (2.2 %) compared to the farmer's practice of readymade feed alone. The BC ratio was also highest in this treatment; hence the findings indicate that supplemtation of readymade feed with vitamin C and turmeric powder should be advocated to the poultry growers to combat with this problem.

Table 2.40: Effect of turmeric supplementation on mortality and growth performance of broiler chicks

Technology Option	No. of trials	Body weight (g/bird)	Feed intake (g/bird)	Feed Conversion Ratio(FCR)	Mortality (%)	Cost of production (Rs./bird)	BC Ratio
Readymade broiler feed (Crude protein 22%) (Farmers' practice)	3	1567	2982	1.90	9.2	94.53	1.09
T_1 + Supplemented with Vitamin C (0.06 gm/liter)		1593	2894	1.82	6.5	93.40	1.012
T_2 + Supplemented with Turmeric Powder (5 gm/kg feed)		1680	2842	1.69	2.2	94.53	1.17

Problem definition*:* Silent heat and long calving interval in buffaloes

Technology assessed: Effect of different feeds on milk yield and service period of buffaloes

KVK Faridkot conducted on farm trial to assess the effect of different feed fed to buffaloes on its milk yield and service period. The results indicated that both treatments i.e. feed preparation from domestic ingredients viz. ground wheat/mustard or cotton seed cake and readymade feed were most commonly followed by farmers. The results given in **Table 2.41** revealed that animal fed with feed preparation from domestic ingredients viz. ground wheat/mustard or cotton seed cake + rice polish/wheat bran + mineral mixture were best performers with lactation yield of 2180 lit followed by 2138 lit in readymade feed + mineral mixture and 1900 lit in feed preparation from domestic ingredients viz. ground wheat/mustard or cotton seed cake. The service period was 105 days in feed preparation from domestic ingredients viz. ground wheat/mustard or cotton seed cake and it was the lowest in animal fed with feed preparation from domestic ingredients viz. ground wheat/mustard or cotton seed cake + rice polish/wheat bran + mineral mixture i.e. 89 days and the silent heat symptoms were not observed in animal fed with feed preparation from domestic ingredients viz. ground wheat/mustard or cotton seed cake + rice polish/wheat bran + mineral mixture and readymade feed + mineral mixture treatments.

Table 2.41: Effect of different feeds on milk production and reproduction of buffaloes

Technology Option	No. of trials	Milk yield lits per lactation	Service period (days)	BC ratio
Feed preparation from domestic ingredients ground wheat/ mustard or cottonseed cake (Farmers' practice)	2	1900	105	2.65
Feed preparation from domestic ingredients ground wheat/ mustard or cottonseed cake + Rice polish/wheat bran + mineral mixture		2170	89	3.03
Readymade feed		1880	115	2.61
Readymade feed + mineral mixture		2138	93	2.98

Problem definition*:* Low milk production

Technology assessed: Effect of mineral mixture and anthelmentics in anestrous heifer/cow

An on farm trial entitled "Effect of mineral mixture and anthelmentics in anestrous heifer/cow" was conducted in Budgam district by KVK Srinagar. A total of thirty female animals were selected and divided into three equal groups of each reared under semi-intensive methods of grazing. Administered of Projona Plus orally to heifers/cows was the farmers' practice. Administrations of Projana plus + 30g mineral mixture and Projana plus + 30g mineral mixture + Fentus Bolus were taken as other treatments of trial. All the cows/heifer was kept under observation of heat detection and after that estrous animals were inseminated scientifically. Pregnancy diagnosis was done after two months in all the inseminated animals. The study revealed that the highest (90%) estrous was found by administration of Projana plus + 30g mineral mixture + Fentus Bolus followed by Projana plus + 30g mineral mixture (80%) and farmers' practice (50%). More over pregnancy detection was found highest in Projana plus + 30g mineral mixture + Fentus Bolus (90%) followed by Projana plus + 30g mineral mixture (70%) and farmers' practice (40%) (**Table 2.42**).

Table 2.42: Effect of mineral mixture and anthelmentics on induction of estrous and pregnancy in

anestrous heifer/cow

Technology Option	No. of trials	Induction of estrous (%)	Pregnancy (%)
Administration of Projana plus orally (Farmers' practice)	3	50	40
Administration of Projana plus + 30g mineral mixture orally		80	70
Administration of Projana plus + 30g mineral mixture + Fentus Bolus orally		90	90

18. Disease and Insect Management (Livestock)

Problem definition*:* Low productivity and poor health buffaloes/cattle due to blood sucking ecto-parasites

Technology refined: Chemical agents/anthelmentics

Infestation of blood sucking parasites causes restlessness in animals resulting in to low production and poor animal welfare. Generally, farmers' creates smoke to control these ecto-prasites resulting in to ineffective management. KVK Hamirpur conducted on farm trails on management of blood sucking ecto-parasites. Different chemical agents/anthelmentics selected for assessment were Himax with oil and Cypermethrin. The results indicated that application of Cypermethrin @ 0.1% was found most effective as it resulted in significant reduction in insect bite over farmer practice **(Table 2.43).**

Table 2.43: Evaluation of different chemical agents/anthelmentics for the management of blood sucking ecto-parasites

Technology Option	No. of trials	Number of ecto-parasite bites per animal	% reduction in number of bites over Farmer practice
Smoke generation (Farmers' practice)	**3**	14	-
Himax with oil (1 :10)		12	14
Cypermethrin 105 w/v (0.1%)		6	57

19. Feed and Fodder Management (Livestock)

Problem definition*:* Low milk production and long service period in crossbred cattle

Technology refined: Effect of mineral mixture feeding and salt lick feeding

Regular feeding of mineral mixture and salt lick is useful to increase milk yield and reproducing ability of crossbed cattle. Farmers of the Faridkot district fed readymade feed without mineral mixture resulting in to low milk production and long service period in crossbred cattle. KVK Faridkot conducted on farm trial for the refinement of effect of mineral mixture feeding and salt lick feeding on milk

production and reproduction of crossbred cattle. The results revealed that by feeding readymade feed + 75 g mineral mixture /day + Uromol lick (kept for 1 hr/day in manger), the lactation yield was 5110 lit followed by readymade feed + 75 g mineral mixture /day with 4640 lit, readymade feed + Uromol lick 4330 lit and readymade feed without mineral mixture 4280 lit. The animals conceived 62 days after calving in readymade feed + 75 g mineral mixture /day + Uromol lick treatment, where as the service period was 67 days (readymade feed + 75 g mineral mixture /day), 74 days (readymade feed + Uromol licking) and 78 days in farmers' practice (**Table 2.44)**

Table 2.44: Effect of mineral mixture and salt lick feeding on milk production and reproduction of cross bred cows

Technology Option	No. of trials	Milk yield lits per lactation	Service period (days)	BC ratio
Readymade feed without mineral mixture (Farmers' practice)	3	4280	78	2.43
Readymade feed + 75 g mineral mixture /day(Recommended)		4640	67	2.63
Readymade feed + Uromol lick (kept for 1 hr/day in manger) (Refined)		4330	74	2.45
Readymade feed + 75 g mineral mixture /day + Uromol lick (kept for 1 hr/day in manger) (Refined)		5110	62	2.90

20. Fodder Production

Problem definition*:* Low fodder/grass production

Technology assessed: Performance of *Setaria* and *Napier* hybrid

In Rajauri district, farmers are facing the problem of low fodder/grass production. Farmers of the area are generally dependent on perennial fodder grasses to fed their animals resulting in to scarcity during winter months. KVK Rajauri conducted on farm trial to assess the performance of *Setaria* and *Napier* hybrid in the region. Results in **Table 2.45** revealed that, in case of high yielding hybrid the farmers were able to take up green grass till the end of the November. However, vegetative growth was reduced to dormant during winter, where as in case of *Setaria*, the green grass was available till the end of October as growth commences in early spring and continues at low autumn temperatures as compared to farmers' practice which is available only till September**.**

Table 2.45: Performance of *Setaria* and *Napier* hybrid on availability period and productivity

Technology Option	No. of trials	Productivity q/ha)	Green grass availability period
Natural Grass (Farmers' practice)	1	38.0	Available till September
Setaria		156.0	Available till the end of October to 1st week of Nov
Napier hybrid		234.0	Available till the end of the Nov

21. Storage Techniques

Problem definition*:* Sprouting of during storage

Technology assessed: Effect of Kharif onion top length on sprouting during storage

Onion sprouting during its storage is the major problem faced by the farmers of Ferozepur district of Punjab. KVK Ferozepur conducted on farm trial to see the effect of kharif onion top length on sprouting in storage. The results given in **Table 2.46** showed that keeping full top length after harvest increased the storage life of kharif onion as compared with other treatments.

Table 2.46: Effect of top length on shelf life of kharif onion during storage

Technology Option	No. of trials	Sprouting (%)	Weight loss (%)	Rooting (%)
2cm top length (Farmers' practice)	1	82.5	42.40	40.66
Root top cutting		65.88	55.28	100
Half length top		64.33	39.10	100
Full length top		0.0	15.88	37.33

Problem definition*:* Sprouting of Onion after harvest

Technology assessed: Application various levels of sulphur on shelf life of Onion

Sprouting of onion during storage is a major problem in Bondipora region. KVK Bondipura conducted on farm trial to assess the effect of application various levels of sulphur on shelf life of Onion during storage. It was observed that application of sulphur @ 20Kg + curring gave the best results over other treatment and farmers' practice as the sprouting started 75 days after the harvest (**Table 2.47**). This treatment should be popularized among the farmers so that they can sell their crop more than two months after the harvest to earn good returns.

Table 2.47: Effect of application various levels of sulphur on shelf life of Onion

Technology Option	No. of trials	Sprouting (days after harvest)	Yield (q/ha)	BC ratio
No sulphur application, irrigation 10days before harvest (Farmers' practice)	3	25	190	1.4
Sulphur 10Kgs + Curring		60	205	1.96
Sulphur 20Kgs + Curring		75	205	1.96

Problem definition*:* Irregular supply of electricity during summer decreases shelf life of food items

Technology refined: Low cost energy saving ice less refrigerator

Refrigerator is a common household need these days but irregular electricity supply in rural areas of the district during summer season results in storage losses in freshness of fruits, vegetables and milk products. To increase the shelf life of vegetables and milk products during summer season ice less refrigerator is good storage technique. It is an eco-friendly, non-toxic, energy saving and cost effective alternative method to substitute electric refrigerators. KVK Ambala conducted on farm trials to assess the effectiveness of low cost energy saving "Ice Less Refrigerator' in rural areas especially for the low and middle income group farm families. The results presented in **Table 2.84** revealed that better storage of raw and cooked vegetables and milk products was obtained in iceless refrigerators during summer and products remain fresh for longer duration as compared to other technologies. The temperature was minimum (23.4 ^{0}C) and shelf life was maximum (240-264 hrs) in case of iceless refrigerator. This iceless refrigerator is recommended for storage of household products during summer season as farm families are ready to accept this technology as it not only saves energy but also suitable in rural areas where frequent electric cuts are experienced.

Table 2.48: Effectiveness of low cost energy saving iceless refrigerator in rural areas

Technology Option	**No. of trials**	**Temperature** (^{0}c)	**Shelf life (h)**
Use of electric refrigerator (Farmers' practice)	3	39^{0}c	24-28
Janta Refrigerator (CCSHAU,Hisar) (Recommended)		28^{0}c	192-240
Ice-less Refrigerator **(**Refinement)		23.4^{0}c	240-264

3. FRONT LINE DEMONSTRATIONS:

One of the important mandates of KVKs is to conduct frontline demonstrations on Crops, Livestock, Farm Implements and other agricultural related enterprises. To demonstrate the proven potential of latest location specific technologies at the farmers' field, frontline demonstrations were conducted. The main emphasis of these demonstrations was to enhance the production of crops in low productivity and problematic areas. During the reporting year, a total of 8185 FLDs were conducted by KVKs of Zone-1 on oilseeds, pulses, cereals, cotton, fodder, commercial crops, fruits, flowers, vegetable crops, livestock, farm implements and other important area covering the total area of 2552.03 ha etc.

Table 3.1: Frontline Demonstrations conducted by KVKs of Zone-I in Year 2012-13

Crop/ Enterprise	Punjab		Haryana		Delhi		Himachal Pradesh		Jammu & Kashmir		Zone-1 Total	
	No. Of farmers	Area (ha)	No. Of farmers	Area (ha)	No. Of farmers	Area (ha)	No. Of farmers	Area (ha)	No. Of farmers	Area (ha)	No. Of farmers	Area (ha)
Oilseeds	115	39.40	428	173.40	50	20.00	453	62.60	498	112.60	1544	408.00
Pulses	285	88.55	533	165.81	5	2.00	444	59.85	179	26.05	1446	342.26
Cereals	353	151.20	783	346.93	18	7.20	185	25.62	1326	358.853	2665	889.80
Vegetables	43	6.78	65	10.97	15	6.20	445	36.10	224	13.63	792	73.67
Fruits	18	6.08					27	2.13			45	8.21
Cotton	39	13.60	46	18.40							85	32.00
Fodder			10	0.55			23	2.00	74	17.25	107	19.80
Flowers	5	1.00					9	0.35			14	1.35
Livestock (Number)			75	140.00 (no.)			67	73.00 (no.)	253	14000.00 (no.)	395	14213.00 (no.)
Commercial Crops			126	50.40							126	50.40
Other Entreprises			42				192				234	
Crop Hybrids	28	8.40					55	8.52	82	26.90	165	43.82
Farm Implements	477	674.60	15	6.00							492	680.60
Spices							75	2.12			75	2.12
Total	**1363**	**989.61**	**2123**	**772.46**	**88**	**35.4**	**1975**	**199.29**	**2636**	**555.28**	**8185**	**2552.03**

A total of 1544 Frontline demonstration conducted on oilseeds in 408.00 ha. area. Table 3.1 depicts that the highest area under oilseeds is in Haryana (173.40 ha.) followed by Jammu & Kashmir (112.60 ha), Himachal Pradesh (62.60 ha), Punjab (39.40 ha) and Delhi (20). Total 1446 FLDs on pulse crops (Black gram, Green gram, Summer moong, Arhar, Gram, Lentil, Rajmash and Cowpea) were carried out by KVKs of Zone-1 in which Haryana is leading with highest area followed by Punjab, Himachal Pradesh, Jammu & Kashmir and Delhi. In case of FLDs on other crops viz., cereals, millets, cotton, commercial crops, vegetable crops, fruits, spices, flower crops and fodder crops were having coverage of 1121.17 ha area and 4308 demonstrations. A total 395 demonstrations were conducted on livestock (Cattle feed, Mineral mixture, UMMB licks, Mortality). Out of these, highest demonstration were conducted on poultry (262) followed by dairy (137), fisheries (11) and piggery (5). A total of 492 Frontline demonstrations were conducted on various farm implements viz., aeroblast sprayer, cotton stalk uprooter, power weeder, cotton planter, mould board plough, laser land leveler, rotavator, happy seeder, zero till drill, pulverizing roller, thresher and paired row trencher.

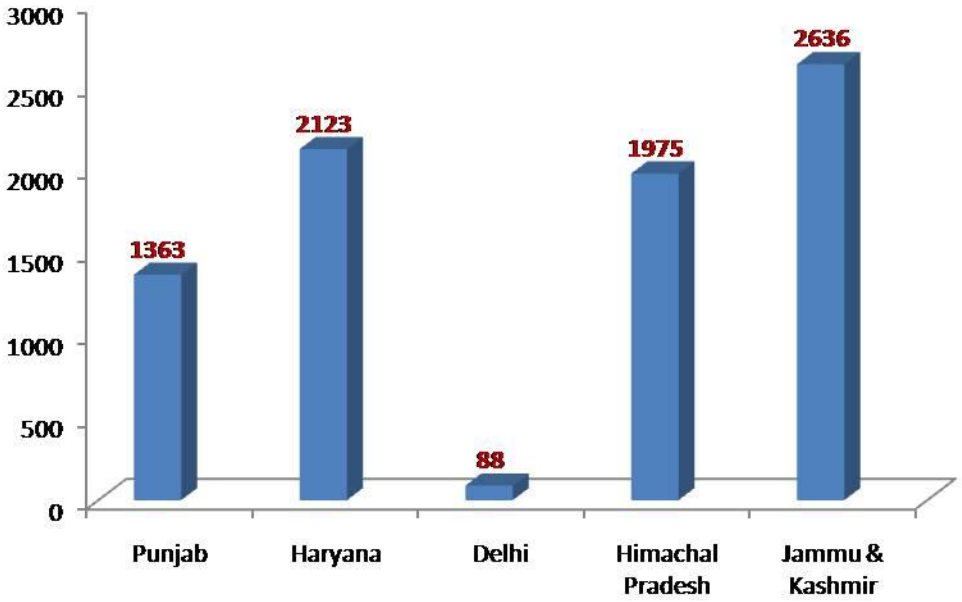


Fig. 3.1 : State wise Front Line Demonstration of Zone-1 conducted during (2012-13)

3.2 : Thematic area wise FLDs conducted by KVKs of Zone-1

Thematic areas	No. of FLDs Conducted	Percentage
Varietal Demonstrations	2085	24.53
Integrated Crop Management	3116	38.55
Integrated Nutrient Management	583	7.21
Resource Conservation Technology	400	4.95
Integrated Pest Management	437	5.41
Integrated Disease management	537	6.64
Integrated Weed Management	327	4.05
Mushroom Production	209	2.59
Farm Machinery	491	6.07
Total	**8185**	**100.00**

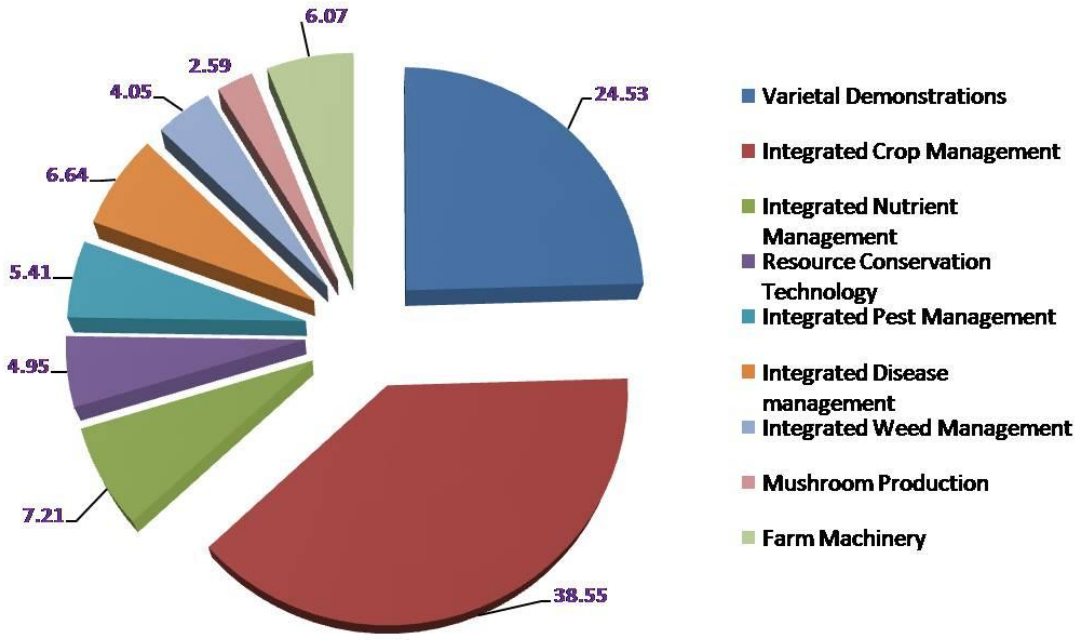


Fig. 3.2: Thematic Area wise Front Line Demonstration in 2012-13 (%age)

Fig 3.2 depicts that the number of FLDs is highest under thematic area of Integrated Crop management (3116) followed by Varietal Demonstrations (2085), Integrated Nutrient Management (583), Integrated Disease management (537),Farm Machinery (491), Integrated Pest management (437), Resource Conservation Technology (400), Integrated Weed Management (327), Mushroom & Vermi-compost (209).

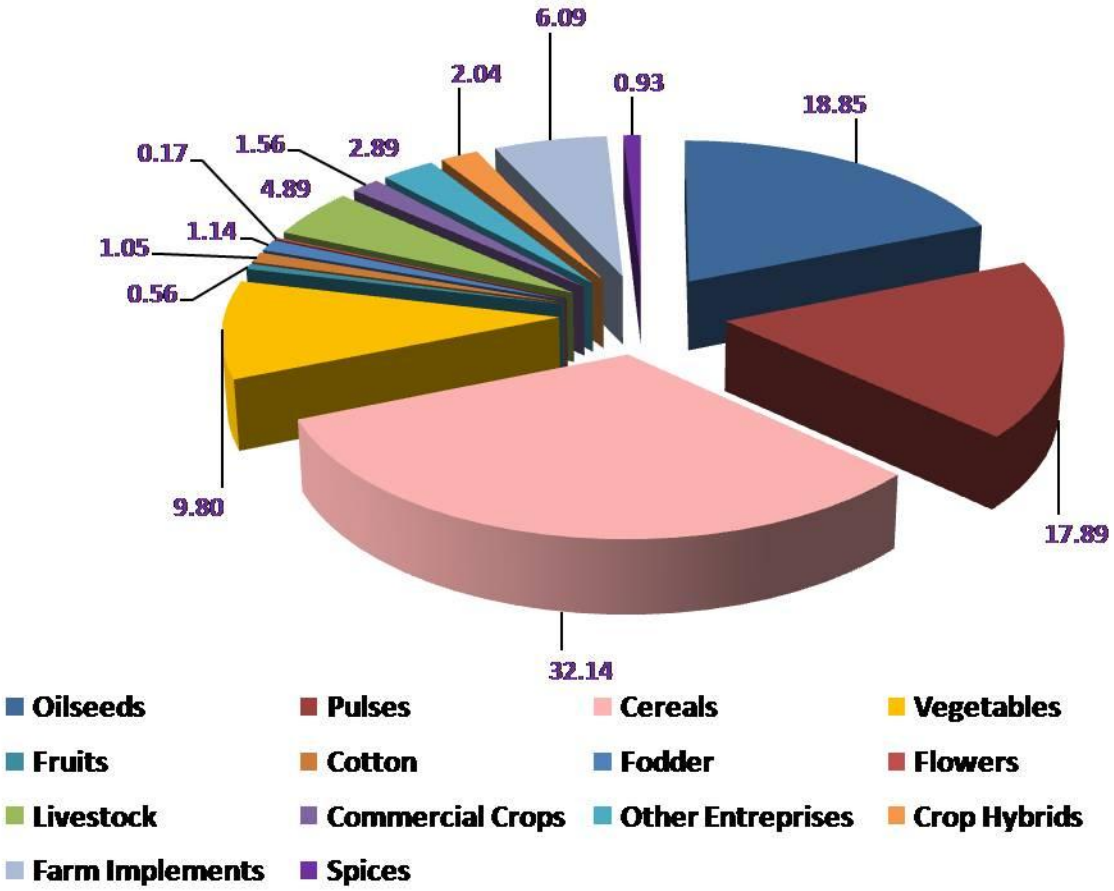


Fig. 3.3: Crop Category wise Front Line Demonstration in 2012-13 (%age)

Fig 3.3 depicts that the highest number of FLDs were conducted on cereals(2665) followed by Oilseeds crops (1544), pulses (1446), vegetables (792), farm implements (492), livestock(395), other enterprises (234), commercial crops (126), fodder (107), cotton (85), spices (75), fruits (45), flowers (14).

6. Training Achievements

Training is a need based, systematically planned and continuous process for desirable behavioral changes of an individual. In this regard, our country has made substantial investment and vigorous efforts on creation of training infrastructure in agriculture sector for up gradation of human skills and change in their attitude towards increase in production through a planned approach. In this direction, the KVKs are imparting training to farmers, farm women, rural youth and extension personnel.

Further, KVKs provide training and communication support to the line departments and voluntary organizations to update the knowledge of recent advances and skills in agriculture and allied sectors. Training courses of KVKs are being formulated based on the training need analysis. These trainings were conducted in the KVK campuses as well as in the villages as per the convenience of the target group and the nature of the training programmes.

Training courses at a glance: A total of **6099** training courses were organized by KVKs of Zone-1 during the year on various aspects of agriculture and allied sectors and trained **1.54** lakh participants of different categories, out of which, **4797** courses were conducted for the farmers and farm women, **853** for rural youth and **449** courses for the extension personnel benefitting **1.23**, **0.21** and **0.09** lakh participants, respectively **(Table 4.1)**

Table: 4.1 Summary of the training programmes conducted by the KVKs of Zone-1 during 2012-13

State wise	No. of Courses	Participants		Total Participants
Farmers and Farm women		**Male**	**Female**	
Punjab	1135	15696	5009	20705
Haryana	2088	47483	9681	57164
Delhi	58	813	386	1199
H.P.	769	13614	13561	27175
J&K	747	13912	3573	17485
Total	**4797**	**91518**	**32210**	**123728**
Rural Youth				
Punjab	235	3307	1374	4681
Haryana	316	6273	3374	9647
Delhi	16	232	158	390
H.P.	128	1997	1640	3637
J&K	158	2343	1250	3593
Total	**853**	**14152**	**7796**	**21948**
Extension Personnel				
Punjab	112	1387	372	1759
Haryana	175	2972	1527	4499
Delhi	3	30	17	47

State wise	No. of Courses	Participants		Total Participants
H.P.	27	531	256	787
J&K	132	1994	166	2160
Total	**449**	**6914**	**2338**	**9252**
Grand Total	**6099**	**112584**	**42344**	**154928**

Sponsored Trainings

Several training programmes were organized through linkages with line departments and other organizations in the districts working for the development of agriculture and progress of the farming community. The KVKs of Zone-1 organized the training courses sponsored by various agencies, mainly District Project officer, ATMA, Department of Soil Conservation, National Horticultural Mission, Department of Agriculture, Department of Animal Husbandry, Department of Forest; Department of Horticulture, National Seed Production Scheme of Department of Agriculture and Cooperation, IFFCO, RKVY etc. The total trainings courses sponsored were **687** in which **17211** farmers, rural youth and extension personnel participated during the year 2012-13 **(Table 4.2)**.

Table: 4.2 No. of training courses sponsored by various agencies for the KVKs of Zone-1

Area of training	No. of Courses	No. of Participants		
		Grand Total		
		Male	Female	Total
Farmers	523	10287	3658	13945
Rural Youth	122	1933	924	2857
Extension Personnels	42	328	81	409
Total	**687**	**12548**	**4663**	**17211**

Thematic area wise trainings to farmers & farm women:

It was organized based on the need of farmers on various thematic areas viz., crop production, management of horticulture crops, soil health and fertility management, livestock production and management, home science, women empowerment, farm mechanization, plant protection, fisheries, production of inputs at site, capacity building and group dynamics and agro-forestry. Data in table 4.3 indicated that majority of courses were organized in management of horticulture crops **(848) and** crop production **(842).** Least courses were organized in fisheries **(13)** in view of paucity of manpower in the KVKs. Female domination was recorded in home science and women empowerment courses however male participation was also observed in home science courses.

Table: 4.3 Thematic area wise training courses organized for farmers and farm women

Thematic Area	No. of Courses	No. of Participants								
		General			SC/ST			Grand Total		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
Crop Production	842	17125	1316	18441	3110	1026	4136	20235	2342	22577
Horticulture	848	13682	4179	17861	3476	2062	5532	17158	6241	23399
Soil Health and Fertility Management	390	6124	706	6830	1036	632	1668	7160	1338	8498
Livestock Production and Management	523	10423	1530	11953	2316	949	3265	12739	2479	15218
Home Science/Women empowerment	677	1033	9772	10805	288	5312	5600	1321	15084	16405
Agril. Engineering	162	2143	368	2511	520	98	618	2663	466	3129
Plant Protection	816	14529	1469	15998	2957	930	3728	17486	2399	19885
Fisheries	13	166	2	168	38	1	39	204	3	207
Production of Inputs at site	44	594	94	688	194	26	220	788	120	908
Capacity Building and Group Dynamics	279	5067	1082	6149	1063	457	1520	6130	1539	7669
Agro-forestry	203	4959	142	5101	675	57	732	5634	199	5833
GRAND TOTAL	**4797**	**75845**	**20660**	**96505**	**15673**	**11550**	**27058**	**91518**	**32210**	**123728**

Thematic area wise trainings for rural youth: -

Training courses for rural youth were mainly focused on development of entrepreneurship in agriculture and allied sector at farm level or home units to sustain the farm income as well to generate additional income. The training was imparted in the areas viz., integrated farming, nursery management of horticulture crops, training and pruning of orchards, protected cultivation of vegetable crops, commercial fruits production, production of organic inputs (seed production, planting material production and vermi-culture), mushroom production, beekeeping, tailoring and stitching, rural crafts, repair and maintenance of farm machinery and implements, post harvest technology & value addition, livestock production and management (Dairying, sheep & goat rearing, Piggery and Poultry production) and fisheries which were specially formulated for development of skill so as to establish small scale units. Table 4.4 represents the thematic area wise training courses organized for rural youth in Zone-I. The data in the table 4.4 reveals that more courses were organized on post harvest processing and value addition **(153)** followed by livestock production **(111)**, Mushroom production **(110)** and Beekeeping **(96)**. This trend clearly indicates that the

rural youth were made aware of emerging potential areas in agriculture and allied sectors where they can venture for income generating activities.

Table: 4.4 Thematic area wise training courses organized for Rural Youth

Thematic Area	No. of Courses	No. of Participants								
		General			SC/ST			Grand Total		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
Mushroom Production	110	1388	273	1661	701	211	912	2089	484	2573
Bee-keeping	96	1872	129	2001	405	57	462	2277	186	2463
Integrated farming	12	161	1	162	101	0	101	262	1	263
Seed production	24	310	17	327	97	41	138	407	58	465
Production of organic inputs	17	163	123	286	32	38	70	195	161	356
Integrated Farming	20	249	105	354	116	12	128	365	117	482
Planting material production	32	535	84	619	88	25	113	623	109	732
Vermi-culture	31	509	96	605	68	30	98	577	126	703
Sericulture	7	56	26	82	15	35	50	71	61	132
Protected cultivation of vegetable crops	58	754	317	1071	306	206	512	1060	523	1583
Commercial fruit production	13	126	88	214	56	41	97	182	129	311
Repair and maintenance of farm machinery and implements	11	123	1	124	42	0	42	165	1	166
Nursery Management of Horticulture crops	26	446	51	497	50	39	89	496	90	586
Training and pruning of orchards	13	227	14	241	20	0	20	247	14	261
Value addition	93	146	1236	1382	94	798	892	240	2034	2274
Production of quality animal products	12	135	46	181	45	7	52	180	53	233
Dairying	67	2850	153	3003	497	153	650	3347	306	3653
Sheep and goat rearing	9	118	36	154	48	26	74	166	62	228
Piggery	4	64	6	70	16	0	16	80	6	86
Poultry production	28	523	39	562	117	16	133	640	55	695
Ornamental fisheries	1	8	2	10	0	5	5	8	7	15
Para extension workers	1	17	0	17	12	0	12	29	0	29
Composite fish culture	1	15	1	16	16	0	16	31	1	32
Fry and fingerling rearing	1	0	0	0	18	12	30	18	12	30
Small scale processing	31	245	375	620	38	85	123	283	460	743

Post Harvest Technology	**29**	74	326	400	20	231	251	94	557	651
Tailoring and Stitching	73	0	427	427	0	1066	1066	0	1493	1493
Rural Crafts	33	1	426	427	19	264	283	20	690	710
TOTAL	**853**	**11115**	**4398**	**15513**	**3037**	**3398**	**6435**	**14152**	**7796**	**21948**

Thematic area wise trainings for extension personnel:-

Training for extension personnel were mainly focused on latest advancements in agriculture and allied sectors to update their day today knowledge and skills for better communication with farmers. The topics includes productivity enhancement in field crops, IPM, INM, rejuvenation of old orchards, protested cultivation technology, production and use of organic inputs, care and maintenance of farm machinery and implements, group dynamics and farmers organization, information networking among farmers, management in farmers animals, livestock feed and fodder production and household food security and all these topics are very much relevant in the present scenario of agriculture. Data in the table 4.5 indicated that most of the training courses were conducted on productivity enhancement in field crops **(95)** followed by Integrated Pest management **(78)**, Protected Cultivation **(42)** and Integrated Nutrient Management **(33)** for extension personnel during the year 2012-13.

Table: 4.5 Thematic area wise training courses organized for Extension Personnel

Thematic Area	No. of Courses	General			SC/ST			Grand Total		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
Productivity enhancement in field crops	95	1553	89	1642	210	20	230	1763	109	1872
Integrated Pest Management	78	1426	17	1443	173	3	176	1599	20	1619
Integrated Nutrient management	33	537	6	543	34	3	37	571	9	580
Rejuvenation of old orchards	14	184	2	186	8	0	8	192	2	194
Protected cultivation technology	42	603	40	643	97	8	105	700	48	748
Formation and Management of SHGs	8	150	2	152	31	12	43	181	14	195
Group Dynamics and farmers	11	107	51	158	28	24	52	135	75	210

organization										
Information networking among farmers	5	129	62	191	19	5	24	148	67	215
Capacity building for ICT application	24	410	54	464	34	16	50	444	70	514
Care and maintenance of farm machinery and implements	10	154	0	154	11	0	11	165	0	165
WTO and IPR issues	7	77	1	78	4	0	4	81	1	82
Management in farm animals	14	207	4	211	29	4	33	236	8	244
Livestock feed and fodder production	16	188	1	189	6	0	6	194	1	195
Household food security	7	58	42	100	2	4	6	60	46	106
Women and Child care	21	0	414	414	0	259	259	0	673	673
Low cost and nutrient efficient diet designing	25	36	497	533	34	166	200	70	663	733
Production and use of organic inputs	16	242	21	263	52	0	52	294	21	315
Gender mainstreaming through SHGs	23	68	389	457	13	122	135	81	511	592
TOTAL	**449**	**6129**	**1692**	**7821**	**785**	**646**	**1431**	**6914**	**2338**	**9252**

7. Extension Activities

In the present scenario of information age, the appropriate information package and its dissemination is equally important. It is not enough to generate information but also to see that the required information is delivered to the end users at the earliest and with least dissemination loss. In this direction, KVKs are also doing limited extension activities for increasing production, productivity and income from the agriculture and allied sectors on a sustained basis. The numbers of extension activities organized and participants are given in table.5.1. A total of 39721 extension activities like field days, kisan melas, kisan gosthies, exhibitions, method demonstrations, group meetings, advisory services, farmer seminars, film shows, workshops, scientists visit, farmers visit, exposure visits, diagnostic visits, ex-trainee sammelans, soil test camps, soil health camps, animal health camps, celebration of important days, lectures delivered, mahila mandals, self help groups, farmer clubs, awareness campaigns etc. were conducted by KVKs benefiting 24.62 lakh farmers and farm women and 0.17 lakh extension officials.

Table 5.1: Number of Extension Activities organized and Participants during 2012-13 in Zone-1

State	No. of Activity	Farmers (Others)		Farmers (SC/ST)		Extension Officials		Total		
		M	F	M	F	M	F	M	F	Total
Punjab	13222	1953553	58632	83748	14576	5441	2001	2042742	75209	2117951
Haryana	7582	121317	16393	19717	10934	4522	1583	145556	28910	174466
Delhi	614	9414	4729	2280	642	33	15	11727	5386	17113
Himachal Pradesh	10125	56833	20873	25106	9691	1458	464	83397	31028	114425
Jammu & Kashmir	8178	38285	5468	7642	2188	1504	140	47431	7796	55227
Zone I	**39721**	**2179402**	**106095**	**138493**	**38031**	**12958**	**4203**	**2330853**	**148329**	**2479182**

Kisan Mobile Advisory

There are several models of ICTs in Indian Agriculture, which have made significant difference in the delivery of services in rural areas. Kisan Mobile Sandesh (KMS) has been one among those and working successfully for technology transfer of latest information in the state of Punjab, Haryana, Delhi and Himachal Pradesh of Zone-I in 37 KVKs. Under this service, the timely information through messages is being sent to farmers/extension personnel/input dealers. During the year 2012-13, 1161 messages were sent to 24486 beneficiaries farmers across all four states.

Table No. 5.2: Number of SMS and Beneficiaries under Kisan Mobile Advisory Service

State	No. of KVKs	No. of SMS	No. of beneficiaries
Punjab	15	367	8278
Haryana	12	532	11733
Delhi	1	20	316
Himachal Pradesh	9	242	4159
Total	**37**	**1161**	**24486**

8. Scientific Advisory Committee

Scientific Advisory Committee (SAC) plans the activities and review the progress of KVKs. This committee includes the representatives from the host institution, ICAR, District level departments, progressive farmers and farm women. The committee evolves the scientific and technical vision documents for the KVK, review periodically and takes further course of action as deemed fit for furthering scientific and technological activities of the KVK. The SAC is conducted twice a year. The details of SAC meetings held during the year 2012-13 are given in Table 6.1.

Table 6.1-Details of SAC Meeting under Zone-I

Sate	**No. of KVK**	**No. of KVK**		**Not Conducted**
		Once	**Twice**	
Punjab	20	8	7	5*
Haryana	18	1	17	0
Delhi	1	1	0	0
Himachal Pradesh	12	4	6	2
Jammu & Kashmir	16	15	0	1*
Total	67	29	30	8

* 3 KVKs in Punjab and 2 KVKs in Jammu & Kashmir were sanctioned during 2011-12

Out of 67 KVKs, 30 KVKs were conducted their SAC meeting twice and 29 were conducted once while reaming 8 KVKs not conducted SAC meeting during the reporting year 2012-13.

PRODUCTION OF QUALITY SEED AND PLANTING MATERIALS

The KVKs of Zone-1 are producing limited quantity of quality seeds and planting materials of different crops on their instructional farm which include field crops, fruits, vegetables, flowers, fodder crops and forest species for their availability to the farmers. Some of the KVKs are also producing bio products and livestock materials for the benefit of farmers. Details of these have been provided in the given tables:

Table7.1 : Seed production of different crops

Crop	Quantity of Seed (q)	Value (Rs) (Rs)	Number of farmers
Cereals	31659.72	23134220	16308
Oilseeds	140.93	692371	3770
Pulses	260.58	1340467	1157
Vegetables	723.82	1203346	31051
Flowers	0.21	840	0
Fodders	52.62	926764	34254
Other (sugarcane, cotton, mushroom)	1915.55	231208	615
Total	**34753.43**	**27529215**	**87155**

KVKs of Punjab produced maximum seed of wheat (19115.41 quintals) and paddy (8040.20 quintals) followed by Haryana (1902.63 quintals) and (1412.40 quintals) respectively. Oilseeds, pulses, sugarcane and cotton production was also maximum in Punjab. However, the seed and seedlings of vegetables, flowers and fodder crops were produced mainly by Punjab, HP and J&K.

Table 7.2: Production of sapling/seedlings of fruits/vegetables/forest/other species

Name of the Crop	Number	Value (Rs.)	Number of Farmers
Vegetables	924679	606768	10283
Fruits	14838	427137	1068
Fodder	10000	2500	12
Forest (Poplar, Morus, Seabuckthorn etc.)	61619	75987	1311
Total	**1011136**	**1112392**	**12674**

The maximum no. of planting materials of vegetables was maximum in Himachal Pradesh (588831), followed by Haryana (231600), followed by Jammu & Kashmir (86708), followed by Punjab (17540).

Table 7.3: Bio products produced by the KVKs of Zone1

Bio Products	Name of the Bio-products	Quantity KG/No	Value (Rs)	Number of Farmers
Bio Fertilizers	Vermicompost	8140	40530	60
Bio Agents	Tricho card (*Trichogramma chilonis)* *Pyrilla parasitoids (Ooincirtus papilionis)* *Pyrilla parasitoids (Epiricania melanoauca)*	206429	0	13227
Vermiculture	Eisenia foetida	1423	245811	456
Pheromone trap	Palam trap (against fruit fly)	2070	207000	-

Bio fertilizers (Vermicompost) and bio agents were mainly produced in the Haryana state. Worm composting which mainly consisted of species *Eisenia foetida* was followed in Himachal Pradesh. At Mandi in HP pheromone trap against fruit fly was produced.

Table 7.4: Production of livestock materials

Particulars of Livestock	Name of the breed	Number	Value (Rs.)	Number of Farmers
Cows	Cross Brred Calf, Jersey, Cross Bred (Jersey)	13	546104	3
Goat	Barbari			
Poultry	IBL-80, CARI Nirbhik, Poultry Eggs, Gramapriya	3593	181829	846
Piggery	Large White York Shire (Piglets)	114	207600	25
Fisheries	Mixed, Catla, Rohu, Mrigal and Common carp	81059	65239	18

Among the livestock materials, 7 cross bred jersey cows were produced in Sirmaour while 2 jersey cows were produced in Kangra. Vanraja bird's production was mainly undertaken in Pulwama district of Jammu & Kashmir. 114 White York Shire Piglets were produced at Ambala. Under fisheries Karnal had the maximum production of Catla, Rohu, Mrigal and Common carp.

8. SOIL, WATER AND PLANT ANALYSIS

43 KVKs of the Zone have established soil, water and plant testing laboratory and carrying out the analysis for the benefit of farming community. Further, KVKs are also utilizing this facility for carrying out the soil test based nutrient recommendations for conducting FLDs and OFTs as well as rendering advisory services on nutrient based recommendations to the farmers. A total of 11320 soil samples, 3509 water samples and 2043 plant samples were tested in the year 2012-13 in Zone-1 **(Table:8.1)**.

Table 8.1: State-wise Soil, Water and Plant Samples Tested in Zone-1

State	Soil Samples (No.)	Water Samples (No.)	Plant Samples (No.)	Total
Punjab	5806	1785	1026	**8617**
Haryana	2588	1702	866	**5156**
Himachal Pradesh	1657	20	110	**1787**
Jammu & Kashmir	1269	2	41	**1312**
Zone-1 Total(No.)	**11320**	**3509**	**2043**	**16872**

9. DETAILS OF HRD ACTIVITIES

Human Resources are the greatest asset of every Nation. Therefore, Human resource Development (HRD) is a relatively modern management tool to enhance the capability of the human capital. Hence, it is important to organize HRD programmes to keep employees abreast with the latest technological development, acquiring specific technical knowledge and skill and update in their subject matter so as to make them efficient to carry out their assignments in the organization as well as for their career development. In this direction, this Directorate has taken up a number of human resource development programmes for the benefit of the KVKs' staff. Details are presented in Table 9.1

Table 9.1: HRD activities organized by ZPD Zone – I in identified areas for KVK staff

Name of the SAU/NGOs/ICAR	Title of the training programmes and period	No of programmes	No. of Participants	No. of KVKs involved
Zonal Project Directorate, Zone-I, Ludhiana	Zonal Workshop during 20-22 May, 2012,	1	135	62
Zonal Project Directorate, Zone-I, Ludhiana	Action Planning Workshop of NICRA Project held on 23 June, 2012.	1	24	12
State agricultural Management Extension & Training Institute, Shimla and Sher-e-Kashmir University of Agricultural Sciences & Technology, Srinagar	Application of ICT in Modified Agricultural Extension Reforms during 09-11 July, 2012 and 09-11 October, 2012	2	16	16
Zonal Project Directorate, Zone-I, Ludhiana	State Level Review workshop held on 30 July, 2012 (Haryana, Delhi), 28 July, 2012 (Punjab), 02-08-2012 (Himachal)	3	340	48
National Academy of Agricultural Research Management, Hyderabad	Institutional Innovations in Agri-extension for Inclusive Growth held on 1-7 August, 2012.	1	3	2 + 1(ZPD)

Dr. Y. S. Parmar University of Horticulture & Forestry, Nauni, Solan	Vegetable Production under changing climate scenario from 1st to 21st September, 2012.	1	8	8
National Institute of Agricultural Extension Management, Hyderabad	Knowledge Management in Agriculture during 11-14 September, 2012.	1	6	6
Dr. Y. S. Parmar University of Horticulture & Forestry, Nauni, Solan	Emerging Issues in Plant Health Management during 28-29 September, 2012.	1	12	12
Indian Agricultural Research Institute, New Delhi	Experiential Learning and Andragogical Methods for Developing Entrepreneurial Human Resources during 11 September – 01 October, 2012.	1	2	2
Zonal Project Directorate, Zone-I, Ludhiana	Hydrogel Technology and its application held on 3 October, 2012	1	37	20
Punjab Agricultural University, Ludhiana	5th Indian Horticulture Congress- 2012 held on during 06-09 November, 2012.	1	31	29
National Academy of Agricultural Research Management, Hyderabad	Communicating Science through Mainstream Media during December 04-11, 2012.	1	2	2
National Institute of Agricultural Extension Management, Hyderabad	Supply Chain Management in Agriculture from 17-20 December, 2012.	1	2	2
Dr. Y. S. Parmar University of Horticulture & Forestry, Nauni, Solan	Emerging Challenges and Paradigm for Sustainable Agri-Rural Development during 18-20 December, 2012.	1	12	12

Sher-e-Kashmir University of Agricultural Sciences and Technology, Jammu	Emerging trends in Plant Pathology during 19-20 December, 2012.	1	8	8
Directorate of Research on Women in Agriculture, Bhubaneswar	Gender Mainstreaming in Eco-friendly Pest Management with special reference to storage Pest during 20-23 February, 2012.	1	2	2
Zonal Project Directorate, Zone-I, Ludhiana	Workshop for Finalization of XII Plan EFC on 23 February, 2013	1	106	48
National Institute of Agricultural Extension Management, Hyderabad	Writing for Print Media 25-28 February, 2013.	1	5	5
Krishi Vigyan Kendra, Kaithal	Conservation Agriculture on 04 March, 2013.	1	45	30
Administrative Staff College of India, Hyderabad	General Management Programme for Women Scientists 04-15 March, 2013	1	3	3
National Research Centre for Orchids, Pakyong, Sikkim	Orchid Conservation & Sustainable Development for Community Livelihood during 08-09 March, 2013.	1	6	6
	Total	**24**	**805**	

10. Success Stories

Name of Krishi Vigyan Kendra: Ambala

Title: Dairy Farming

Introduction:

Haryana holds a special place in the field of milk production and produces 60.6 lakh tonnes milk, out of which 80 percent is contributed by buffaloes. Demand for milk is increasing day by day owing to increase in population and disposable income of the individuals. Dairy farming is being adopted as a subsidiary occupation and not as a primary occupation. Since the dairy farming has proved to reduce the income inequality among the farmers and as an instrument for economic and social change for rural masses, there is a need to look the dairy farming activity for viable proposition. Commercial aspects of livestock production are gaining importance due to changes in land utilization pattern, agriculture and socio-economic conditions. Ambala district is on the border of Punjab state and abundant availability of green fodder in the district motivated the farmers to keep high yielding crossbred cattle.

Interventions by KVK:

KVK organized training programmes in dairy farming and motivated farmers to start the dairy farming for self-employment and improve the existing management practices for better and sustainable production in line with the government's policy of diversification in agriculture. Farmers were trained from time to time in all aspects of dairying like ideal housing, breeding and management, hay and silage making, quality and clean milk production including prophylaxis and correct practices were demonstrated to them. The common field practices like hay and silage making, computation of ration, urea treatment of wheat straw, naval cord cutting, anti-tick bath application and teat dip method were demonstrated to the dairy farmers. KVK, conducted 7 vocational training for rural youth (286 participants) and 40 short duration courses for practicing farmers (716 participants) during the years from 2008 to 2010. KVK also arranged exposure visits of the trainees to the units of progressive dairy farmers/ NDRI Karnal to motivate them.

Output:

After getting the required motivation and training, the farmers adopted dairy farming as an enterprise. The department of Animal Husbandry and Dairying too played crucial role by providing subsidies for purchasing animals, milking equipments and construction for shed etc. to needy and un-employed rural youth. After KVK intervention, farmers were convinced to replace indigenous cows and buffaloes with improved breeds, particularly Holstein Friesian and Murrah, through Artificial Insemination (AI). Around 70 percent farmers in the district used AI on regular basis. Hence, the productivity of indigenous animals and also number of good quality animals increased. Various technological interventions like mineral supplementation, balanced feeding, silage making and urea treatment of wheat straw are now being practiced by the majority dairy farmers. About 53.12 percent farmers have started preparing the concentrate with available local resources after getting the appropriate knowledge through trainings, group discussion followed by method demonstration.

With the efforts of State & Central Government in providing subsidized facilities as well as sound technical back-up provided by the KVK experts to dairy farmers, presently about thirty Hi-tech dairy units with minimum of 20 or more milch animals have been established in the district. These dairy units generate more employment as normally one person gains full employment by keeping 2-3 milch animals.

	
Glimpse of training session of rural youths	**Demonstration on enrichment of wheat straw**

Name of Krishi Vigyan Kendra: Jhajjar

Title: Food Processing - An Emerging Social Enterprise

Introduction:

The district is undergoing tremendous change and unprecedented transformation, especially shift from farm to non-farm economy in Nazafgarh, Bahadurgarh and Gurgaon adjoining areas. Declining land- holding, rainfed conditions in the district and landlessness is cause of concern in the district. This calls for development of farm ***based social micro-enterprises*** especially value addition of pearl millet and locally produced fruits and vegetables. This can play an important role by providing health package to the people coupled with their sustainable economic development too. Moreover nutritionally rich high yielding varieties of pearl millet are coming up on a larger area under district. This nutri-millet will provide health package to people by preventing them from micro-nutrient deficiency diseases. Value added products of horticultural crops and pearl millet can also provide nutritional security and economic empowerment of rural women.

KVK Interventions:

KVK has been conducting trainings, demonstrations, and other extension activities on value addition of pearl millet and horticultural crops. Such activities have also been carried out on production and protection technologies. Rigorous campaigning through trainings, demonstrations, extension literature, exposure visits has been done on nutritional importance of pearl millet as a rich source of protein, calcium, iron, potassium, fiber and other micro-nutrients essential for good health. On farm trial was also conducted on pearl millet/ bajra biscuits for assessment and refinement for further modifications. Hundreds of rural women and men have been trained in food processing and value addition of pearl millet by making biscuits, matar, mathie, namkeen, laddoo, samosa, and vermicelli based products etc. Value added products of fruits and vegetables have also been popularized and vocational training programmes have been conducted on pickles, sauce, chutney, squashes, syrups and murabbas etc. for providing food and nutritional security. Through the approach of engaging ‘all departments and agencies of the government and its semi-government outfits’, the KVK went on to organize ‘programmes aimed at

providing ‘coordinating mechanism’ for all ‘development department and agencies and other players such as NGOs and private sector’ to work in unison for economic development of underprivileged segments’.

Output:

During the last three years, 138 farm women and farmers in food processing and 118 farm women and farmers have been trained in preservation of fruits and vegetables. Approximately 65 percent of the participants are making use of these technologies at household level for their own consumption. A great awareness has been created in the district with respect to pearl millet value added products and value added products of aonla, carrot, pumpkin and tomato are in largely used at household level. Several women have been linked with preparation of mid day meals in schools.

The pearlmillet products were exhibited and sold by entrepreneur at various rural Haats, Melas and other platforms and exhibited at state and National level meets. Products of pearl millet got high acceptability amongst masses at all platforms and appreciated at various levels. Refinement in recipe of pearl millet biscuit was done as per the opinion of vast majority of people during campaigning, melas, meets and other platforms, which was found to be highly acceptable. After being got recognized and accepted organoleptically, one of the entrepreneur Sh. Vedpal from village Kanwah has established his own household unit of Multigrain pearl millet production unit in his village with the investment of Rs. 50,000/-. Many more entrepreneurs like him are now coming up in the region

	
Food processing training view at KVK Jhajjar	**Processing of fruits and vegetables at centre.**

Name of Krishi Vigyan Kendra: Shimla

Title: Management of collar rot in apple

Introduction:

Collar rot caused by *Phytophthora cactorum* is one of serious problems in apple orchards of district Shimla. The incidence of the disease is upto 50 percent in most of the orchards affected with the disease, mostly where the orchards are planted in heavy soils with low pH. The early plantations by the farmers have been done just by doing a hole without proper pit formation. Due to this, the collar portion of the plants in most of the cases have been covered under the soil, and damaged during various cultural practices like basin preparation, fertilizer application, weeding etc. Secondly, farmers used to intercrop potato and pea mainly in the initial years of plantations and during intercultural operations, plants get injured and infected with the disease.

KVK intervention:

The KVK intervened through organization of on and off campus training camps and conducted on farm trials and demonstration on farmers' fields. The farmers were educated about the proper site selection, soil testing, symptomatology, cause of disease and integrated disease management practices to be adopted for the management of the disease. The technology was given from the package of practices of fruit crops of Dr YSP UHF Nauni, Solan with some modifications. The farmers are being advised to improve cultural practices i.e. improvement in water drainage system in the tree basin, opening of collar region of the affected plant and removal of affected portion with the application of Chaubatia paste on open wounds (preferably in months of November & December). The fungicide treatment is given as and when symptoms are noticed, besides, three drenching of fungicides in rainy season i.e. two drenching of Ridomil MZ @ 0.4% and one Bordeaux mixture @ 1.0 % at 15 days intervals. In addition to this, seedling rootstocks (4-5 per plant) are grafted the month of March and April through approach grafting technique to the infected plants from the affected side to provide additional support and nutrition.

Output:

The adoption of integrated disease management technology, the production per plant regained within two to three years. After adoption of proper management practice, the plant regained its health within two to three years and bear fruits same as in other healthy plants with in the orchards. The impact of the trainings and demonstrations are such, that technology which was demonstrated in 20- 30 orchards are now being adopted by most of the farmers having such problems in their orchards. The apple orchardists of apple growing area are in constant contact with the scientists of the KVK regarding different problems faced by them in their orchards and suggestions thereof.

	
Plant showing a complete lesion healing caused due to collar rot after treatment with fungicides	**Seedling rootstocks grafted to collar rot infected plant through approach grafting technique**

Name of Krishi Vigyan Kendra: Kullu

Title: Beekeeping as an Enterprise

Introduction:

Himachal Pradesh has diversity of bee flora and varied agro-climatic conditions and so this hilly state has enormous potential for profitable beekeeping. Beekeeping has predominant role to play in pollination, honey and wax production. Pollination benefits can be evaluated at higher level as compared to by products produced by the bees. Honey bees during foraging for pollen and nectar from flower of different plant species; enhance agricultural productivity to the tune of 30-80% annually through cross-pollination. The modern beekeeping in H.P. was introduced only in the year 1934 in Kullu valley and in 1936 in Kangra valley. Only *Apis cerana indica* the Indian honey bee was reared in the state until the year 1961 when *A. mellifera* was introduced in India at Bee Research Station, Nagrota Bagwan (H.P.).

KVK Intervention:

KVK Kullu organized 11 training programme (5-7 days) during the year 2005-2012. After successfully acquiring the training from KVK, 6 trainees started commercial beekeeping with *Apis mellifera* and are getting handsome amount of money. Others have taken up *Apis cerana* beekeeping in a scientific way in movable hives and use them for pollination in their orchards besides renting them to other orchardists. To overcome the winter, bee colonies are migrated to Haryana, UP, and Rajasthan as per the availability of flora. In April the colonies are brought back to Kullu valley and provided to the orchardists, particularly apple and stone fruits (almond, peach, plum, apricot, cherry etc.) for efficient pollination purpose on rental basis. Colonies are rented out to orchardists @ Rs. 600 to 700 per colony (depending upon colony strength) per flowering season and getting additional income. During last week of May the colonies are migrated to Koksar (Lahaul). The honey produced in Lahaul valley especially, the white honey obtained from flora of *Plectranthus* spp. and other medicinal plants which have medicinal values gets higher price in the market.

Output:

By imparting beekeeping training, KVK has made a positive contribution to the development of beekeeping enterprise and the generation of employment opportunities to the unemployed youth and rural people. Six youths, who were imparted training during 2005-2012, have taken up commercial beekeeping with *Apis mellifera* and are earning 2.5-5.0 lakhs every year. Others have taken up *Apis cerana*

beekeeping in a scientific way in movable hives and use them for pollination in their orchards besides renting them to other orchardists. Besides some participants after having got encouragement regarding the plantation of bee flora in rangelands and common waste lands under social forestry have taken up plantation in such lands. Technical guidance and provision of financial support by preparing project profiles to avail loans from various banks were provided for the inquisitive trainees to exhort them to shift to modern beekeeping from the traditional one.

	
A view of training programme on apiculture	**Hand on training on bee handling**

Name of Krishi Vigyan Kendra: Pulwama

Title: Popularization of Vanraja breed of poultry as backyard poultry farming

Introduction:

Backyard poultry farming plays vital role in augmenting the rural family income and also in food security especially for marginalized families. Vanraja breed of poultry has long been tested and tried as backyard poultry in most parts of the Kashmir Valley including district Pulwama. It has potential to meet the requirements for a typical backyard farming utilizing the backyard wastes like kitchen wastes along with other non conventional feed stuff.

KVK Intervention:

For encouraging Vanraja breed, KVK has taken the lead initiative and distributed 900 Vanraja birds in the year 2011-12 among the farmers for further production so that small units of backyard poultry could be established at farmer's level. These units will act as demonstration units for other farmers of the district which will help in popularizing the Vanraja as back yard poultry upto great extent.

Output:

Initially less people were engaged with backyard poultry farming of Vanraja and were sporadically rearing either local less yielding poultry birds in backyard or other commercial strains on intensive or semi-intensive patterns. Due to efforts of KVK, the Vanraja breed of poultry was popularized enough to the level that its presence in backyard was felt in the selected pockets of the district. The farmers who were given vanraja for rearing are satisfied with the results as they observed an average weight of about 2kg/ bird within six months against 1kg in local bird. The farmers of district Pulwama especially of villages Renzipora, Lajoura and Koil, started to rear the Vanraja in their backyards and its impact on their socio economic condition directly or indirectly is reflecting slowly.

Vanjara birds for backyard poultry

Name of Krishi Vigyan Kendra: Fatehgarh Sahib

Title: Happy seeder for managing rice residue

Introduction:

Rice-wheat is a major crop rotation in Indo-gangatic region. About 27 lakh hectare area is under this rotation in the state of Punjab alone. In north-western India combine harvesting of rice and wheat is a common practice leaving large amount of crop residues in the fields. Rice straw is considered poor feed for animals due to its high silica content and has also no other economic uses and remains unutilized. To vacate fields for the timely sowing of wheat, majority of the rice straw is burnt in situ by the farmers because residues interfere with tillage and seeding operations for the next crop. Burning of rice stubble is rapid and cheap option for farmer which causes a serious atmospheric pollution besides, loss of plant nutrients and organic carbon of the soil and deteriorates the soil health. Happy seeder has been found suitable to solve this problem to a greater extent.

KVK intervention :

The farmers from different blocks of district Fatehgarh Sahib were selected through personal meetings and persuaded to adopt wheat sowing with happy seeder as this technology has been found useful compared to use of seed drill. KVK Fatehgarh Sahib conducted various activities to popularize Happy seeder viz. training programmes, front line demonstrations, field days, method demonstrations etc. The field trials of machine on 40 acres were conducted in varied soil types ranging from loamy-sand to clayey-loam. Apart from this advisory services on this technology were also provided to the farmers.

Output:

Wheat sowing with Happy seeder technology was evaluated at several locations in the district. About 42 – 55.00q/ha mean grain yield of wheat was recorded during experiments with Happy seeder with an average increase in yield of about 5% over conventional seed drill method. The activities taken up by the KVK in spreading know-how and imparting technical guidance has helped in increasing the area under happy seeder in the district. Around 250 acres of land has been successfully sown with happy seeder in the district. The Happy seeder machines are available with co-operative societies along with progressive farmers. Presently there are 26 happy seeder machines running in the districts through cooperatives societies and the numbers are likely to increase further in future.

Sowing wheat with Happy seeder

Germination of seed sown with happy seeder

Different stages of wheat sowing with Happy Seeder

Name of Krishi Vigyan Kendra: Gurdaspur

Title: Economic significance of laser land leveling in Gurdaspur district of Punjab

Introduction:

Inefficient use of irrigation water, uneven crop stands, increased weed infestation, uneven maturity of crops, etc. are the problems being caused by the unlevelled fields which tend to directly reduce crop yields, quality and ultimately the potential farm income. Recognising this issue, farmers of Punjab have been trying hard to get their fields levelled in one way or the other. However, the traditional methods of land levelling are not only cumbersome and time consuming but also expensive as well. The effective land levelling is meant to optimise the input use efficiency along with improving the crop establishment and saving the labour.

The farmers of Punjab heaved a sigh of relief with the introduction and recommendation of laser land levelling technology by Punjab Agricultural University (PAU) as an essential farm operation towards the precision agriculture. Since, its inception in Punjab (2005), various experiments and field trials have shown favourable results in saving the irrigation water by 22 to 33 per cent and improving grain yield by 5.5 to 11 per cent. In order to overcome the higher initial cost, its availability on the custom hiring basis has been advocated so that this technology could reach to every farmer. The State Department of Agriculture and the State Farmers Commission have been providing subsidy to the tune of 25 to 33 per cent for the establishment of Agricultural Machinery Service Centres (AMSC) to the cooperative societies and entrepreneurs. Many organisations have put in great endeavours for the large scale adoption of this technology in Punjab. An exponential growth has taken place in its numbers; increasing from just eight during 2005 to around six thousand during 2011 and a total of 1509 AMSCs have been sanctioned.

KVK Intervention:

The Krishi Vigyan Kendra (KVK) Gurdaspur was pioneer to introduce laser land leveller in the district through a field day in collaboration with the Department of Farm Machinery and Power Engineering, PAU, Ludhiana in 2007-08. Thereafter, front line/method demonstrations, on and off campus trainings were conducted to popularize the technology among the farmers. Although, a late entry of this technology has been reported in the border district of Gurdaspur, however, it is picking up well of the late.

Output:

KVK Gurdaspur conducted study on promotion, economic significance and impact of laser land leveling technology in the district. During 2007-08 when this technology was initially launched in this district, only one cooperative society was found to be operational and doing a business of less than 100 hrs. Next year, few more societies came into existence and took the business to around 1100 hrs. However, thereafter it started picking up well with the entry of individual entrepreneurs and every succeeding year witnessed 1.5 to 4.0 times more growth than the preceding year. During the year 2011-12 the total operational hours to the tune 10,000 covering an area of around 3000 ha were reported under this technology. During the same year a maximum service of 1740 hrs was found to be done by a single entrepreneur. The custom hiring charges being realized by the service providers ranged between Rs 500/hrs to 800/hrs depending upon the land to be leveled. The average revenue earned by them ranged from Rs 1.68 lakh to 3.02 lakh/service provider/year.

Training cum demonstration on use of Laser land leveler

Name of Krishi Vigyan Kendra: Delhi

Title: Off season Cucumber cultivation in Alipur block of NCT Delhi

Introduction:

In most of rural Delhi the underground water is saline. Alipur block of NCT Delhi is along Yamuna river bed and quality of underground water is good. The main crops of the area are wheat, paddy, mustard, bajra, cauliflower, cabbage, carrot, spinach, cucurbits, onion, brinjal and tomato. In addition culinary herbs such as fenugreek and coriander are also cultivated. Almost all kinds of seasonal vegetables can be grown in this region which makes it in advantageous position. Most of the farmers are growing these vegetables during their main season, which is less profitable, because during that period markets are flooded with vegetables, thereby reducing the average price drastically.

KVK intervention:

KVK established a farmers club (Bhoomi Putra Krishak Club) in collaboration with NABARD for better farmer linkage in Alipur block. After observing the potential of vegetable crops in the area, KVK focused on the intervention of off season cultivation of cucumber through off and on campus trainings in collaboration with IARI on improved cultural practices with main emphasis on scheduling of planting dates. Complete technology on off season cucumber cultivation was the focus of the intervention. To improve the skill of farmers the visit of farmer's club members to Indian Institute of Horticulture Research (IIHR), Bangalore was also arranged through support of NABARD by KVK.

Output:

Equipped with trainings, visit of IIHR, Bangalore and hand holding of KVK scientists 7 farmers of farmer's club in Alipur block started growing early cucumber in 15 ha of area in year 2009. The concept of off season cucumber production resulted in good profit to these growers. It has been fairly accepted in the whole area and more growers are joining hands with earlier few progressive farmers to take up this new venture. During 2012-13 about 250 farmers of Alipur block are growing off season cucumber in about 185 ha area. They have formed vegetable growers groups for bargaining with wholesales like Reliance, Big Bazar, Spencer, Bharti Walmart etc. for marketing their produce.

11. Achievements under NICRA

National Initiative on Climate Resilient Agriculture (NICRA) is a network project of the Indian Council of Agricultural Research (ICAR) launched in February, 2011. The project aims to enhance resilience of Indian agriculture to climate change and climate variability through strategic research and technology demonstration. The project consists of four components viz. Strategic Research, Technology Demonstration, Capacity Building and Sponsored/Competitive Grants. Under the Technology Demonstration component of NICRA, the available options from the National Agricultural Research System which help farmers to cope with the climate variability are being tested in 100 village panchayats in vulnerable districts. These include drought/flood tolerant crop varieties, intercropping systems, moisture conservation practices that help in overcoming mid season droughts, water harvesting and recycling, managing frost in food and horticulture crops, etc. The technologies are divided in four modules, i.e. Natural Resource Management, Crop Production, Livestock & Fisheries and Institutional Interventions. There are 12 districts selected under zone-I which fall in 4 states namely Punjab, Himachal Pradesh, Haryana and Jammu & Kashmir.

Module 11.1: Natural resource management

Interventions	**No. of KVKs Involved**	**Technology demonstrated**	**No. of farmers**	**Area (ha)**	**Measurable indicators of output***	**Economics of demonstration (Rs./ha)**			
						Gross Cost	**Gross Return**	**Net Return**	**BCR**
In-situ moisture conservation RCT	6	Sowing of wheat with happy seeder	31	28	Yield	21929	65865	43936	3.00
		Sowing of summer moong with Zero tillage	25	6.4	Yield	17500	58100	40600	3.32
		Sowing of wheat with zero tillage	5	2	Yield	23050	74925	51875	3.25
		Leaf colour chart	80	32	Yield	31000	80800	49800	2.61
		Ploughing across the slope and contour	119	47	To avoid soil erosion losses				
Water harvesting and recycling for supplemental irrigation	3	Community water storage tanks and rain water harvesting structures work	10	5					
		Rain water harvesting	12	10 (Area irrigated)	Water holding capacity				
Artificial ground water recharge		Ploughing across the slope and contours. Pitting across the slope for planting multipurpose tress like Amla, Harad , Buhinia etc	74	27	Improved infiltration / percolation				

Interventions	No. of KVKs Involved	Technology demonstrated	No. of farmers	Area (ha)	Measurable indicators of output*	Economics of demonstration (Rs./ha)			
						Gross Cost	Gross Return	Net Return	BCR
Water saving irrigation methods	4	Drip irrigation in cotton	2	0.8	Yield	31350	105840	74490	3.38
		Sprinkler irrigation in wheat	4	1.6	Yield	23150	74250	51100	3.21
		Use of Tensiometers in paddy	35	15	No. of irrigations saved (4-6 irrigations saved by using tensiometers)				
		Division of fields in to smaller plots	100	40	Water saving (Around 15 % water saving)				
Laser levelling	2	Laser levelling	90	83.6	Water Saving (Uniform application of irrigation water and 2-5% water saving)				
Management of Farm yard Manure(FYM)	1	Digging up of manure pits	15	0.001					
Green Manuring with Sunhemp/Dhaincha	2	Green Manuring	13	8	Less fertilizer requirement in next crop and soil health improvement				
Alternate energy source	1	Establishment of Biogas Plant	6	-	-				
Planting forest trees	2	Planting of agro-forestry and forest trees	95	6					
Vermi-composting	3	Vermi-composting	22	22 units					
Introduction of summer moong in paddy –wheat rotation.	1	Cultivation of summer moong var. SML-668	34	26.4	Yield	20337	50075	29738	2.46

Interventions	No. of KVKs Involved	Technology demonstrated	No. of farmers	Area (ha)	Measurable indicators of output*	Economics of demonstration (Rs./ha)			
						Gross Cost	Gross Return	Net Return	BCR
Judicious fertilizer use as means of preserving soil health	3	Urea application based on Use of leaf color charts in paddy	25	25	Saving of urea (Saving of 25-62.5 kg urea/ha)				
		Fertilizer application in apple on soil test basis	50	75	Yield	75000	256000	181000	3.41
		Fertilizer application in rajmash on soil test basis	50	75	Yield (Rajmash-12.3 q/ha)	55000	141450	86450	2.57
Fodder grass on farm bunds	2	Moisture conservation through planting on bunds	35	3.2	Strengthened farm bunds, enhanced availability of fodder during lean periods and reduced soil erosion				
Establishment of community nurseries	1	Community poplar nursery	3	0.05					

Module 11. 2: Crop Production

Interventions	No. of KVKs Involved	No. of farmers	Area (ha)	Measurable indicators of yield*q/ha		% increase	Economics of demonstration (Rs./ha)			
				Demo	Local		Gross Cost	Gross Return	Net Return	BCR
Introducing drought / temperature tolerant varieties										
Drought tolerant varieties	22	86	7	23.4	22.2	5.41	20500	38880	18380	1.90
		12	1	30	22.2	35.14	20500	36000	15500	1.76
		19	2	27.5	22.2	23.87	20500	33000	12500	1.61
		34	6	54.1	33	63.94	15900	39120	23220	2.46
		65	23.85	17.25	12.5	38.00	10700	37950	27250	3.55
		21	4	8.25	5.7	44.74	15000	25575	10575	1.71
		6	0.5	26	18.6	39.78	18000	29900	11900	1.66
		6	0.5	25	18.6	34.41	18000	28750	10750	1.60
		72	4.04	12.6	9	40.00	12000	26460	14460	2.21
		19	1.82	10	9	11.11	12000	21000	9000	1.75
		121	11.2	9.6	6.5	47.69	19600	76800	57200	3.92
		80	2.5	6.2	4.6	34.78	1500	31000	29500	20.67
		15	2	9	4.15	116.87	11000	36000	25000	3.27
		31	3.25	39	21.5	81.40	11570	40950	29380	3.54
		29	2.5	34	22	54.55	16500	27200	10700	1.65
		33	2.5	40	22	81.82	17500	32000	14500	1.83
		10	6	yield	yield		2800	41000	38200	14.64
		21	1	10.5	6.8	54.41	14800	52500	37700	3.55
Temperature tolerant varieties	3	80	6	21.6	18.2	18.68	10500	15120	4620	1.44
		33	10				1,00,000			
		15	6	Yield	Yield		31300	60210	28910	1.92
		40	8	31.8	21.5	47.91	18500	38160	19660	2.06
Short duration var. duration varieties	1	25	10	7.15	6.8	5.15	13850	25025	11175	1.81
Low water requiring varieties	2									
		82	37	42	36	16.67	22000	51200	29200	2.33
		10	4	20	15	33.33	32000	92000	60000	2.88
Water saving paddy cultivation methods (SRI, aerobic, direct seeding)	3									
		105	50	72.1	70.9	1.69	28196.6	106708	78511.4	3.78
		1	0.1	25.47	29.85	-14.67	25530	89136	63606	3.49
		12	28	50.9	50.1	1.60	27200	70242	43042	2.58
Agro-forestry	1	20	0.8							
Location specific inter cropping systems with high sustainable yield index	4									
		20	1	33.2	23.8	39.50	19400	47200	27800	2.43
		15	1	33.6	23.2	44.83	20100	54000	33900	2.69
		10	3	32	17.5	82.86	11700	44800	33100	3.83
				11	10.75	2.33	600	33000	32400	55.00
		10	6	4.5	3.5	28.57	10060	16450	6390	1.64
				7.1	5.5	29.09	500	25550	25050	51.10

Interventions	No. of KVKs Involved	No. of farmers	Area (ha)	Measurable indicators of yield*q/ha		% increase	Economics of demonstration (Rs./ha)			
				Demo	Local		Gross Cost	Gross Return	Net Return	BCR
Introduction of New Varieties	3	12	0.4	3.75	3	25.00	15000	30940	15940	2.06
		10	4	50.5	48.5	4.12	24350	68175	43825	2.8
		28	2.5	304	268	13.43	30390	608000	577610	20.01
Disease Management	8	23	1.5	15.9	13.8	15.22	22000	54060	32060	2.46
		25	10	52.6	43.8	20.09	23200	71010	47810	3.06
		26	12	4.39	3.89	12.85	9250	32500	23250	3.51
		11	10	935	880	6.25	63500	252450	188950	3.98
		5	2	5560	4375	27.09	34560	127880	93320	3.70
		5	3	5130	5025	2.09	24150	69225	45075	2.87
		15	6	1045	915	14.21	65800	282150	216350	4.29
		26	1.4	148	86	72.09	120000	222000	102000	1.85
Crop diversification	18	15	2	16.8	16.6	1.20	22000	57120	35120	2.60
		24	1	8.2	5.8	41.38	13600	28700	15100	2.11
		50	4	250	164.5	51.98	50000	150000	100000	3.00
		19	1.46	125	86	45.35	55119	187500	132381	3.40
		88	3.77	112	85	31.76	48000	168000	120000	3.50
		20	3.5	12.5	8.3	50.60	12500	37500	25000	3.00
		44	8.5	17.5	11.8	48.31	1314705	4111764	2797059	3.13
		47	3.5	12.8	7.3	75.34	12500	44800	32300	3.58
		18	1	4.8	3.4	41.18	12300	28800	16500	2.34
		37	2	8.4	5.7	47.37	13600	29400	15800	2.16
		8	1	290	215	34.88	80000	290000	210000	3.63
		30	6	6.5	4	62.50	1149	35500	34351	30.90
		20	5	6	4.5	33.33	11220	33260	22040	2.96
		9	2.5	5.25	3.35	56.72	9500	31500	22000	3.32
		10	0.6	90	55	63.64	17200	90380	73180	5.25
		60	10.75	9.5	6.75	40.74	8590	30400	21810	3.54
		23	1.5	15.9	13.8	15.22	22000	54060	32060	2.46
Community nursery of apple	4	25	0.5							
		200	0.8							
		10	2							
		28	2.5							
Vegetable cultivation	8	150	3	350	235	48.94	75000	255000	180000	3.40
		100	3	122	85	43.53	55000	129250	74250	2.35
		100	1	220	150	46.67	57000	129000	72000	2.26
		100	1	330	225	46.67	50000	115000	65000	2.30
		100	0.8	170	120	41.67	48000	113000	65000	2.35
		100	16	110	77	42.86	62000	137000	75000	2.21
		12	0.6	180	130	38.46	50000	180000	130000	3.60
		22	0.12	315	230	36.96	80000	252000	172000	3.15

Interventions	No. of KVKs Involved	No. of farmers	Area (ha)	Measurable indicators of yield*q/ha		% increase	Economics of demonstration (Rs./ha)			
				Demo	Local		Gross Cost	Gross Return	Net Return	BCR
Integrated nutrient management	3	18	7.2	56.5	53.5	5.61	24900	76275	51375	3.06
		3	1.2	5525	5250	5.24	24500	74587	50087	3.04
Mushroom cultivation	1	20	100 bags	0.0215	0.018	19.44	8500	21550	13050	2.54

Module 11.3: Livestock & Fisheries

Interventions	NO. of KVKs Involved	Technology demonstrated	No. of farmers	Unit / No. / Area (ha)	Measurable indicators of output*		% increase	Economics of demonstration (Rs./ha)			
					Demo	Local		Gross Cost	Gross Return	Net Return	BCR
Use of community lands for fodder production during droughts / floods	2	Plantation of fodder trees for fodder availibilty during lean period	40	22.8	405	340	19.1	12700	40500	27800	3.19
Improved fodder/feed storage methods	3	Improved fodder/feed storage methods	143	141							
De-Worming	5	De-Worming	257	2152							
Any other (Pl. specify)											
Mineral mixture	5	Mineral mixture	535	621 dairy animals							
	Faridkot	Mineral mixture	50	100 dairy animals	Milk yield 5130 lt/lactation (305 day)	Milk yield 4600 lt/lactation	11.52	1200/animal/lactation	12600	11400	
Animal health check-up	2	Animal health check-up	270	353	Animal health						

Interventions	NO. of KVKs Involved	Technology demonstrated	No. of farmers	Unit / No. / Area (ha)	Measurable indicators of output*		% increase	Economics of demonstration (Rs./ha)			
					Demo	Local		Gross Cost	Gross Return	Net Return	BCR
Clean milk production	1	Clean milk production	22	22							
Backyard poultry	3	Backyard poultry	73	1050	125eggs/ year	90 eggs/ year	39				
Breed Up gradation	1	Breed Up gradation	5	15 animals							
Haylage making	1	Haylage making	24	3							

Module 11.4: Institutional Interventions

Interventions	No. of KVKs Involved	Details of activity			Critical input (Breed / Variety / Medicine doses,)	No. of farmers	Unit / No. / Area (ha)
		Name of crops / Commodity groups / Implements	Quantity / Number / Rent / Charges	Technology used in seed / fodder bank & function of groups			
Seed bank	3	Summer Moong,Wheat,Rajmash	1.92	Zero tillage Summer Moong& farmer group	Summer moong-SML-832,HD-2967, HD-2851,Raj-3765&Rajmash-Basapa,Triloki,Jwala&Kalash	39	16.4
Commodity groups	2	Commodity groups	5	Fruits and vegetables processing	Vegetable Production and Marketing	75	
Custom hiring centre	6	Agricultural Impements			Farm machinery on custom hiring	744	789.24
	Ropar	Multi crop Planter,Forage Chopper, Turbo seeder ,Power Weeder,	Rs 50/hr for all Farm equipments		Farm machinery on custom hiring	38	20
	Fatehgarh sahib	Tractor mounted sprayer, Reaper binder,tractor drawn water,multiple ridge planter, zero till drill,water channel maker,harrow ridger,leveller metallic	8 no.			93	90
	Kullu	Power weeder , GK	24 no.			390	111.24

Interventions	No. of KVKs Involved	Details of activity			Critical input (Breed / Variety / Medicine doses,)	No. of farmers	Unit / No. / Area (ha)
		Name of crops / Commodity groups / Implements	**Quantity / Number / Rent / Charges**	**Technology used in seed / fodder bank & function of groups**			
		100 Power sprayer,Sr 420 Mist Blower, Knap sack Farm Star 708, Portable mini sprinkler, Portable sprinkler system with pumpset, spaneo garlic planter,Falcon Premium with Angular Long Rod Prunner,Falcon Premium Fruit Catcher					
	Faridkot	Machine for direct sowing of paddy,Rotavator,zero till drill, bed planter, multi crop planter , tractor mounted spray pump, forage harvestor, preseed cleaner, spike tooth harrow	8 no.		Implements provided on custom hiring basis	223	568
	Hamirpur	Power tiller,Maize Sheller,spray pump,bush cutter	Rs200/hr,Rs60/hr,Rs10/hr, Rs50/hr				
	Chamba	Foot sprayers-3	Rs 20/hr				
		Weighing machine	Rs0.50/bag				
		Power tiller	Rs20/hr				
		Cultivator with accessories-1					
		Maize cob sheller-3	Rs 5.00/qt				
		Power sprayer pump-1	Rs 10/hr				
Collective marketing	1	Vegetables	120qts		Seed & seedlings	12	6ha
Feed inrichment	1	Feed enrichment			Concentrate ration of CSK HPKV	7	78 animals

Module 11.5: Capacity Building (HRD)

Crop production	No. of kvk involved	Title of training	No. of Courses	No. of beneficiaries		Total
				Males	Females	
Crop production	2	Scientific cultivation of Rabi crops for realizing higher yield	6	178	13	191
		Importance of seed treatment in Rabi crops				
		Control of grassy and broad leaf weed in wheat and other rabi crops				
		Scientific cultivation of summer pulses for higher returns				
		Improved production technology on Rajmash				
		Management of summer pulses				
Resource conservation Technology	12	Techniques for sowing of wheat with Turbo seeder	27	595	198	793
		Training programme on hydrogel technology				
		Water harvesting technologies and its importance				
		Direct seed rice and Rice straw management for soil health improvement				
		Crop production& natural resource management				
		Use of Leaf Colour Chart&Tensiometer				
		Recycling and management of Paddy straw				
		Sowing of wheat with Happy seeder				
		Wheat sowing with Happy Seeder				
		Biogas Plant				
		Water harvesting and efficient use of water				
		Importance and usage of tensiometer and leaf color charts				
		Tensiometre based scheduling of irrigation in Rice				
		Leaf color chart based application of nitrogenous fertilizer in Rice				
		Leaf color chart based application of nitrogenous fertilizer in Rice				
		Importance of aforestration and conservation				
		Canopy Management, Harvesting of Rainwater				
Crop Diversification	5	Mushroom cultivation as subsidiary occupation	10	153	92	245
		Zero drill sowing of Summer Moong				
		Green Manuring with Sunhemp				
		Mushroom Cultivation				
		Crop diversification				
		Diversification option under changing climate scenario				

Crop production	No. of kvk involved	Title of training	No. of Courses	No. of beneficiaries		Total
				Males	Females	
		Turmeric cultivation in monkey menace areas				
		Scientific cultivation of okra				
		Cultivation and management of floricultural crops.				
Live stock management	7	Training of Azola and feed management in goats	13	293	121	414
		Veterinary clinical camps				
		Importance of sanitation and hygiene in cattle				
		Nutrition Management of milch cattle during pregnancy				
		Breed up gradation				
		Clinical camp				
		Management of Livestock and feeding on mineral mixture etc. in cattle and sheep				
		Live stock management				
		Importance of mineral mixture in animal feed				
		Poultry management				
Crop management	5	Seed treatment & soil testing	17	445	126	571
		Time of wheat sowing and varietal selection				
		Management of white fly in cotton				
		Vegetable cultivation under protected condition				
		Importance of pollinizers and pollinators in fruit production				
		Scientific Methods of training and pruning in Apple				
		Improved production technology on Rajmash				
		Scientific cultivation of okra				
		Pre training programme on Pulse crop				
		Pre training programme on oilseed crops				
		Pre training programme on oilseed and pulse crops				
		Scientific cultivation of Rabi crops				
		Soil sampling and management of soil health				
		Crop management				
Farm implements and Machinery	3	Benefits of Using farm implements and machinery	7	186	24	210
		Safe use of farm implements and machinery				
		Machinery for seed bed preparation, paddy transplanting and spraying				
		Improved farm implements				
Fodder and feed Management	3	Fodder management technologies during winter	6	141	45	186
		Use of mineral mixture to enhance fertility				

Crop production	No. of kvk involved	Title of training	No. of Courses	No. of beneficiaries		Total
				Males	Females	
		and milk yield in dairy animals				
		Fodder and feed management				
Pest and disease management	7	Integrated pest and disease management	21	522	135	657
		IPM/IDM in field crops				
		Effect of pesticides and insecticides on human health				
		Fruit fly trap demonstration				
		Fruit fly management				
		IPM in Rabi crops				
		Insect and disease management in wheat crop				
		Management of Nursery Diseases, Insect-pests, Management of Cole crops				
		Pest and disease management				
		IPM in sugarcane				
		Seed treatment and diseases control in paddy nursery				
		Control of diseases and insect in oil seeds and pulses				
		Disease and insect control in wheat				
		Disease and insect control in vegetable				
		Control of Insects-pest of Moong				
		Scientific methods of rodent control in apple				
		Seed Treatment in Guar				
Human nutrition and child care	1	Nutrition and immunization of newborn babies	1	8	25	33
Nutrition Management	4	Integrated Nutrient Management in Apple	5	89	28	117
		Techniques for the preparation and use of Organic manures				
		Balanced nutrition in horticultural crops				
		Integrated nutrient management in field crops				
Production of organic inputs	1	Preparation of quality compost and bio gas plant	2	51		51
Forest tree/agro-forestry Plantation	1	Planning and lay out for planting forest tree	2	39	5	44
Employment generation	2	Poultry farming	2	13	27	40
		Employment generation				
Home science	1	Women Empowerment	2	12	34	46
		Income generation activities for SHGs				
Value addition	5	Value addition of citrus fruits	7	47	149	196
		Processing				
		Value addition in fruits and vegetables				
		Value added Mango products				
		Value addition of aonla fruit				
		Value addition of locally available plant fiber				
		Drying of seasonal vegetables				

Crop production	No. of kvk involved	Title of training	No. of Courses	No. of beneficiaries		Total
				Males	Females	
Vegetable cultivation	2	Improved Technology of vegetable cultivation	3	183	31	214
		Scientific cultivation of Cauliflower				
Climate Awareness	3	Climate risk management	4	201	35	236
		Effect of climate change on crops				
		Environment Day celebration				
Nursery raising	1	Nursery raising	1	14	26	40
Demonstration on oyster mushroom	1	Demonstration on oyster mushroom	1	2	26	28
Bee keeping	1	Bee keeping	1	8		8
Co-Operative agriculture	3	Co-Operative agriculture	3	86	10	96
		Programme on different credit lending schemes				
		Formation of farmers Club				
Agro- advisory services	1	Agro- advisory services	1	22		22

Module 11.6: Extension Activities

Name of the activity	No. of KVK involved	Number of programmes	No. of beneficiaries		Total
Method Demonstration	8	166	956	383	1339
Field day	6	18	587	48	635
Awareness campaign	7	55	1270	1266	2536
Exposure visit	6	10	308	50	358
Group Discussion	7	94	1016	395	1411
Agro-Advisory	8	205	1127	435	1562
Diagnostic visit	6	66	296	152	448
Community check-up for women	1	1		43	43
Commodity groups	1	1	22	2	24
Field visit	5	61	222	48	270
Establishment of community nurseries	1	1	3		3

13. PUBLICATIONS

Staff of Zonal Project Directorate have involved in documentation of various activities. Publications brought out during the period under report are listed below :

Technical/Popular articles:

1) Narula A.M., Keshava and Ajaib Singh 2012. Making Agriculture Distinct. In Souvenir of 7th National Conference on KVK-2012. Punjab Agricultural University, Ludhiana, pp12-13.
2) ?????? ??????? ?????2012 "?????????? ???? ?? ???? स्वस्थप्रद बनाओ ??????????????Vol.13, pp 58-60.
3) ?????? ??????? ?????2012 ?????????????????????, ???? ??????????, Vol.13, pp 63-66.
4) ?????? .?? , ????? ?? ., ???? ?????2012 ????? ?????? ????????? ??????? ?? ?????? ????? ???? ???? ", ??? ??? ??? Vol. 15 No.7 pp 25-26.

Technical bulletins/books:

1) Kokate K.D., Narula A.M., Thakur S.K., Pankaj Sood and Yadav D.S. 2012. Protected Cultivation : KVKs Initiative in Himachal Pradesh. Zonal Project Directorate, Zone-I(ICAR), Ludhiana, P 77
2) Narula A.M., Pankaj Sood, Yadav D.S., AjaibSingh and Thakur S.K. 2012. Farm Innovators : The Backyard Scientists, Zonal Project Directorate, Zone-I(ICAR), Ludhiana, P 129
3) Narula A.M., , Ramnivas Sharma, Anjani Kumar and Keshava. 2012. Vivasayak Dairy Nirdishka , Zonal Project Directorate, Zone-I(ICAR), Ludhiana, P 100
4) Booklet comprising of State and Central Government schemes related to agriculture and allied sectors implemented in Punjab, Haryana and Himachal Pradesh, 2012, Zonal Project Directorate, Zone-I(ICAR), Ludhiana,

Research Papers:

1) Narula, A M, Keshava and Ajaib Singh. 2012. Initial learning in making the agriculture climate resilient. Crop Improvement, Vol 39 (Spl. Issue), pp 631-632.
2) Mamgai. P. 2012. Nutrition education and awareness generation among rural women through Krishi Vigyan Kendras. Crop Improvement, Vol 39 (Spl. Issue), pp 1265-1266.

Annexure-I

STAFF POSITION OF ZONAL PROJECT DIRECTORATE, ZONE-I, LUDHIANA

Staff Position as on 31st March, 2013

Sr. No.	Name of incumbent	Designation	Date of Joining
Scientist			
1.	Dr. A.M. Narula	Zonal Project Director	11.02.2010
2.	Dr. Keshava	Senior Scientist	07.11.2005
3.	Dr. Preeti Mamgai	Scientist (Senior Scale)	28.07.2006
Technical			
5.	Sh. Harbhajan Singh	Driver (T-2)	14.10.1997
Administrative			
6.	Sh. Deep Chandra Sati	AF&AO	27.06.2009
7.	Mrs. Manjit Kaur	Assistant	29.08.1997
8.	Ms. Indu Bagal	Assistant	25.05.2012
9.	Sh. Sashi Pal	Personal Assistant	24.01.2011
10.	Sh. Permod Sharma	LDC	10.01.2006
11.	SH. Raj Kumar	LDC	22.03.1996
12.	Sh. Deepak Sharma	LDC	04.04.1996